Academic Information and Procedures

It is each student's responsibility to know or seek out as needed the regulations and pertinent procedures of the Graduate School as set forth in the Graduate Degree Programs Bulletin and in the Thesis Guide and to meet the standards and requirements expressed by these regulations. The Graduate Bulletin is available online at www.psu.edu/bulletins/whitebook; the Thesis Guide is on the Thesis Office Web site at: forms.gradsch.psu.edu/thesis/thesisguide.pdf.

Graduate students are encouraged to contact the Office of Graduate Enrollment Services, 114 Kern Building (814-865-1795), for guidance if they have any questions, uncertainties, or difficulties concerning any procedure or regulation of the Graduate School or any procedure or regulation of the University as it may affect them.

In addition, all programs should have a graduate handbook, which provides students with information on specific program requirements and procedures from admission to degree completion (i.e., arrangement of courses in accordance with degree requirements including required courses and typical elective courses; appointment of advisors and/or committees; responsibilities of the student, advisor and committee; scheduling of exams; assistantship duties; etc.).

UNSATISFACTORY SCHOLARSHIP

A graduate student who fails to maintain satisfactory scholarship or to make acceptable progress in a degree program may be dropped from the University. One or more failing grades or a cumulative grade-point average below 3.00 for any semester or session or combination of semesters and/or sessions may be considered as evidence of failure to maintain satisfactory scholarship. Action may be initiated by the department or committee in charge of the graduate major or by the chair of the student’s doctoral committee. The procedures to be followed in such action are found inAppendix III in this bulletin.

CONFIDENTIALITY OF STUDENTS' RECORDS

The Pennsylvania State University collects and retains data and information about students for designa-ted periods of time for the express purpose of facilitating the students’ educational development. The University recognizes the privacy rights of individuals in exerting control over what information about themselves may be disclosed and, at the same time, attempts to balance that right with the institution’s need for information relevant to the fulfillment of its educational missions.

The University further recognizes its obligation to inform the students of their rights under the Family Educational Rights and Privacy Act of 1978 (FERPA); to inform students of the existence and location of records as well as to define the

purposes for which such information is obtained; to provide security for such material; to permit students access to, disclosure of, and challenge to this information as here- in described; and to discontinue such information when compelling reasons for its retention no longer exist.

Student Record Policy---No information from records, files and data directly related to a student shall be disclosed by any means (including telephone) to individuals or agencies outside the University without the written consent of the student, except pursuant to lawful subpoena or court order, or in the case of specifically designated educational and governmental officials as required by FERPA. Information contained in such records may be shared within the University by University officials with “legitimate educational interest” in such information.

A more complete description of the University’s policy on confidentiality of student records, including educational records and alumni records; disclosures to students, third parties, agencies and parents of dependent students; and challenges to entries, is contained in *Policies and Rules,* which is available at departmental and deans’ offices.

Programs and Advanced Degrees

PROGRAMS

Major Program--A student's major program is the field of primary interest and the one in which the greater portion of graduate work is taken. Programs are designed to prepare students to assume positions of informed and responsible authority in their fields and to contribute creatively to them. They promote not only specialization, but also breadth of scholarship, the ability to study and think independently, and familiarity with the principal techniques and important literature in the field. The research undertaken by the candidate should deal with a problem that can yield a significant contribution to knowledge.

In general, departments of the University are identified with specific major programs. Thus, Aerospace Engineering is the program of study that is offered by the Department of Aerospace Engineering. In some cases, a single department offers work in more than one degree program. Occasionally, two or more departments within a college collaborate in offering an interdisciplinary program.

Intercollege Graduate Programs--When faculty members from departments in two or more colleges collaborate in offering a graduate major, the program is designated as an intercollege graduate degree program. A committee of graduate faculty members approved by the Graduate School is responsible for administering the program under a program chair. The University currently offers more than a dozen such programs, primarily at the doctoral level. They are included and identified in the listings at the beginning of this bulletin. Students interested in these programs should contact the program chair listed in the program description in this bulletin.

ADVANCED DEGREES OFFERED

The degrees of Doctor of Philosophy, Doctor of Education, and Doctor of Musical Arts are conferred by the University. The Ph.D. places a strong emphasis on research. The D.Ed. strongly emphasizes professional competence in a field of education. All require high attainment and productive scholarship.

The Master of Arts and the Master of Science degrees are academic in nature, the programs placing emphasis on basic knowledge and research. A number of professional master's degrees also are conferred: Master of Accounting, Master of Agriculture, Master of Applied Statistics, Master of Architecture, Master of Biotechnology, Master of Business Administration, Master of Education, Master of Engineering, Master of Environmental Pollution Control, Master of Finance, Master of Fine Arts, Master of Forest Resources, Master of Geographic Information Systems, Master of Health Administration, Master of International Affairs, Master of Landscape Architecture, Master of Leadership Development, Master of Manufacturing Management, Master of Music, Master of Music Education, Master of

Professional Studies, Master of Project Management, Master of Public Administration, and Master of Software Engineering.

Graduate degree programs are offered at five campuses of the University: University Park (State College); Penn State Erie, The Behrend College (Erie); Penn State Harrisburg (Harrisburg); the Penn State Milton S. Hershey Medical Center (Hershey); and Penn State Great Valley (Malvern). Some graduate programs also are offered online through Penn State's World Campus at www.worldcampus.psu.edu(Opens New Window).

CHANGE OF DEGREE OR PROGRAM

A graduate student who has been admitted for work in one major program but who wants to transfer to another should complete a “Resume Study/Change of Degree or Major” form and submit the request to the Office of Graduate Enrollment Services. The student’s credentials will be reviewed and the proposed new major department head or committee chair consulted. If the change is approved but the student is inadequately prepared for the new major, the student may be required to make up certain deficiencies.

A graduate student admitted for either an academic degree (M.A., M.S., or Ph.D.) or a professional degree (M.Acc., M.Agr., M.A.S., M.Arch., M.Biot., M.B.A., M.C.P., M.E.P.C., M.Ed., M.Eng., M.F.A., M.Fin., M.F.R., M.G.I.S., M.H.A., M.I.A., M.L.A., M.L.D., M.M.E., M.M.M., M.Mus., M.P.A., M.P.M., M.P.S., M.S.E., D.Ed., or D.M.A.) who wants to change from one type of degree program to another must complete a “Resume Study/Change of Degree or Major” form and submit the request to the Office of Graduate Enrollment Services. Similarly, a student who has earned a master’s degree but who wants to earn a doctoral degree in a different field must complete a “Resume Study/Change of Degree or Major” form and submit the request ot the Office of Graduate Enrollment Services. A student may be required to make up certain deficiencies if inadequately prepared for the new program.

CONCURRENT CANDIDACIES

In general, graduate students are best advised to focus on one degree objective at a time. However, a candidate for a master’s degree in one major field who wishes to begin work for either a master’s or a doctoral degree in a second field; or a candidate for a doctoral degree who wishes to begin work on a master’s degree in a second field while concurrently completing the doctoral program can petition to do so (approval will not be granted for concurrent double Ph.D. or D.Ed. degrees). The department heads of both fields and the director of Graduate Enrollment Services must approve any such plan. Guidelines for preparation of a proposal for concurrent candidacies have been established by the Graduate Council and are available in the Office of Graduate Enrollment Services, 114 Kern Building.

DUAL-TITLE DEGREE PROGRAMS

Students may apply for dual-title degrees in one of the dual-title programs approved by the Graduate Council. Students wishing to follow this course of action must already be enrolled in an existing graduate program and have a primary program in which the greater portion of the work will be conducted. The primary program will be supplemented by a secondary program in which substantial work is carried out under the supervision of a faculty adviser from the secondary program. Guidelines and information are available from the dean of the Graduate School.

Integrated Undergraduate-Graduate Study--The Schreyer Honors College offers selected baccalaureate degree candidates the opportunity to integrate undergraduate and graduate courses of study in a continuous program culminating in both a baccalaureate and a master's degree.

A University Scholar who is granted Integrated Undergraduate–Graduate (IUG) status will have dual enrollment in an undergraduate program and in the Graduate School. Some credits earned as an under-graduate may be applied to both degree programs. Guidelines and information are available from The Schreyer Honors College.

Other Integrated Undergraduate-Graduate Programs--A limited number of approved Integrated Undergraduate–Graduate programs other than those in The Schreyer Honors College are also offered. These programs allow students to work on an undergraduate and a graduate degree at the same time and are intended for exceptional students who can perform their academic studies at an accelerated pace and take on the challenges of graduate courses and research while still enrolled as undergraduates. Typically, a certain number of credits may be applied to both degrees, and the total time for completing both degrees is less than if the degrees were earned separately. These programs include those within a single department, such as the B.L.A./M.L.A. in Landscape Architecture, the B.Arch.-M.S.Arch. program, the B.A./M.A. in Comparative Literature, and B.A.E./M.A.E. in Architectural Engineering; and also those that are interdepartmental or intercollegiate programs, and the integrated five-year science/business B.S./M.B.A. program. Guidelines and information are available from the dean of the Graduate School.

Registration

A graduate student who is in residence at the University is expected to be properly registered. In residence means that the student (whether full- or part-time, whether commuting to campus or other instructional site or living nearby or on campus) is pursuing graduate credits and/or an advanced degree by (a) attending classes or seminars for credit or audit; (b) doing a thesis, term project, independent study, or similar research or scholarly work in a University laboratory or other research facility; (c) consulting in person or by other means of communication with one or more faculty members on scholarly matters, research projects, or dissertation; (d) using the library, Computation Center, or other University information resources; or (e) using other University facilities provided for graduate study.

The responsibility for being properly registered rests first with the student and secondarily with the student's adviser if the student has one (nondegree students may not). A student may register for course work or research or a combination of the two. In the case of research the number of credits shall be determined by the amount of time devoted to the investigation, with 1 credit representing approximately the equivalent of one week of full-time work. In the later stages of the program, the situation will determine the requirements for the student's registration. (See Registration Near the Completion of a Program.)

International Students--Because international students on an F1 or J1 visa are required by the Department of Homeland Security regulation to be in residence, all international students need to be registered for full-time status (fall and spring semester), unless an exception to full-time enrollment has been approved. Students who fail to register may jeopardize their status.

Advisers--Advising is an important factor in enhancing the quality of a student's program. To assist the student in planning a coherent program and meeting all degree requirements, the head of the major department or program chair will designate a member of the faculty to serve as adviser. It is the student's responsibility to secure an adviser from the department or program and to seek a conference before each registration.

Time of Registration--Registration days are indicated in the calendar at the beginning of this bulletin. A student is expected to complete registration during the officially designated period and to attend the first meeting of all classes. If this is impossible because of some emergency or unusual circumstance, the student may be granted permission by the instructor to miss a few class meetings, it being understood that work missed will be made up subsequently. Under these conditions permission may be granted through the Office of Graduate Enrollment Services for the student to register late. In general, a student who receives permission to register late will be required to reduce the course load in proportion to the length of absence.

A student who fails to complete the process of registration within the officially

designated registration period will be liable for the late registration charge, regardless of when the student begins attending classes.

Continuity of Registration--A student who is a degree candidate at any of the five graduate campuses of the University and who registers there without interruption for each fall and spring semester is considered to have maintained a normal continuity of registration. A student who has been admitted as a "summers only" D.Ed. candidate (see D.Ed. Residence Requirements) can maintain continuity by registering each summer for a six-week summer session.

Anyone who has interrupted such a normal sequence and now plans to register for work at the University Park campus is required to apply to the Office of Graduate Enrollment Services, 114 Kern Building, or via the Web at www.gradsch.psu.edu/curr www.gradsch.psu.edu/current/current.html (Opens New Window).

The policy may be summarized for any specific semester or session as follows:

- *Summer* Session--Resume Study/Change of Degree or Major form required unless the student was registered for the preceding spring semester or the preceding summer session (if "summers only" student).
- *Fall* Semester--Resume Study/Change of Degree or Major form required unless the student was registered for the preceding summer session or the preceding spring semester.
- *Spring* Semester--Resume Study/Change of Degree or Major form required unless the student was registered for the preceding fall semester.

Withdrawal--The dropping of all academic work for which a student is registered in any semester constitutes withdrawal from the University, and changes the student's status to nondegree. A "Resume Study/Change of Degree or Major" form must then be submitted and approved if the student wants to enroll for further work toward a degree.

Procedure--For each registration, it is expected that the student, in consultation with the adviser, will prepare a schedule of courses and research designed to fit individual needs and meeting the pertinent credit limits. The registration process is completed in the manner specified for all students at the University.

Under certain conditions credit may be earned for work done away from the campus. A student contemplating such work should first consult with his or her adviser and then inquire at the Office of Graduate Enrollment Services about the procedures and conditions. The student must assume responsibility for the registration process, by accessing the Registrar's Web site atwww.registrar.psu.edu (Opens New Window). Registration must be completed before the close of central registration at University Park campus.

A student must register for courses audited as well as those taken for credit.

REGISTRATION NEAR THE COMPLETION OF A PROGRAM

A candidate for the Ph.D. degree is required to register continuously for each semester from the time the comprehensive examination is passed and the two-semester residence requirement is met until the thesis is accepted by the doctoral committee, regardless of whether work is being done on the thesis during this interval. (See Registration and Continuous Registration.)

Although there is no general continuous registration requirement for D.Ed. degree candidates and master's students, individual programs may require it. It should be noted, moreover, that (a) proper registration (see Registration) is expected of all graduate students; (b) graduate assistants must carry the prescribed credit loads (see Credit Loads and Academic Status); and (c) because of visa considerations, international students typically will register every semester, no matter what their degree objectives.

A master's candidate is not required to register for the final semester in order to graduate or in order to make minor revisions to the thesis and/or to take a final examination for the degree, unless required to do so by the program.

Graduate Credits

Typically, a candidate for an advanced degree is required to earn a certain minimum number of credits at Penn State. Consequently, there is a limit to the number of credits that may be earned at another approved institution to meet the minimum requirements of the degree. Moreover, the department or committee in charge of a major program may require a student to do more of the work at the University than specified by the limitations set by the Graduate Faculty.

Full-time participation in graduate study involves a wide range of activities. The nature of these activities varies because of the diversity of programs throughout the University. The graduate student is responsible for ascertaining, through the adviser and/or program office, the range of total activity of his or her individual program that constitutes normal progress toward the degree.

A self-supported or fellowship student who is registered for at least 9 credits is considered to be engaged in full-time academic work for that semester. If such a student wishes to register for more than 15 credits, an exception to the normal maximum load must be granted through petition (with adviser's approval) to the Office of Graduate Enrollment Services.

Credit limits and full-time status for assistants and University employees are described under Assistantships and Credit Loads and Academic Status.

Graduate courses carry numbers from 500 to 599 and 800 to 899.

--A 500-level graduate course builds on advanced undergraduate and/or graduate courses, dealing with the frontiers of knowledge in the field. It is grounded in theories, hypotheses, and methodologies as expounded in current and/or primary literature sources. Synthesis of knowledge and independent analytical work by the student must be demonstrated. Significant interaction among students and with the instructor(s) is expected.

--An 800-level graduate course pertains to the most recently established knowledge and methodologies in a field of study, as applied to practice. It emphasizes analytical thinking and application of knowledge by the student in the context of providing pragmatic solutions for professionals. Significant interaction among students and with the instructor(s) is expected.

Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. Language courses used to meet foreign language requirements are exceptions, as are the ESL courses for international students.

No student is permitted to count audited credits toward the minimum credit load for full-time or part-time status.

Course-Numbering System--Courses in the series 1–399 are not listed in this bulletin because they are strictly undergraduate courses and yield no graduate

credit. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Courses in the series 400–499 are for upperclass students with at least a junior standing and for graduate students. Only a limited number of credits earned in these courses may be counted toward the requirements for an advanced degree. Detailed regulations concerning the restrictions are given under the specific requirements for the various master's degrees.

Courses in the series 500–599 and 800-899 are restricted to students registered in the Graduate School, senior undergraduate students with an average of at least 3.50, and certain other students with averages of at least 3.00 who have been granted special permission to enroll through the Office of Graduate Enrollment Services. (See the introduction to Graduate Programs, Faculty, and Courses for a more detailed description of these courses.)

The numbers 600 (on campus) and 610 (off campus) are available for credit in thesis research in all graduate major programs. The numbers 601 and 611 do not denote conventional courses but are used for noncredit special registration for thesis preparation by a Ph.D. candidate. (Note that 596 course numbers may not be used for thesis research work.) Registration under these numbers will maintain status as a full-time (601) or part-time (611) student during the interval that begins at the time the student passes the comprehensive examination and meets the two-semester residence requirement and ends at the time the doctoral committee accepts the thesis. The student may register for 601 if engaged full-time in the preparation of a thesis or for 611 if engaged only part-time in thesis preparation. Candidates for the Ph.D. degree do not receive grades for noncredit registrations (601 and 611). [See also Ph.D.—Additional Specific Requirements and the common course descriptions in the introduction to Graduate Programs, Faculty, and Courses.]

Schedule of Courses--The most current information on courses that will be offered in any specific semester is at http://soc.our.psu.edu/soc (Opens New Window) . It gives the number of the class, the hours at which the class will meet, the location of the class, and in some cases the instructor's name.

Visiting and Auditing Classes--A graduate student registered for a given semester who wants to attend classes without receiving credit may secure permission either to visit or to audit courses during that semester.

As a visitor, a student may attend classes with the approval of the instructor but may not claim the usual privileges of class membership, such as participating in discussion, doing practicum work, or taking examinations. Registration is not required for the privilege of visiting, and no record appears on the student's transcript.

As an auditor, a student may participate in class discussion, do practicum work, take examinations, and generally enjoy the privileges of a class member. Registration procedures and fee payment are the same as for taking the course for credit. Attendance is required. No credit is given, either on completion of the

course or at a later time; however, the number of credits assigned to the course appears on the grade report and on the student's transcript. Thus, when a student receives an audit grade, the number of credits audited is shown. The symbol AU shall be used if attendance has been regular, the symbol W if attendance has been unsatisfactory.

A graduate assistant or Fellow who is required to register for a certain minimum number of credits is not permitted to count audited course credits toward the minimum credits needed. Undergraduate courses taken to meet foreign language or English requirements do count in the total credit load. The student may register for credit or audit beyond the required minimum but may not exceed the normal maximum without special permission.

Credit Loads and Academic Status

Graduate Assistants--Graduate assistants must be enrolled at Penn State as graduate students. More specifically, since assistantships are provided as aids to completion of advanced degrees, assistants are expected to enroll for credit loads each semester that fall within the limits indicated in the table below. Maximum limits on permissible credit loads are indicated in order to assure that the student can give appropriate attention both to academic progress and assistantship responsibilities. These considerations give rise to the table of permissible credit loads below.

Level of Assistantship	Credits Per Semester		Credits per 6-Week Summer Session	
	Minimum	Maximum	Minimum	Maximum
Quarter-time	9	14	5	7
Half-time	9	12	4	6
Three-quarter-time	6	8	3	4

*Credits taken over both six-week summer sessions must total a minimum of 9 (for 1/4- and 1/2-time assistantships) or 6 (for 3/4-time assistantships) and cannot exceed a maximum of 8 (for 3/4-time assistantships), 12 (for 1/2-time assistantships), or 14 (for 1/4-time assistantships).

To provide for some flexibility, moderate exceptions to the specified limits may be made in particular cases. The credit limits specified above may only be increased or decreased in exceptional cases for a specific semester or summer session by permission of the assistantship supervisor, the student's academic adviser, and the dean of the Graduate School (requests should be submitted for the dean's approval via the Office of Graduate Enrollment Services). The Graduate School expects that an exception made in one semester or summer session will be compensated for by a suitably modified credit load in the subsequent semester or summer session, so that, on the average, normal progress is maintained at a rate falling within the limits above. Failure to do so may jeopardize the student's academic status. Maintenance of the established credit loads and responsibility for consequences of a graduate student's change of course load rest with the student and adviser. The course load is a factor in determining whether a graduate student is classified as a full-time or part-time student; has met residence requirements; and is eligible to hold a fellowship, traineeship, assistantship, or departmental or program appointment.

Full-Time Academic Status--Students holding fellowships, traineeships, or other awards based on academic excellence are required to carry 9 or more credits each semester (fall and spring). For awards that require full-time summer registration, students should register for a minimum cumulative total of nine credits (over all summer sessions), or SUBJ 601 (in the case of post-comprehensive doctoral candidates). A graduate assistant whose semester or summer session credit load

exceeds the minima in the above credit table and whose assistantship duties are directly related to his or her degree objectives is considered by the Graduate School to be engaged in full-time academic work for that semester or summer. A post-comprehensive doctoral candidate who is registered for SUBJ 601 also is so considered.

Part-Time Academic Status--A student who in any semester or summer session is registered for study but who does not meet the criteria for full-time status is considered to be engaged in part-time academic work for that semester. This includes students registered for SUBJ 611.

Credit Loads for Internationals--The Department of Homeland Security requires that international students proceed in a timely fashion toward completion of their degrees, as established by the academic department and (usually) stated on their initial immigration document. Failure to maintain normal progress toward completion of the degree during this period will jeopardize the student's ability to continue academic study, adjust status, or seek future employment in the United States. Because of this, students should not be enrolled less than full-time during fall or spring semester without approval of International Student Services (ISS).

The U.S. Department of Homeland Security requires the ISS to report violations of status, including failure to maintain full-time enrollment. The following is intended to provide guidance for international graduate students and for ISS in determining full-time status:

- A graduate student is considered full-time if registered for a minimum of 9 credits, excluding courses taken for audit, or if a Ph.D. candidate who has successfully completed the comprehensive examination and is registered for SUBJ 601.
- On rare occasions, and under exceptional circumstances, international students in master's degree programs who have completed all required course work and, if applicable, research for their degree, may be granted an exception to the need to maintain full-time status as defined above, for a limited period (in no case to exceed two semesters), by special petition to ISS in advance of the semester in which the exception is needed. This request must be accompanied by a letter from the chair of the graduate program in which the student is enrolled verifying that all course and any research requirements have been completed, and indicating support for the request. ISS may consult with the Office of the Dean of the Graduate School in determining whether specific requests are appropriate and justified.
- Under all circumstances, international students must maintain registration for at least 1 credit as stipulated earlier in this bulletin. (See Academic Information and Procedures/International Students.)

Employment--Many students depend upon part-time employment to help meet their expenses. A student who is thus employed, whether on or off campus, must recognize the time demands of a work schedule in planning an academic program. A student holding a fellowship or scholarship may not accept employment of any kind for service beyond that specifically permitted by the appointment. A graduate assistant may assist in classroom or laboratory instruction, in research

or in other work. The tasks assigned to a graduate assistant often are identical in nature to those required for the advanced degree sought. Additional compensation is paid to a graduate assistant by the University for additional hours of work only with special, advance approval of the administrative head of the academic unit in which the assistantship is held, and of the chair of the student's graduate academic program, and provided that such compensation is not for additional hours of work on the assigned assistantship duties. A graduate assistant may not hold a concurrent appointment with the University other than a Fellowship Supplement.

For international students, guidelines for assistantships or employment are the same as for domestic students, with the following distinctions: (a) I-9 and W-4 forms must be processed through ISS; (b) vacation period employment may be up to forty hours per week; and (c) since Department of Homeland Security regulations on employment are subject to change, all employment off campus for international students must be cleared through ISS.

Full-Time Employment Off Campus--A candidate for the Ph.D. degree at a particular campus of the University may not count the work of any semester toward the residence requirement for this degree while engaged in full-time employment off campus or at a different campus of the University.

Staff Employee Credit Status--A full-time staff employee of the University may schedule up to 16 credits per academic year, either for credit or audit.

Full-time University employees may meet Ph.D. degree residence requirements by registering for 6 credits per semester or 4 credits per eight-week summer session and by obtaining certification from the department head as being principally engaged in activities directly relating to their degree objectives. A post-comprehensive full-time University employee may not register for SUBJ 601 (i.e., full-time thesis preparation), but may register for SUBJ 611 (part-time thesis preparation).

No academic employee above the rank of instructor or research assistant or equivalent may receive from the University a master's degree or doctoral degree in any graduate program where the faculty member has membership, teaches courses, serves on master's or doctoral committees, or has other supervisory responsibilities that might give rise to conflicts of interest. The faculty member should inform his/her department head of his/her intention to pursue an advanced degree.
University staff employees who want to take graduate degree work must first be admitted to the Graduate School.

Grading System

A grade is given solely on the basis of the instructor's judgment as to the student's scholarly attainment. The following grading system applies to graduate students: A (EXCELLENT) indicates exceptional achievement; B (GOOD) indicates substantial achievement; C (SATISFACTORY) indicates acceptable but substandard achievement; D (POOR) indicates inadequate achievement and is a failing grade for a graduate student—a required course in which a D has been obtained cannot be used to meet degree requirements; and F (FAILURE) indicates work unworthy of any credit, and suggests that the student may not be capable of succeeding in graduate study. The grade-point equivalents for the above marks are: A, 4.00; B, 3.00; C, 2.00; D, 1.00; F, 0. A minimum grade-point average of 3.00 for work done at the University is required for all graduate degrees. In Fall 1995 a +/– grading system went into effect that includes A–, B+, B–, and C+. The grade-point equivalents are A–, 3.67; B+, 3.33; B–, 2.67; and C+, 2.33.

In addition to the quality grades listed above, two symbols, DF (deferred) and R, may appear on a student's transcript. If work is incomplete at the end of a semester because of extenuating circumstances, the instructor may report DF in place of a grade, which will appear temporarily on the student's record. It is not appropriate to use the DF either casually or routinely to extend a course beyond the end of the semester or to extend a course for a student who has failed so that the individual can do extra work to improve the grade. The DF must be removed (i.e., the course must be completed) within nine weeks of the beginning of the succeeding semester, with two possible exceptions: (a) a completion deadline longer than nine weeks may have been previously agreed upon by the instructor and student, with a memo on the agreement having been sent to the Office of Graduate Enrollment Services, 114 Kern Building, for inclusion in the student's file; or (b) as the nine-week deadline nears, it may become evident that an extension is warranted. The instructor then sends a request for an extension (to a specified date) to the Office of Graduate Enrollment Services, with a justifying statement.

It is to be emphasized that no deferred (DF), missing(*), or no grades (NG) may remain on the record at those times when a student reaches an academic benchmark. Benchmarks include completion of a degree program (e.g., master's completed for a student continuing through for a doctoral degree) and the doctoral candidacy, comprehensive, and final oral examinations. Graduate programs may add additional benchmarks.

It is further noted that there are only three circumstances under which a course grade, once assigned, can be changed: (1) if there was a calculational or recording error on the instructor's part in the original grade assignment (Senate Policy 48-30); (2) if it is a course for which an R grade has been approved and in which an initial R can be assigned and changed later to a quality grade; (3) if, as discussed above, a DF was assigned and the deadline for course completion has not yet passed.

Grade changes are governed by Senate Policy 48-30, found in Policies and Rules.

In the case of thesis work, either in progress or completed, and in certain courses (e.g., 590, 594, 595, 596, 597, 598, 599, 894, 895, 896, 897, 899, and a few others) approved by the Graduate Council, the instructor may report the symbol R in place of a grade. An R does not influence the grade-point average. It indicates that the student has devoted adequate effort to the work scheduled but gives no indication of its quality. The symbol may be used, for instance, in courses that are officially designed to extend over more than one semester or in courses for which a quality grade is not appropriate. An R in an approved graduate course need not be changed later to a quality grade. Graduate courses approved for R grading may be credited toward fulfilling graduation requirements. However, if the instructor deems it appropriate, the R grade may be changed to a quality grade when the course work has been completed. Normally, if a quality grade is to be assigned, the grade must be reported no later than the end of the following semester.

When reported for thesis work, an R will not influence the grade-point average and remains on the student's transcript if not converted to a quality grade within one semester of its recording. *The Graduate Council has established upper limits of 6 credits of quality grades for master's thesis research and 12 credits for doctoral dissertation research. The remaining credits must be assigned Rs except in the case of academic or disciplinary sanctions, in which case an F or XF grade may be assigned, as appropriate, up to the total number of thesis research credits (600 or 610) on record. (See* Senate Policy 49-20 and Procedures G-9, as well as Appendix II of this bulletin).

Pass-Fail (P/F) grading is used exclusively in certain graduate courses where it has been requested by the program and approved by the graduate dean following guidelines established by the Graduate Council. A grade of P does not influence the GPA, but an F does.

Thesis

Thesis Research--To register for thesis research in all graduate major programs, a student uses the appropriate number (600 for on campus, 610 for off campus) preceded by the abbreviation designating the major field. The Bursar's office assesses charges for these courses at the current rate of tuition according to the student's status at the time of registration.

Students registering for 600 or 610 should be aware that the Graduate Council has established limits on the total number of research credits that can be assigned letter grades in a student's program (i.e., other than R): 6 credits for master's candidates and 12 credits for doctoral candidates.

Thesis Preparation--The numbers 601 and 611 are available to Ph.D. degree candidates only and are used for special noncredit registration for thesis preparation work. Such candidates must have passed the comprehensive examination and must have met the two-semester residence requirement. A candidate registered for SUBJ 601 is classified as a full-time student, while one registered for SUBJ 611 is classified as a part-time student.

The numbers 600, 601, 610, and 611 may not always appear in the Schedule of Courses for each semester, but they are available for registration each semester.

Thesis Deposit--When a student completes a thesis or a dissertation, an archival copy must be submitted to the Graduate School (see Thesis Acceptance). After acceptance by the Graduate School , the document is available through the University Libraries.

Graduation

Students who plan to graduate at the end of the current semester/session are responsible for indicating an intent to graduate. A student must initiate an intent to graduate via eLion during the designated period for that semester. Any changes to a student's graduation status after this time period must be made by contacting Graduate Enrollment Services at 814-865-1795.

Students who have been removed from the graduation list will need to initiate their intent to graduate again for the semester in which they plan to graduate.

A preliminary graduation list is prepared and reviewed by Graduate Enrollment Services soon after the deadline for each semester or summer session. Accepted theses, master's papers, and project reports are noted as may be relevant. The records of candidates who appear to have met requirements are forwarded to major and minor department heads or program chairs for review and recommendation. The final list of approved candidates appears in the fall, spring, or summer commencement program.

Only those transfer credits that have been accepted by the Graduate School and entered upon the student's transcript before the graduation deadline will be considered in evaluating a student for graduation at the end of that particular semester or summer session.

The University holds commencement exercises for graduate students three times a year: at the end of the fall and spring semesters and at the end of the summer session. Attendance at commencement exercises is expected. Diplomas are mailed to all students unable to participate in the commencement exercises. Information is available at the Office of the University Registrar, 112 Shields Building, or by accessing the Registrar's Web site at www.registrar.psu.edu (Opens New Window).

Even though the student's name may appear in the commencement program, no degrees are conferred until final grade reports have been received and all requirements fulfilled. A student's transcript or diploma, or both, may be withheld until any outstanding financial obligations to the University have been paid.

Admission

The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, or veteran status. Discrimination or harassment against faculty, staff, or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-2801, Tel 814-863-0471; 814-863-1150/TTY.

Application and Admission Procedures

Each step of the educational process, from admission through graduation, requires continuing review and appropriate approval by University officials. The University, therefore, reserves the right to change the requirements and regulations contained in this bulletin and to determine whether a student has satisfactorily met its requirements for admission or graduation, and to reject any applicant for admission for any reason the University determines to be material to the applicant's qualification to pursue higher education.

An applicant for admission to the Graduate School should understand that graduate work is not a simple extension of an undergraduate program but, rather, demands scholarship of a higher order, and emphasizes research, creativity, and professional competence with a minimum of formal requirements and a maximum of student initiative and responsibility.

Objective--The objective of the admission process of the Graduate School is to identify and admit a qualified graduate student body up to the limit of the University's resources to provide outstanding graduate programs. In most programs, a student may begin graduate work in the fall or spring semester or in the summer session.

As at all universities, Penn State's staff, facilities, and other resources are limited, so that not all qualified persons can be admitted. The number accepted will vary by program and from semester to semester. In some graduate programs all vacancies will have been filled long before the deadline for submitting applications, so that even outstanding students cannot be accepted.

Degree Admission--Applicants interested in applying to a graduate program at Penn State should obtain information on individual program requirements via the Web site at www.gradsch.psu.edu/prospective/program.cfm (Opens New Window). Applicants may apply for admission to only one program at a time.

Qualifications--For admission to the Graduate School, an applicant must hold either (1) a bachelor's degree from a U.S. regionally accredited institution or (2) a postsecondary degree that is equivalent to a U.S. baccalaureate degree earned from an officially recognized degree-granting international institution. Ordinarily, an entering student must have completed in a satisfactory manner a minimum of course work in designated areas, the specific courses and amount of work depending upon the intended field of advanced study. Scores on the Graduate Record Examinations (GRE) General Test are required by most programs. Individual program requirements for admission are included under the specific program descriptions. Information about GRE publications can be obtained by calling the Educational Testing Service in Princeton, New Jersey, USA at 1-866-473-4373 or writing to GRE, Educational Testing Service, P.O. Box 6000, Princeton, NJ USA 08541-6000. If you prefer, you may send an e-mail to gre-info@ets.org or order publications through the Web site at www.gre.org (Opens New Window).

Provisional admission may be granted to applicants whose credentials are not complete at the time of application because the baccalaureate degree has not yet been conferred, grades for the current semester are not yet available, etc. Such admission is subject to cancellation if the complete credentials, on arrival, do not meet the requirements for admission. In the interim, certification of any earned credits will be withheld. If admission is canceled for any reason, the student is dropped automatically from the Graduate School. Completion of admission in such cases is dependent upon receipt of the missing credentials. (See Provisional Admission under Classification of Students.)

Admission is granted jointly by the Graduate School and the department or graduate program in which the student plans to study. The establishment of standards by which applicants are admitted is a departmental or program responsibility. Although the Graduate School has no fixed minimum grade-point requirement for admission, an applicant is generally expected to maintain a junior-senior grade-point average of at least 2.50 on Penn State's grading scale of A (4.00) to D (1.00). Individual programs often establish higher grade-point average requirements and use other criteria to judge candidates for admission. In exceptional cases, departments or major programs may also approve admission by reason of special backgrounds, abilities, and interests. Departmental or program requirements are given in the descriptive statements appearing under the graduate programs listed in the latter part of this publication.
A student who has been admitted to a program in which the doctorate is offered may begin working toward that degree but has no official status as a doctoral student and no assurance of acceptance as a doctoral candidate until a candidacy examination administered by the major department or committee has been passed. (See Candidacy Examination under Graduate Degree Requirements.)

Deadlines--Applicants should obtain application deadlines by contacting the individual graduate program. Because the admission process is time consuming, applications should be submitted as early as possible.

Pennsylvania Act 34 Clearance—Applicants should note that some programs may require clearance of students participating in internships/practicums in Pennsylvania school districts. Pennsylvania Act 34 of 1985 (Criminal History Record Information) specifies that employees of Pennsylvania public and private schools must undergo background checks. School districts accepting graduate students for internships/practicums increasingly require Act 34 clearance before permitting students to begin their practicums in the district, even though they are not employees. In addition, non-Pennsylvania residents are expected to present evidence of an FBI background information check. Applicants are encouraged to contact the program to which they are applying if they have questions as to this requirement and how it may affect them.

Nondegree Admission--If you do not intend to pursue a graduate degree, but want to take graduate-level courses for personal enrichment, professional development, permanent certification, or to apply for degree status at a later date, you can seek admission as a nondegree graduate student. Information on applying for nondegree graduate status may be obtained via the Web site at www.gradsch.psu. www.gradsch.psu.edu/go/apply(Opens New Window).

Changing from graduate nondegree status to regular status requires a new admission application. No more than 15 graduate credits of course work taken prior to admission to a graduate degree program may be applicable to a graduate program. (*See* "Nodegree Student" under Classification of Students.) However, admission as a nondegree graduate student neither guarantees nor implies subsequent admission to a degree program. Nondegree students are not eligible to receive fellowships or graduate assistantships and preference for courses is given to degree students. Programs control access to some courses.

Applicants for nondegree admission must have received from a regionally accredited institution a baccalaureate degree under residence and credit conditions substantially equivalent to those required by Penn State.

Minority Students--Minority students are encouraged to apply for admission to any of the programs offered in the Graduate School. Information concerning programs and financial aid can be obtained from the chair of the graduate program, the dean of the college of the student's major interest, or from the Office of Graduate Educational Equity, 304 Kern Building.

International Students--International applicants must hold the equivalent of an American **four**-year baccalaureate degree. They must submit official or attested university records, with certified translations if the records are not in English. Notarized copies are not sufficient.

English Proficiency--The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. Specific graduate programs may have more stringent requirements.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

Specific graduate programs may require all international applicants to submit a TOEFL or IELTS score, regardless of their academic background and country of origin.

Information about the TOEFL can be obtained by writing to the Educational Testing Service, Box 6155, Princeton, NJ 08541-6155 or visiting its Web site at www. www.toefl.org (Opens New Window). Local administration at University Park campus of the TOEFL is handled by the IECP. Information about the IELTS can be

obtained by contacting IELTS International, 100 East Corson Street, Suite 200, Pasadena, CA 91103 or visiting its Web site at www.ielts.org (Opens New Window).

Undergraduate Students--Any senior with a 3.50 grade-point average may be admitted to 500- or 800-level courses with the consent of the instructor; other seniors with a B average or better may be admitted to graduate courses with the consent of the instructor, the student's academic adviser, and the director of Graduate Enrollment Services. Forms to request permission to take 500- or 800-level courses are available in the Office of Graduate Enrollment Services, 114 Kern Building.

Undergraduate students in The Schreyer Honors College who undertake integrated undergraduate–graduate study (IUG) can pursue concurrent bachelor's and master's degrees. Information on IUG study can be obtained at the office of the dean of The Schreyer Honors College, 10 Schreyer Honors College.

In certain cases undergraduate students may subsequently apply credits they have earned in 400, 500, and 800 series courses toward an advanced degree at Penn State. After admission to the Graduate School, and with the approval of the major field, a maximum of 9 credits relevant to the graduate program of study that were not used to satisfy undergraduate requirements may be applied toward an advanced degree. The time limitation on the completion of a master's degree program applies to these as well as to other credits.

Postdoctoral Fellows, Scholars, and Guests of the University--Postdoctoral Fellow appointments are financed under a Postdoctoral Fellow Program of a granting agency outside the University. A Postdoctoral Scholar is the usual designation for all other postdoctoral appointments that meet the standards enumerated by the National Research Council. Postdoctoral appointments are considered appointments of a temporary nature that are intended to offer an opportunity for continued experience in research or teaching, usually, though not necessarily, under the supervision of a senior mentor.

Individuals holding the highest degree in their fields from Penn State or other accredited colleges and universities are invited to apply to the dean of the Graduate School for guest privileges for purposes of noncredit study. Guests may attend seminars and courses with the privileges of faculty members and, if space and facilities are available, carry on research. Individuals may also be appointed to temporary positions in all University ranks. All guests are expected to affiliate formally or informally with one of the departments, institutes, or other subdivisions of the University engaged in scholarly pursuits.

Policy on Second Doctorates--The Graduate School does not admit applicants to concurrent double Ph.D. degree programs, D.Ed. degree programs, or concurrent Ph.D. and D.Ed. programs. In general, the Graduate School discourages the pursuit of a second Ph.D. or D.Ed. degree. However, if an applicant who holds either of these degrees requests admission to a second doctoral degree program (either Ph.D. or D.Ed.), the applicant is asked to give the Graduate School the reason why the second doctorate is necessary (as opposed to taking course work or a master's degree in the second field). The Graduate School then may solicit responses concerning the necessity of the second doctorate from representatives of the field

at Penn State or elsewhere. This information is then given to the Dean of the Graduate School for the final decision. If approved, all Graduate School requirements for the second doctorate must be met *de novo.*

Student Pennsylvania Resident Status--When it appears that an applicant for admission is not a resident of Pennsylvania for tuition purposes, a non-Pennsylvanian classification is assigned. If the student who is thus admitted believes that circumstances do not justify classification as a non-Pennsylvanian, a petition may be addressed to the Fee Assessor, The Pennsylvania State University, 108 Shields Building, University Park, PA 16802 for reclassification. Penn State Harrisburg students may petition the Penn State Harrisburg financial officer.

A copy of the Policy for Determination of Eligibility for Reclassification as a Pennsylvania Resident for Tuition Purposes can be obtained in the office mentioned above or via the Web at**www.psu.edu/bulletins/bluebook/intro/gi-051**. **www.psu.edu/bulletins/bluebook/intro/gi-051.htm**and should be reviewed before requesting reclassification. Any reclassification resulting from a student's petition shall be effective for tuition purposes as of the date such petition was filed. A student who changes residency from Pennsylvania to another state must promptly give written notice to the University. See Appendix V to this bulletin.

TRANSFER CREDIT

Subject to the limitations given below, a maximum of 10 credits of high-quality graduate work done at a regionally accredited institution may be applied toward the requirements for the master's degree. However, credits earned to complete a previous master's degree, whether at Penn State or elsewhere, may not be applied to a second master's degree program at Penn State.

The student should distinguish carefully between the transferability of credit and its applicability in a particular degree program. Approval to apply any transferred credits toward a degree program must be granted by the student's academic adviser, the program head or graduate officer, and the Graduate School. Transferred academic work must have been completed within five years prior to the date of first degree registration at the Graduate School of Penn State, must be of at least B quality (grades of B- are not transferable), and must appear on an official graduate transcript of a regionally accredited university.

Pass-fail grades are not transferable to an advanced degree program unless the "Pass" can be substantiated by the former institution as having at least B quality.

Forms for transfer of credit can be obtained from the Office of Graduate Enrollment Services, 114 Kern Building.

Classification of Students

A graduate student may be admitted as a degree student, a certificate student, or a nondegree student, depending upon the student's objectives. A student who has held only nondegree status and who later wants to apply for degree status should contact his or her intended program of study. Admission as a nondegree student neither guarantees nor implies subsequent admission to a degree program. Any other change in classification must be arranged through the Office of Graduate Enrollment Services, 114 Kern Building.

Degree Student--A degree student is one who plans to become a candidate for an advanced degree at Penn State and who has been formally admitted for advanced studies in a particular program. The program of study is developed under the guidance of an adviser appointed by the head of the student's major program. A degree student who has passed a candidacy examination is classified as a doctoral candidate.

Provisional Admission--Provisional admission is a temporary classification in which an applicant may remain for a period of either one or two semesters (depending on the provisional type) following admission. If the conditions of provisional admission are not met within that time, the student may be dropped from the program. In addition, all provisional conditions must be met before a student reaches an academic benchmark. Benchmarks include completion of a master's program, the doctoral candidacy, comprehensive, and the final oral examinations. A student will not be permitted to graduate who has not met the conditions of his or her provisional admission.

Nondegree Student--If you do not intend to pursue a graduate degree, but want to take graduate-level courses for personal enrichment, professional development, permanent certification, or to apply for degree status at a later date, you can seek admission as a nondegree graduate student. Information on applying for nondegree graduate status may be obtained via the Web site atwww.gradsch.psu. www.gradsch.psu.edu/go/apply(Opens New Window).

A maximum of 15 graduate credits taken as a nondegree student prior to admission to a graduate degree program may be applied to a graduate program, with departmental approval. The credits must have been earned within five years preceding entry into the degree program. Forms for transfer of nondegree credits are available in the Office of Graduate Enrollment Services, 114 Kern Building.

Applicants for nondegree admission must have received from a regionally accredited institution a baccalaureate degree earned under residence and credit conditions substantially equivalent to those required by Penn State.

Certificate Student--A certificate student is one who is engaged in a program of study leading to a certificate or equivalent recognition of accomplishment rather than a graduate degree program at Penn State. Certification students, i.e., candidates for Instructional, Supervisory, Educational Specialist, and Administrative certificates, have the same University privileges and

responsibilities as graduate degree students. (*See* additional information under Pennsylvania Department of Education Certificate Candidates.)

Undergraduate Student--Such a student is not a graduate student because a baccalaureate degree has not been attained. The student may not register for graduate courses (500 or 800 series) unless he or she is a senior with at least a 3.50 cumulative GPA or with at least a 3.0 GPA and special permission from the Office of Graduate Enrollment Services. Forms to request permission to take 500- or 800-level courses are available in the Office of Graduate Enrollment Services, 114 Kern Building.

CREDIT BY EXAMINATION

Examinations to establish credit for work done in absentia or without formal class work may be used to remove undergraduate deficiencies, but not to earn credits toward an advanced degree. Arrangements are made by the student directly with the major department head or program chair.

Tuition and Costs

All tuition information is accessible at www.tuition.psu.edu (Opens New Window). For other general financial information, go to http://www.bursar.psu.edu/ (Opens New Window) and click on the appropriate links.

Student Aid

For general information regarding available sources of student aid, see www.psu.edu/studentaid (Opens New Window) and click on the link for Graduate Students.

Assistantships

For information, see www.gradsch.psu.edu/prospective/assistantships.html (Opens New Window).

Fellowships and Traineeships

For information, see http://gradsch.psu.edu/fellowships (Opens New Window).

For information about specific funding programs, see www.gradsch.psu.edu/fellowships/programs (Opens New Window).

Veterans' Benefits

For information, see www.equity.psu.edu/veterans/outreach.asp (Opens New Window)

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History of Graduate Education at Penn State

For information, see www.gradsch.psu.edu/aboutus/history.html.

The Graduate Faculty

For information, see http://www.gradsch.psu.edu/factstaff/faculty.cfm.

The Graduate Council

For information, see www.gradsch.psu.edu/council (Opens New Window).

Administration

For information, see www.gradsch.psu.edu/aboutus (Opens New Window).

Program Locations

Programs of graduate study are offered at five locations in Pennsylvania:

- **Penn State Erie**- -pennstatebehrend.psu.edu (Opens New Window)
- **Penn State Harrisburg**- -www.hbg.psu.edu (Opens New Window)
- **College of Medicine**- -http://www.pennstatehershey.org/web/guest/education
- **Penn State Great Valley**- -www.gv.psu.edu (Opens New Window)
- **University Park Campus**- -www.gradsch.psu.edu (Opens New Window)

Off-site courses--Graduate degree programs based at any of the five administrative centers of the Graduate Schoollisted previously, but offered at locations away from those centers, may be discontinued at any time. Degree candidates will be eligible to continue the program, but this may require attendance at courses offered only at the center where the program is based. The University will provide notice of the discontinuance of any program offered at an off-center site at least one semester in advance and furnish information concerning available options for continuance in the program.

GRADUATE LIFE

Current graduate enrollment at University Park campus is about 6,790 students, of whom 78 percent are engaged in graduate study full time, 47 percent are women, and 35 percent are residents of Pennsylvania. (Undergraduate enrollment at University Park campus exceeds 40,000.) International students make up about 35 percent of the graduate student population, and about 8 percent of enrolling graduate students report themselves as members of recognized U.S. ethnic minority groups.

University Park campus is one of the most naturally beautiful American campuses. On any given day of the semester, about 50,000 people will be on the campus: 38,000 students, 12,000 employees, and several hundred visitors. Although the size of the campus can be intimidating, graduate students soon find that its size and diversity afford a variety of stimulating activities. This variety reflects the University's view that a person's graduate experience should include, in addition to course work and research, living in a scholarly atmosphere, profiting from the perspectives of visiting scholars and artists, and engaging in informal discussions with faculty and fellow students. It also should mean participating in student affairs and University governance, and allowing time to reflect, to explore fields related to one's specialty, and to enjoy leisure activities.

Although the mailing address of the largest campus is University Park, PA 16802, this name ordinarily does not appear on maps. The University Park campus is located in State College, Pennsylvania, an area with a population of more than 67,000. State College is located on U.S. Highway 322, near Interstates 80 and 99, and can be reached directly by bus or airline service. The town retains a collegiate atmosphere enhanced by many small shops, restaurants, cinemas, and bookstores.

GRADUATE STUDENT ASSOCIATION

For information, see www.clubs.psu.edu/up/gsa (Opens New Window).

GRADUATE SCHOOL ALUMNI SOCIETY

For information, see www.gradsch.psu.edu/av (Opens New Window).

RECREATIONAL AND ATHLETIC FACILITIES

For information, see www.psu.edu/ur/athrec.html (Opens New Window).

THE ARTS

For information, see www.psu.edu/ur/arts.html (Opens New Window).

REGULATIONS AND CONDUCT STANDARDS FOR STUDENTS ENROLLED IN THE GRADUATE SCHOOL

It is the responsibility of students to be cognizant of the rules, regulations, and procedures of the University. This information is contained in the graduate school policies at www.gradsch.psu.edu/policies (Opens New Window).

MOTOR VEHICLE REGULATIONS

For information, see guru.psu.edu/policies/BS04.html (Opens New Window).

BICYCLE REGULATIONS

For information, see guru.psu.edu/policies/SY16.html (Opens New Window).

STANDARDS OF CONDUCT

For general information, see Appendix I in this bulletin and www.sa.psu.edu/ja (Opens New Window).
Research Integrity-See guru.psu.edu/policies/AD47.html (Opens New Window).
General Standards of Professional Ethics-See guru.psu.edu/policies/RA10.html (Opens New Window).

RESOLUTION OF PROBLEMS

For information regarding procedures for resolving or appealing problems in the classroom and outside, see Appendix II in this bulletin.

OWNERSHIP OF INTELLECTUAL PROPERTY

For information, see www.research.psu.edu/ipo (Opens New Window) and guru.psu.edu/policies/RA11.html (Opens New Window).

RESEARCH PROTECTIONS

To ensure compliance with applicable federal and state laws, certain University activities require review and approval by appointed institutional review committees. Projects involving any of the following concerns must be reviewed and approved through the Office for Research Protections (ORP) before the project is initiated.

For information, see www.research.psu.edu/orp (Opens New Window).

Conflict of Interest--See guru.psu.edu/policies/RA20.html (Opens New Window).

For policy statements on these issues, see guru.psu.edu/policies/RA14.html and guru.psu.edu/policies/RA15.html. See also policies on safety issues at guru.psu.edu/policies/SY24.html (Opens New Window).

NOTE: The College of Medicine at the Penn State Milton S. Hershey Medical Center is a unique Penn State campus in that it maintains a separate IRB, IACUC, UBC, and UIC. Students conducting projects at Hershey should contact their local committees for approval of research.

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STUDENT SERVICES

CAREER SERVICES

For information, see www.sa.psu.edu/career (Opens New Window).

CENTER FOR COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS)

For information, see www.sa.psu.edu/caps (Opens New Window)

OFFICE FOR DISABILITY SERVICES

For information, see www.equity.psu.edu/ods (Opens New Window).

OFFICE OF GRADUATE EDUCATIONAL EQUITY

For information, see http://www.gradsch.psu.edu/diversity/ (Opens New Window).

HEALTH INSURANCE

For information, see www.sa.psu.edu/uhs/basics/insurance.cfm (Opens New Window).

UNIVERSITY HEALTH SERVICES (UHS)

For information, see www.sa.psu.edu/uhs (Opens New Window).

Penn State Erie-#See pennstatebehrend.psu.edu/student/health (Opens New Window).

Penn State Harrisburg-#See http://php.scripts.psu.edu/dept/iit/hbg/studentaffairs/health.php (Opens New Window).

HOUSING AND FOOD SERVICES

For information about housing, see www.hfs.psu.edu/housing (Opens New Window).

For information about food services, see http://www.foodservices.psu.edu/ (Opens New Window).

INTERNATIONAL STUDENT SERVICES

For information, see www.international.psu.edu (Opens New Window).

VETERANS OUTREACH OFFICE

For information, see www.equity.psu.edu/veterans (Opens New Window).

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FACILITIES

Of the University's more than 16,000 acres of land, a substantial portion consists of recreation areas, farms and agricultural experiment grounds, and forest tracts that are used by graduate students in their work and research. Animal and wildlife students, for example, are conducting nutrition and reproductive physiology studies of whitetail deer, sheltered at one of the forest tracts. Astronomy students study at an observatory housing the largest telescope east of the Rockies. Those in civil engineering can carry out research at the only highway test track in Pennsylvania. Laboratories and equipment devoted to meteorology, mining, chemistry, combustion, biomechanics, engineering acoustics, psychology, and microbiology mirror the University's strengths in those disciplines. Biotechnology and microelectronics groups have established themselves here, and centers of expertise in computer-assisted design and manufacture, as well as robotics, have emerged. The Huck Institutes of the Life Sciences provides centralized facilities for all researchers in the biological sciences. The Huck Institutes, Materials Research Institute, and the Penn State Institutes of the Environment enable new opportunities for multidisciplinary education and research within the life sciences, materials, energy, and environment-related disciplines.

The Social Science Research Institute has a Survey Research Center (SRC) that provides state-of-the-art and cost-effective survey research services to Penn State faculty and administrative units. SRC contributes to the education and training of Penn State students in areas related to survey research, and also serves as a focal point for Penn State faculty in a variety of disciplines whose research interests touch on the methodology of survey research. The SRC provides services in the areas of survey design, sampling, and data collection (including telephone, mail, face-to-face, and Internet surveys and focus groups); survey data management; and data analysis. Center staff assist researchers in estimating the costs associated with the collection and analysis of survey data. The center employs undergraduate and graduate students, serves as a resource on primary survey data collection for students enrolled in research methods courses, and offers short survey research workshops open to students and faculty each academic year. A major goal of the center is to serve as a focal point for Penn State faculty in a variety of disciplines who have an interest in the methodology of survey research. In the near future we will be developing a program to enable faculty to become associates of the Survey Research Center. The purpose of this program is to enhance collaborative research and training activities focusing on survey research methodology.

In addition to research conducted in academic departments or in organized research units within the individual colleges, opportunities for interdisciplinary research exist in the Huck Institutes of the Life Sciences, the Materials Research Institute, the Children, Youth, and Families Consortium, the Penn State Institutes of the Environment, the Social Science Research Institute, and in research units: the Applied Research Laboratory and the Institute for the Arts and Humanities. The Animal Resource Program also provides University-wide services.

THE UNIVERSITY LIBRARIES

The University Libraries constitute a major resource for students and researchers in all fields of study. The Libraries are ranked among the top ten research libraries in North America by the Association of Research Libraries and contain more than 53 million volumes, 6.9 million microforms, 88,668 serial subscriptions, plus more than 536 databases and 45,906 online full-text journals, and 100,000 e-books.

The University Libraries include a central facility and five other libraries at University Park campus, plus libraries at 23 Penn State locations throughout the state, including the Dickinson School of Law and the Milton S. Hershey Center and the Penn State affiliated Pennsylvania College of Technology. At University Park, the Arts and Humanities, Business, Education and Behavioral Sciences, Gateway Commons, Social Sciences, Maps, Life Sciences, Special Collections, and News and Microforms libraries are maintained in Pattee Library and Paterno Library. Other Libraries at University Park include the Architecture and Landscape Architecture, Earth and Mineral Sciences, Engineering, Law, and Physical and Mathematical Sciences libraries.

In addition Pattee Library houses Course Reserves Services, the Extended Hours Study Area, (now offering 24-hour service), and Library Services for Persons with Disabilities. The Special Collections Library in Paterno Library includes Historical Collections and Labor Archives, Rare Books and Manuscripts, and the Penn State University Archives. Additional library services include assigned carrels, photocopiers, a student lounge with vending machines, change machines, and MacKinnon's Cafe.

Among special collections of national importance are those on Arnold Bennett, Kenneth Burke, Jean Giraudoux, John O'Hara, Vance Packard, Joseph Priestley, Conrad Richter; the Allison-Shelley collection of Anglo-Americana-Germanica; and materials on Utopian literature and on Australia. The Historical Collections and Labor Archives contain a wide variety of documentary sources, including the papers of Pennsylvania leaders and businesses and records of labor unions. The most notable of these documents are those of Richard Schweiker, William Scranton, the United Steelworkers of America, and the United Mine Workers of America. The Penn State University Archives house an extensive collection of materials about the University and the surrounding community.

Faculty members may recommend books and other library material purchases by contacting a subject specialist at www.libraries.psu.edu/psul/cataloging/services_policies/specialists.html (Opens New Window). Faculty at locations other than University Park can also contact their head librarian.

Access to holdings is obtained through The CAT, a computerized catalog, part of the Library Information Access System (LIAS), available on the Web at www.libraries. www.libraries.psu.edu (Opens New Window). LIAS is a dynamic, integrated information system that provides electronic access to a great variety of materials

in many subject areas.

The Libraries maintain a comprehensive program of general and specialized reference and instructional services. The Libraries' faculty teach credit courses as part of the Library Studies Program and offer a variety of topical seminars. Introductory sessions, offered by Library Learning Services, are scheduled on a regular basis to familiarize faculty, students, and other library users with LIAS. Class sessions designed for specific courses can be arranged in the library to help students learn how to find, use, and evaluate relevant books, articles, Web sites, and other information resources. Assistance is available to help design assignments that use library resources to enhance student research skills and critical thinking. Library instruction rooms (hands-on labs or traditional classrooms) can be reserved for on-site instruction in the use of library resources. For information, go to: www.libraries.psu.edu/psul/lls.html (Opens New Window).

Penn State holds membership in the Association of Research Libraries, the Consortium for Institutional Cooperation, and the Online Computer Library Center (OCLC). Participation in these organizations provides faculty and students with access to the collections of more than 2,500 libraries across the United States and internationally, including major research libraries. It is the largest research library in Pennsylvania and one of four resource libraries that provide service and collections to all other libraries and citizens of the Commonwealth.

The publication Guide to the University Libraries offers additional information on services and programs and is available at Libraries service desks and by calling 814-863-4240. More information is also available at www.libraries.psu.edu/psul/pram/publications.html (Opens New Window). An Open House is held each fall semester.

Media and Technology Support Services (MediaTech), www.libraries.psu.edu/mtss/ (Opens New Window), a division of the University Libraries, has a collection of more than 24,000 films and videotapes and more than 5,000 pieces of technology and audio-visual equipment available to faculty, staff, and students. Titles in the Media Tech collection are listed in The CAT, the Libraries' online catalog and in the MediaTech database at http://extranet.libraries.psu.edu/mtss/media/searchMediane http://extranet.libraries.psu.edu/mtss/media/searchMedianet.html (Opens New Window).

Services include:

- Consultation for purchase of technology or audiovisual equipment: 814-863-0665
- Consultation for purchase of technology or audiovisual equipment: 814-863-0665
- Equipment scheduling: 814-865-5400, or 26 Willard Building; e-mail to mtsseq@psulias.psu.edu
- Media Duplication: Call 814-863-8144 or e-mail mjs149@psu.edu. Downloadable duplication order form (PDF) at www.libraries.psu.edu/mtss/serv www.libraries.psu.edu/mtss/services/duplication.html
- Media Site Live: www.libraries.psu.edu/mtss/mediasitelive/mediasitelive.html
- Preview facilities: 814-863-3202 and 814-865-5400, Wagner Annex

- Program scheduling: 814-865-5400; e-mail to mtssmed@psulias.psu.edu
- Repair and Installation Services: 814-863-4389
- Video/Photo Prodution Studios: Students and faculty may reserve time and space in the studios to produce, edit, and export their video/audio projets. Green Screen is also available for use, with on-site staff available to answer questions and conduct demonstrations. Call 814-865-5400.
- Video Taping Class Presentations: Schedule taping at least thirty-eight hours before the presentation by contacting MTSS Equipment at 814-865-5400 or mtsseq@psulias.psu.edu. Indicate desired format when scheduling--mini-DV tape or DVD (digital).
- MediaTech Info Line: 814-863-1234 (touch-tone phones only). Includes current weather forecasts as provided by the Campus Weather Service, the University Calendar of Events, information on town and campus movies, JOBS-Penn State's employment information service, open house schedules for the Department of Astronomy, and construction barriers on or around the University Park campus.

For more information about services available from MediaTech, e-mail mtssmed@psulias.psu.edu or visit www.libraries.psu.edu/mtss (Opens New Window)

THE PENN STATE PRESS

The Penn State Press is a publisher of books and journals that contribute to the advancement of scholarship. It publishes in most areas of the humanities and social sciences, giving emphasis to art and architectural history, literature and literary criticism, philosophy, religious studies, history, political science, women's studies, sociology, Latin American studies, and East European and Russian studies. Its journals include the Chaucer Review, Journal of Nietzsche Studies, the Good Society, Philosophy and Rhetoric, Journal of General Education, Journal of Speculative Philosophy, Comparative Literature Studies, Journal of Policy History, Pennsylvania History, Book History, and Shaw: The Annual of Bernard Shaw Studies. The Press publishes eight series: Issues in Policy History (Editor: Donald T. Critchlow); Literature and Philosophy (Editor: Anthony J. Cascardi); Penn State Series in the History of the Book (Editor: James L. W. West III); Re-reading the Canon (Editor: Nancy Tuana); Studies of the Greater Philadelphia Philosophy Consortium (Editor: Michael Krausz); Rural Studies Series (Editor: Clare Hinrichs); Penn State Library of Jewish Literature (Editors: Baruch Halpern and Aminadav Dykman); American and European Philosophy Series (Editors: Charles Scott and John Stuhr); Buildings, Landscapes, and Societies; and Refiguring Modernism.

INFORMATION TECHNOLOGY SERVICES

Information Technology Services (ITS) ensures that faculty, students, and staff have the information technology tools and infrastructure necessary to carry out the University's mission. ITS is working to achieve five broad goals: help faculty improve the way education is delivered; provide students with resources to enrich their educational experience; create and sustain an environment that enables leading-edge research; help to improve productivity; and establish the information technology infrastructure necessary to maintain Penn State's preeminence in integrating high-quality programs in teaching, research, and outreach. For additional information, see its.psu.edu on the Web.

SPECIALIZED COMPUTING FACILITIES

Penn State also provides distributed computing and information systems. Many academic computing facilities exist to support the specialized research and instructional requirements of the colleges and the intercollege research programs. Some of these facilities are described below.

Colleges

College of Arts and Architecture

The School of Architecture and Landscape Architecture operates dedicated student computer labs and has integrated desktop computers into the studio environment. Students have access to high-performance networks via either wired or wireless connections. The school's computer labs, including the Stuckeman Center for Design Computing, are primarily used for teaching and research in such areas as computer graphics, computer-assisted drawing, design, GIS, and digital imaging, as well as exploration into computer visualization, virtual reality, and digital fabrication. A wide variety of available input and output equipment, such as large-format printers, color printers, scanners, a CNC laser cutter, site survey, and video imaging and capturing equipment, provides faculty and students with opportunities to explore and master a variety of technologies and presentation techniques.

The Immersive Environments Lab (IEL) is a joint venture between Penn State's Information Technology Services (ITS) and the School of Architecture and Landscape Architecture (SALA). The IEL is a stereo visualization system consisting of a three-screen panorama display and a cluster of graphics workstations. Students have the capability of displaying a range of 2D and 3D presentations or they may launch 3D to a full three-screen stereo panorama for a group walk-through. Using virtual reality to visualize interior and exterior spaces allows students to follow the design process from conception to construction to completion.

The School of Music provides students and faculty in all disciplines within the school with a Macintosh-based electronic music laboratory and two computerized music rooms. These facilities afford faculty and students opportunities to create, analyze, and perform music as well as develop innovative music teaching materials.

The School of Theatre maintains lab facilities to support its technical theatre program, including set design, lighting, sound, and costume design. Interaction with common and professional applications affords students the opportunity to gain familiarity and experience with tools being used in the field. In addition, computers are regularly used in performance to control lighting and sound systems and to facilitate such complex tasks as moving scenery.

The School of Visual Arts computer facilities are customized for the advanced technological needs of students and faculty in the School of Visual Arts and the Department of Integrative Arts. Located in 302, 304, and 401 Patterson Building and maintained by Information Technology Services (ITS), the Patterson computer laboratories are specialized for design, animation, and high-end multimedia production. Within close proximity, the Graphic Design computer laboratory, 208 Visual Arts Building, is designed to meet the specific needs of students enrolled in the Graphic Design program. The Digital Photography computer laboratory, customized for students enrolled in the Photography program, is located in 209 Visual Arts Building. All five labs are Macintosh environments and are used as both teaching and study facilities. Most labs are open twenty-four hours a day, seven days a week.

College of Earth and Mineral Sciences

The College of Earth and Mineral Sciences has installed a high-speed communications network that provides computer-to-computer communications within the college, as well as with external networks and computers via University facilities. Wireless access to this network is provided throughout the college. Computing facilities are distributed throughout thedepartments and institutes of the college, and include extensive local PC, UNIX/LINUX, and Macintosh computer laboratories accessible to undergraduate and graduate students. Many graduate students have a PC or UNIX computer supplied to their desktop. In addition to these distributed facilities, high-performance computing is available on high-end Linux clusters operated by the ITS GeARS group in concert with the college's departments and institutes.

College of Education

In the College of Education, the Education Technology Center, located in 201 Chambers Building, provides technical support services, multimedia and graphic design services, Web design and development services, and computer application training for College of Education faculty and staff. The Education Technology Center also maintains the Education Technology Demonstration Classroom and video conferencing services. The Demonstration Classroom is used by College of Education faculty for implementing technology into teaching and learning for undergraduate and graduate College of Education courses. It also provides a computer facility equipped to instruct College of Education students how to use technology in their teaching and learning experiences.

The IBM Personal Computer Lab, located in 202 Chambers Building and the Macintosh Computer Lab located in 205 Chambers provide microcomputer access to the University community. Thirty networked IBM and twenty-eight Macintosh computers are available for student and faculty use. (The labs are restricted during certain hours; check schedule outside each room.)

College of Engineering

The College of Engineering has a number of general and special purpose computational resources and services to support the College's educational and research endeavors. Each department maintains multiple laboratories that include various servers and workstations. These laboratories employ a number of Sun, PC, and Macintosh workstations running under the latest Sun, Microsoft, LINUX, or UNIX operating system. In addition to these general purpose facilities, several departments have faculty who maintain High-Performance Parallel Computing facilities with multiprocessor computing nodes for research initiatives. These facilities typically use PC-based systems running LINUX or Macintosh OSX servers running Open BSD in Beowulf clustering configurations. The University's Information Technology Services also maintains a multinode High-Performance Parallel Computing facility for faculty and graduate student research. The College of Engineering also operates and maintains a multimode High-Performance Computing cluster to support undergraduate and graduate education. The College system is available during non-peak usage times to support graduate research.

The Department of Computer Science and Engineering at Penn State uses a network of Solaris, Linux, OS X, and Windows workstations and servers to support academic computing needs. Instruction is supported by pairs of Sun V240 and V880 servers. These servers act as application, Web, e-mail, and license servers for over 400 workstations in labs, graduate student offices, and faculty offices. Funded research efforts utilize any one of the departments nine High Performance Computing Clusters, totaling nearly 400 multi-processor compute nodes sharing IBA, DolpinNet, Myrinet, and GigE interconnection. Researchers currently share approximately 15TB of BlueArc NAS storage. Additionally, the department is constructing a cognition and perception lab with cutting edge computer vision technology. NSF CISE/Instrumentation, Infrastructure, and IGERT grants have funded much of CSE's research equipment. Computing resources are connected via a fail-safe pair of 3Com 7700 Switching Routers. The routers provide GigE service to all backbone-connected devices, including all edge switching devices. CSE's GigE connection to the campus backbone (including I and I2) is hosted with a resilient pair of interfaces through an HSRP enabled firewall. All of this equipment is housed in the Information Sciences and Technology building, Penn State's new technology showcase building.

The Institute for Computational Science is a University-wide initiative conceived and chaired by a faculty member in the College of Engineering. The institute addresses the need for resources and computing power required for fields such as computational fluid dynamics, computational chemistry, computational meteorology, computational physics, artificial intelligence, computational materials science, business computing, etc. Annual conferences focus on collaboration among researchers in the aforementioned computation intensive programs.

Electronic and Computer Services (ECS) within the College of Engineering provides faculty and graduate students with engineering expertise and support in the areas of hardware and software system design, prototyping, and complete systems integration. ECS resources include high-performance workstations and design tools (ViewLogic, H-Spice, Cadence, LabView, AutoCAD, etc.). Also available are

tools for embedded system development. Prototyping facilities consist of Xilinx and Altera systems for FPGA design. Distributed access to College, departmental, and ECS resources is through the College's maintained high-speed secure data network. ECS maintains the College's High-Performance computing cluster and network throughout 26 buildings; ECS also maintains and operates core College e-mail, Web and departmental servers, providing nightly backup services to these critical systems. Virtual Private Networking and secure wireless services throughout the College enables mobile computing and data access from anywhere Internet connectivity is available.

College of Health and Human Development

The Department of Kinesiology maintains several specialized computer systems dedicated to automated motion analyses, musculoskeletal modeling, medical imaging, physiological testing, and the generation of virtual reality environments for experimental purposes.

Eberly College of Science

Within the Eberly College of Science, each department has an array of computer facilities.

- The Department of Astronomy and Astrophysics computing resources include a large and ever-expanding network of workstations and personal computers. The current census includes 50 Sun workstations, 12 Power Macs, and 70 PCs. Many of the workstations are configured for maximum processing power so that data sets from various ground- and space-based observing platforms from around the world can be intensively analyzed by faculty and graduate students. The Department has a 100-MB intranet with a fiber optic 100-MB connection to the University backbone. Ten terabytes of online disk space serves data to Department research teams.
- The Department of Biochemistry and Molecular Biology maintains a 100-Mbps Ethernet with ~500 IP addresses currently in use. Most of these serve desktop computers in individual research groups. Twelve desktop computers are maintained in one room for general or instructional use, and eight workstations are dedicated to special equipment for phosphorimaging, laser densitometry, analytical ultracentrifugation, surface plasmon resonance measurements, and X-ray crystallography. Laptops and projectors also are available for general use.
- The Department of Biology maintains two 100-MB fiber backbones that support nearly 500 PC and Macintosh machines. Most of these computers are used to run research machinery and for individual research label workstations. The department also houses thirteen servers, including a state-of-the-art firewall, two domain controllers, automated Windows patch management, automated antivirus system management, and an advanced Web application cluster. Licensed software within the department includes a wide array of Microsoft and Macintosh products.
- The Department of Chemistry provides network access for approximately

1,024 nodes comprising numerous PCs, workstations, and servers of varying operation systems, supported by 10/100/1000 MB Fast Ethernet. Chemistry also Penn State Wireless 2.0 access, VPN service and Web space for courses and research as well as computer an instrumentation repair services for Penn State-funded equipment. Several individusl research groups within Chemistry boast their own PC clusters. Some of the computer-intensive research groups participate in the shared resources of the Graduate Educational and Research Services (GEaRs) and the Institute for High-Performance Computing Applications.

- The Department of Mathematics maintains a high-speed switched network of UNIX-based workstations and servers for use by faculty, students, and staff. Most workstations are for use by individuals or small groups. A lab is maintained for use by undergraduates, graduates, faculty, and visitors. Supported operating systems are Solaris and OSX. Supported software includes Mathematica, Matlab, TeX, and LaTeX. Supported programming languages include C, C++, Java, Fortran, and Perl. Some research groups maintain their own computing equipment including a Beowulf cluster and computers used to control high-speed cameras.
- The Department of Physics maintains a high-speed switched network that provides several connections to each office and supports a wide variety of computing environments. In addition to this wired networking, the department provides wireless internet access in several areas. Many research groups have their own computing systems, which range from simple PCs to Beowulf clusters. At the departmental level, a group of UNIX and MAC servers supports mail, Web, printing, backup, etc. All department members are entitled to accounts on general access Windows XP, Linux, and Sun system with a variety of appropriate software. A computer lab, available to all department members, has workstations, printers, and scanners. The department hosts a Reconfigurable Advance Visualization Environment (RAVE) for stereoscopic visualization of simulation results.
- The Department of Statistics maintains computer systems and laboratories to provide facilities for both research and instruction. Equipment includes thirty Sun UNIX workstations, sixty PCs (operating Windows and LINUX), high-quality laser printers, color printers, a color scanner, and video-capture facilities. Faculty and students have computers in their offices. Software packages include BMDP, MINITAB, SAS, Splus, R, ArcInfo, Mathematica, FORTRAN, C, Java, LaTeX, and TeX. The department has two full-time system administrators to maintain a high-quality computer infrastructure.

Many colleges operate computing laboratories that provide students and faculty with microcomputing capabilities and/or batch and interactive access to the University's principal computers through Information Technology Services (ITS).

Interdisciplinary—The Applied Research Laboratory (ARL) uses more than 2,000 computers in multiple networks of Microsoft Windows, LINUX, Solaris, and VAX workstations, with software supporting data acquisition and processing, process control, modeling and simulation, visualization, data fusion, interactive problem solving, and business applications. MATLAB is used extensively. A synthetic

environment lab is available for 3-D visualization. High-performance computer resources include multiple Linux clusters and grids, and access to U.S. government HPC resources. Mechanical and printed circuit CAD software is used for design, and computer-aided manufacturing software is used extensively to run the shop's multi-axis CNC machines. Student access is dependant upon their relationship with ARL.

The Materials Research Institute (MRI, at www.mri.psu.edu (Opens New Window)), together with more than a dozen academic departments/units, offers students access to professionally staffed materials processing, characterization, and computer simulation facilities. MRI enables new opportunities for multidisciplinary education and research within the materials-related disciplines.

Materials Simulation Center (MSC)

A group of faculty and professional staff develop state-of-the-art atomic-scale materials modeling for design of high-performance alloys, evaluation of precursors for epitaxial growth, calculation of electronic and structural properties of nanoscale materials, and simulations for materials processing.

Center for Computational Materials Design (CCMD)

An NSF I/UCRC Center based on needs identified by CCMD members, which initially includes 13 organizations representing both large and small businesses and DOE and DOD laboratories. Faculty from Penn State and Georgia Tech will carry out short and long term research in innovative materials design. The proposed research will be at the interface of industrial relevance and scientific knowledge and will include interdisciplinary groups of materials science and engineering faculty and graduate students, as well as engineering systems design faculty, computer scientists, and applied mathematicians.

Institute for Computational Science

Computational science refers to the use of computers, networks, storage devices, software, and algorithms to solve problems, do simulations, build things, or create new knowledge.

The Penn State Institutes of Energy and the Environment (PSIE) at the Land and Water Research Building provide computing and network infrastructure to support the research of affiliated faculty, researchers, and graduate students. Resources include a firewalled local network as well as web servers and infrastructure for public presentation of research, applications, and data. Additionally, PSIE maintains a 25-person capacity videoconferencing facility for faculty and research use.

APPENDIX I

CONDUCT

The Pennsylvania State University recognizes the basic rights and responsibilities of the members of the University and accepts its obligation to preserve and protect those rights and responsibilities. Further, the University must provide for its members the opportunities and protections that best serve the nature of the educational process.

The Code of Conduct governing the behavior of members of the University must ensure the basic rights of individuals as well as reflect the practical necessities of the community. The code also must prohibit or limit acts that interfere with the basic purposes, necessities, or processes of the University or with the rights of its members. Finally, the code must reconcile the principles of maximum freedom and necessary order.

Violations of the Code of Conduct shall be adjudicated by appropriate University mechanisms established in consultation with faculty, students, and staff. The mechanisms for adjudicating cases of alleged misconduct on the part of student members of the University is the discipline system described by The Office of Judicial Affairs http://www.sa.psu.edu/ja/pdf/PoliciesRules.pdf

. For purposes of this policy, a student is defined as an individual currently or previously enrolled in any academic offering of the University. The Office of Judicial Affairs should be consulted for questions regarding how this would apply in specific cases. There shall be clearly defined channels and procedures for such adjudication and the right of appeal. Sanctions shall be commensurate with the seriousness of the offense and may include temporary or permanent expulsion. Repeated violations justify increasingly severe sanctions.

The Code of Conduct shall be made public in an appropriate manner and may be revised by the University in consultation with the faculty, students, and staff.

NOTE: Nothing within this appendix, nor within any portion of the Graduate Degree Programs Bulletin, is intended to constitute a contract nor contractual terms. No provisions of this Appendix, nor any portion of the Graduate Degree Programs Bulletin, shall confer contractual rights upon any parties. To the extent that the terms of this Appendix may be applicable to faculty or staff, the terms outlined herein do not constitute terms, benefits or conditions of employment. The terms set forth herein are subject to change unilaterally and without notice by University administration.

CODE OF CONDUCT: http://www.sa.psu.edu/ja/conduct.shtml

RELATED CROSS REFERENCES:
AD-47 (General Standards of Professional Ethics)

Approved by Graduate Council February 2003.

Revised by special Ad Hoc Committee on Student-Related Polices, August 2005.

DATE LAST REVIEWED: 12/19/06

APPENDIX II

Procedures for Resolution of Problems

Procedures for Resolution of Problems--These procedures pertain to a range of concerns and disagreements involving graduate students and other members of the University community excluding: Code of Conduct issues (see Appendix I); Termination of the Degree Program of a Graduate Student for Unsatisfactory Scholarship (see Appendix III); or Termination of Assistantships due to Inadequate Performance (see Appendix IV). Concerns may be raised by either a graduate student or another member of the University community (e.g., faculty, staff, or undergraduate student).

In most cases, when concerns arise, the most appropriate action will be for the parties involved to attempt to resolve problems between themselves. Parties should begin with the assumption that each is acting in good faith. Efforts should be made, as appropriate, to protect the confidentiality and reputations of all parties involved during the course of problem resolution procedures, as described below.

A. Grades and Grading

Disagreements regarding course grades and grading should be dealt with by the student and the instructor as outlined in Academic Administrative Policy G-10 and University Faculty Senate Policies 47-00 (in particular, 47-20), 48-00, and 49-00.

B. Academic Integrity

Issues related to misconduct in registered activities and other academic venues (including the thesis or dissertation), and to academic sanctions (grading), should be dealt with as outlined in Academic Integrity Policy 49-20 and Procedures G-9. This policy is implemented by College Academic Integrity Committees, which deal with issues of integrity in academic venues (e.g., courses or other registered activities; the thesis or dissertation) and with academic sanctions (from grades to dismissal from an academic program). The appropriate Academic Integrity Committee would be that of the college offering the registered activity. For Intercollege Graduate Degree Program (IGDP)-listed courses, the appropriate Academic Integrity Committee is that of the instructor's college. For issues related to the thesis or dissertation, it is the Academic Integrity Committee of the college in which the student's thesis or dissertation adviser resides. For advisers in units not within academic colleges, the dean of the Graduate School will determine the appropriate college Academic Integrity Committee.

Note: Issues of integrity and ethics in research and other scholarly activities not related to academic activities as delineated above, should be handled under RA-10

(Handling Inquiries/Investigations into Questions of Ethics in Research and in Other Scholarly Activities). The following are examples of integrity issues and appropriate courses of action, but are not intended to be comprehensive or absolute:

1. Alleged misconduct in a registered course or activity (e.g., cheating or plagiarism) falls under the purview of Policy 49-20 (see G-9 as well), and the Academic Integrity Committee of the credit-offering college. For Intercollege Graduate Degree Program (IGDP)-listed courses, this is the Academic Integrity Committee of the instructor's college.
2. Plagiarism in a thesis or dissertation falls under the purview of Policy 49-20 (see G-9 as well), and the Academic Integrity Committee of the college in which the student's thesis or dissertation adviser resides. For advisers in units not within academic colleges, the dean of the Graduate School will determine the appropriate college Academic Integrity Committee.
3. Plagiarism in a research report, manuscript, or other scholarly work not related to the thesis, dissertation, or registered activity, is handled under RA-10.
4. Misconduct related to thesis or dissertation research (e.g., falsification of data or methods) can involve issues related to both academic integrity and research integrity. Issues related to academic integrity may justify academic sanctions with respect to 600, 610, or other appropriate credits. Issues related to research integrity may require retraction of research reports, notification of funding sources, and/or other actions. In such situations involving both academic and research integrity, procedures should be followed as per RA-10. At the completion of the RA-10 process, the results of the RA-10 inquiry that are relevant should be forwarded to the appropriate college Academic Integrity Committee for review and determination of whether action with regard to potential academic sanctions should be pursued as per Senate Policy 49-20.
5. Misconduct related to research or other scholarly activity that is not part of a thesis, dissertation, or registered activity is handled strictly under RA-10.
6. If no misconduct is determined to exist, diligent efforts should be undertaken, as appropriate, to restore the reputations of the accused. Also diligent efforts should be undertaken to protect the positions and reputations of those who, in good faith, make allegations of misconduct.

C. Classroom Situations

(Exclusive of Grades and Grading and Academic Misconduct)

Students are occasionally confronted with classroom situations (exclusive of grades and grading) that cause them concern and/or inconvenience. Examples include:

- failure of an instructor or administrator to uphold University policies, such as prohibition of smoking in classrooms, prohibition of scheduling comprehensive examinations during the last week, or early completion of semesters.

- failure of an instructor to enforce the Code of Conduct (see Appendix I) with respect to students in the classroom.
- failure of an instructor to fulfill instructional obligations such as unjustified cancellation of classes, frequent absenteeism or late arrival, excessive absences during designated office hours, or inappropriate substitution of teaching assistants.

A graduate student who believes that a problem exists has several avenues by which he/she can pursue resolution. The avenue chosen by a student will depend upon the type of problem encountered and the wishes of the student.

1. Most problems may be resolved by discussing the matter with the instructor directly involved, and/or with the student's adviser.
2. If the problem remains unresolved following 1 above, or if the nature of the problem or any other reason prompts a graduate student to believe that this first avenue is inappropriate, the student may seek recourse first through the unit leader of the academic unit offering the course. If this step does not resolve the matter, the student should seek further recourse through the office of the appropriate Associate or Assistant Dean of the college or division offering the course. For courses that are jointly offered or team-taught by instructors from multiple colleges, the associate dean for graduate studies of the college of the instructor involved in the problem should be consulted. These officers are prepared to help students with classroom problems of the types listed above. Action of the Dean's office, if deemed appropriate by both the student and the administrator, shall occur within 30 days of the complaint or by the end of the semester.

Students may use this channel of communication with assurance that confidentiality will be maintained as appropriate: only information required to pursue a course of action as requested, or consented to, by the student in writing will be disclosed.

Note: Classroom situations involving conduct such as outlined in the Code of Conduct (Appendix I) should first be addressed informally between the instructor and student, however, if this approach does not successfully resolve the issue, it should be referred to the Office of Judicial Affairs.

D. Other Situations

Disagreements to be considered under the following guidelines involve alleged violations of academic freedom, professional ethics, procedural fairness and consistency, and other issues of conduct not covered under Appendix I, Appendix II A, B, or C above, Appendix III or Appendix IV. These guidelines do not apply to classroom matters, academic or research integrity (covered in Appendix II A above), or behaviors addressed in the Code of Conduct (Appendix I; refer to the Office of Judicial Affairs).

1. Every effort should be made to resolve disagreements within the department or graduate program in which the student(s) and/or faculty member(s) are based.

2. If resolution cannot be achieved at the level of the department/graduate program, the parties involved in the dispute should consult the appropriate Associate (or Assistant, as appropriate) Dean of the college to attempt resolution of the issue.
3. If at any stage of examining a disagreement there is concern that misconduct by a student occurred that falls under the Code of Conduct, the misconduct shall be referred by the college to the Office of Judicial Affairs and/or the Affirmative Action Office for sexual harassment or discrimination issues as appropriate, and shall not be subject to adjudication under these guidelines.
4. For disagreements that remain unresolved after consultation with the assistant/associate dean for graduate studies of the college, the individual bringing the disagreement forward may request that the disagreement be considered for a grievance proceeding by filing a written statement detailing the specifics of the disagreement with the assistant/associate dean of the college. The assistant/associate dean of the college, in consultation with the Graduate School, will determine whether a grievance proceeding is warranted and the grievance process described below should be initiated. A grievance process that has been approved by the assistant/associate dean will be then be fowarded to the dean of the college, who will initiate the grievance process. Disagreements should be reported in a timely manner and this will be taken into account in light of the totality of circumstances as to whether the grievance process moves forward.

   For students enrolled in intercollege degree programs, the grievance is filed with the dean of the college in which the student is housed (generally, the college of the student's graduate adviser). If personnel from several colleges are involved, the grievance should be filed with the Dean of the college that has administrative jurisdiction over the person against whom the grievance is being directed. In the case of nondegree students or in any case where questions arise as to jurisdiction, the Dean of the Graduate School will identify the appropriate college and Dean with whom the grievance should be filed The parties to the grievance process shall be the person(s) filing the grievance and the person(s) against whom the grievance is directed.

   1. In response to the grievance, the College Dean shall consult with the Graduate School for the purpose of determining whether the subject matter of the grievance is covered by these guidelines, and if appropriate, the College Dean shall appoint and convene a Hearing Committee consisting of seven (7) members, within three (3) weeks of receipt of the grievance. From that time until the hearing ends, the College Dean shall refrain from involvement in the dispute. The Hearing Committee consists of three graduate students, three faculty members, and an administrator who will serve as chairperson. All members of the Hearing Committee will be from outside the academic department or unit, and from outside any graduate programs in which either the graduate student(s) or faculty member(s) involved in the grievance participate, whenever possible. In the case of multiple colleges being involved, the Hearing Committee shall include faculty and graduate students from each college involved. The chair of the committee should

be an administrator from the college of the individual(s) against whom the grievance is directed.

2. The Hearing Committee should make every effort to conduct its proceedings in a timely manner.
3. Each party is allowed up to one disqualification from this committee without cause. An indefinite number of disqualifications are allowed with cause, as determined by the College Dean. The College Dean shall make additional appointments as necessary to fully staff the Hearing Committee.
4. The hearing is not public. During the hearing, either party may have present an adviser, who must be a student, faculty, or staff member of the University. In light of the nature and spirit of the proceeding, representation by legal counsel is prohibited.
5. The hearing committee may have present at the hearing such assistance as it deems necessary.
6. The hearing committee is not bound by strict rules of evidence and may admit any relevant evidence.
7. A record of the hearing shall be made by some means such as stenographic transcript, audio recording or the equivalent, and the record made available to the parties involved if requested.
8. The parties are afforded an opportunity to obtain necessary witnesses and documentary or other evidence. The department, program, or intercollege program involved makes all reasonable efforts to cooperate with the committee in securing witnesses and making available documentary and other evidence.
9. Each party has the right to respond to evidence presented by all witnesses. Expenses incurred in obtaining a witness will be the responsibility of the party requesting the witness.
10. The Hearing Committee's findings are based solely on the hearing record. In cases where issues involve authorship credit, the hearing committee should adhere to the spirit of RA13 (CO-AUTHORSHIP OF SCHOLARLY REPORTS, PAPERS, AND PUBLICATIONS).
11. If it is determined during the course of the proceedings that a student may have violated the Code of Conduct, (Appendix I), the misconduct shall be referred to the Office of Judicial Affairs (or the appropriate college academic integrity committee for issues related to academic misconduct), and shall not be subject to adjudication by the Hearing Committee; provided however, that any other issues covered by these guidelines, including but not limited to alleged breach of professional ethics by graduate students or faculty, shall be subject to adjudication by the Hearing Committee.

    If serious misconduct is identified and evidence is provided to the Academic Integrity Committee after a student is awarded the graduate degree, sanctions up to and including the revocation of a degree can be imposed with recommendation by the Dean of the Graduate School to the President of the University, with whom final approval rests as the designee of the Board of Trustees.
12. Following the conclusion of the hearing, the Hearing Committee shall

convene deliberations and shall issue a decision within thirty (30) calendar days of the conclusion of the hearings. (Under extraordinary circumstances, either party may request a stay to the 30-day time limit. A request for such a stay must include a justification and indicate the desired duration of the stay, and be directed to the Dean of the Graduate School, whose decision on the stay will be final.) The decision of the Hearing Committee will specify any sanction(s) or remedy(ies) that is (are) deemed appropriate, including but not limited to termination of the student's academic program and termination of the student's representation of the college in any capacity within the college, department or University. The decision of the Hearing Committee shall be provided to the College Dean for implementation. In the case of termination of a student's academic program for breach of professional ethics or other professional misconduct, the following notation shall be made on the student's transcript: "Program terminated for Professional Misconduct." Written notice of the decision of the Hearing Committee shall be provided to all parties. The Hearing Committee's written decision, along with any supporting documents, shall be submitted to and kept by the Graduate School for not less than seven years from the date of the decision. In cases where a finding of professional misconduct against a graduate student is determined, the College should maintain a record of the case and forward a copy of the written decision of the Hearing Committee along with any supporting documents to the Graduate School for its records as well.

5. Any party subject to any sanction or adverse finding may appeal the decision of the Hearing Committee to the College Dean. The appeal must be submitted in writing to the College Dean within three weeks of receipt of the decision of the Hearing Committee. The College Dean shall not convene an additional hearing, but shall consider the record of the hearing, as well as the decision of the Hearing Committee. The College Dean may endorse all, part, or none of the Hearing Committee's decision, sanction or remedy. The College Dean shall come to a decision and issue a written notice within thirty (30) calendar days of receipt of the written appeal. (Under extraordinary circumstances, either party may request a stay to the 30-day time limit. A request for such a stay must include a justification and indicate the desired duration of the stay, and be directed to the Dean of the Graduate School, whose decision on the stay will be final.) If the College Dean does not endorse all of the findings and decision of the Hearing Committee, an explanation shall be included within the College Dean's written decision. The decision of the College Dean shall be final, except for circumstances where additional avenues of appeal are provided for by other University policies or procedures (e.g., Faculty Rights and Responsibilities). The College Dean's written decision, along with supporting documents, shall be submitted to and kept by the Graduate School for not less than seven years from the date of the resolution of the complaint.

RELATED CROSS REFERENCES:

RA13 (Coauthorship of Scholarly Reports, Papers and Publications)

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Approved by Graduate Council, May 7, 2003. Revised by special Ad Hoc Committee on Student-Related Polices, August 2005.

Revised by special Ad Hoc Committee on Student-Related Policies, May 2007

Last updated by Publications (fixed links): 10/21/09

APPENDIX III

Procedures for Termination of the Degree Program of a Graduate Student for Unsatisfactory Scholarship

When a program chair or program committee determines that the program of a graduate student must be terminated for unsatisfactory scholarship, the student must be given advance notice, in writing, which in general terms shall advise the student of the academic reasons for the termination. Examples of unsatisfactory scholarship may include, but are not limited to, inadequate grade-point average, failure to obtain satisfactory grades in required courses for the program, or failing the candidacy, comprehensive, or final oral examination.

Upon receipt of this notice the student has the opportunity to seek a review of the decision. If the student desires such a review, the student must, within ten days of receipt of the notice, submit a written appeal to the program chair. If the student alleges that discrimination including, for example, sexual harassment either was the reason for the termination or caused the unsatisfactory scholarship, and the discrimination or harassment was committed by an individual in a role of authority, such as an administrator, faculty member, instructor, teaching assistant, or research assistant, the matter shall be referred to the Affirmative Action Office of the University, 328 Boucke Building, established to review such claims. If the Affirmative Action Office determines that the student's allegation has merit, the Affirmative Action Office will manage the investigation and report back to the program chair and any other University office as appropriate. If the Affirmative Action Office determines that the student's allegation is unfounded, the program chair then provides an opportunity for the student to meet with him/her and, if applicable, the program committee or other faculty involved in the decision to terminate the student's program.

If there is no allegation of discrimination within the written appeal, then the department head or program chair provides an opportunity for the student to meet with the faculty member(s) who made the decision to terminate the student's program. This meeting must be held within 30 days of receipt of the student's written appeal. (Under extraordinary circumstances, either party may request a stay to the 30-day time limit. A request for such a stay must include a justification and indicate the desired duration of the stay, and be directed to the Dean of the Graduate School, whose decision on the stay will be final.)

Formal rules of evidence are not applicable to the meeting, and attorneys are not permitted to represent any person attending the meeting. If the student's faculty adviser would not otherwise be present (i.e., was not involved in the decision to terminate), the adviser should be permitted to attend this meeting if requested by the student or program chair, or if the adviser wishes to do so. The program chair is responsible for ensuring that minutes of the meeting are taken and copies distributed to all those in attendance.

Following this meeting, the program chair must notify the student within five (5) days, in writing, whether the termination decision has been sustained or reversed. If it is sustained, the program chair shall notify the Dean of the Graduate School.

Within five days of receiving this notice of termination for unsatisfactory scholarship, the student may make a written request to the Dean of the Graduate School for a further review of the decision. The standard of review by the Graduate School is whether the decision to terminate for unsatisfactory scholarship was arbitrary and capricious. The terms "arbitrary and capricious" mean that the decision to terminate is not supportable on any rational basis, or that there is no evidence upon which the decision may be based. The Graduate School does not review faculty judgments as to the quality of a student's academic performance, but only whether a program's decision was arbitrary and capricious.

Although not required to do so, the Dean of the Graduate School may meet with the student and/or program chair, or request additional information from the student and/or the program chair. If a meeting is held, the student may not be represented by an attorney but may have present a faculty adviser of his or her choice. The student is permitted to submit additional information or statements in writing.

After this review, the Dean of the Graduate School either sustains the termination and, at the discretion of the program, directs that it be entered on the student's transcript or requests additional information from the student and/or program chair or, only if he or she determines that the decision was arbitrary and capricious, reverses the decision and permits the student to continue in the program. The Dean of the Graduate School gives written notice of the decision to the program chair and to the student within three (3) weeks of receipt of the student's written request to the Dean. In the event of a reversal, such written notice shall contain a statement of the basis on which the decision was made.

A registration hold may be placed on the student's records while action is pending under these procedures.

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Approved by the Graduate Council, May 8, 2002

Revised by special Ad Hoc Committee on Student-Related Policies, August 2005

Revised by special Ad Hoc Committee on Student-Related Policies, April 2007

Revisions by the Graduate Council Committee on Academic Standards, January 2008

APPENDIX IV

Procedures for Termination of Assistantships due to Inadequate Performance

PROCEDURES FOR TERMINATION OF ASSISTANTSHIPS DUE TO INADEQUATE PERFORMANCE -- The purpose of this policy is to provide guidance to units in dealing with inadequate performance by graduate assistants. This policy applies only to inadequate performance by a graduate assistant in his or her duties and responsibilities during the term of appointment. It does not apply to (i) a decision by the unit not to renew an assistantship appointment, (ii) matters involving the academic performance of the graduate assistant, and (iii) the automatic termination of an assistantship appointment when the graduate assistant is no longer a student.

Position Descriptions -- Duties and responsibilities of graduate assistants vary widely among units, and even within units. In light of the nature of the obligations of a graduate assistant, it is not always feasible to provide a written description of the graduate assistant's duties and responsibilities. Where possible, however, it is recommended that the unit prepare a written statement of the duties and responsibilities of a graduate assistant (a "position description"). If a position description is prepared by the unit, it should be made available to the recipients of an assistantship at the time awards are made. [If there is no general position description used by the unit, the unit should provide a written statement of duties and responsibilities to the individual at the time he or she is awarded the assistantship.]

Performance Improvement Meetings -- When a supervisor determines that a graduate assistant is failing to meet acceptable standards, the supervisor will meet with the assistant. Together, they will review the duties and responsibilities expected of the graduate assistant, and the supervisor will identify those areas in which the performance of those duties and responsibilities is judged to be substandard. The supervisor should then advise the graduate assistant that if his or her performance does not improve to a satisfactory level within a time period specified by the supervisor, the assistantship will be terminated. The time period established by the supervisor should provide a sufficient and reasonable time for the graduate assistant to demonstrate a satisfactory level of performance. In some instances, the graduate assistant's failure to meet acceptable standards of performance may be disruptive of the educational process (e.g., failure to appear for a teaching assignment class, or failure to grade examinations in a timely fashion). In such instances, the graduate student should be advised that any subsequent failure to meet acceptable performance standards may result in subsequent termination of the assistantship. As soon as possible following this meeting (generally within five calendar days) the supervisor will provide the assistant with a written summary of the meeting, a copy of which will also be sent to the administrator of the unit.

Termination of an Assistantship -- If a graduate assistant fails to meet acceptable standards of performance as prescribed in the performance improvement meeting, the supervisor will notify the administrator of the unit. The unit administrator will schedule a meeting with the supervisor and graduate assistant as soon as possible, generally within three days. At that meeting, the graduate assistant's performance will again be reviewed. If it is concluded that the graduate assistant has failed to meet acceptable performance standards, the administrator of the unit may terminate the graduate assistantship appointment. The administrator of the unit will provide a written summary of the meeting and of the action taken to the graduate assistant, the dean of the college, and the associate dean of the Graduate School. Students should be notified, in writing, of consequences with regard to healthcare and/or other benefits when termination of an assistantship occurs, and be referred to the University's Student Insurance Office to determine the nature and extent of these consequences in individual cases. When termination occurs prior to the end of the semester, consideration should be given to providing a grace period prior to cessation of payroll, if necessary, in order to provide the student with an opportunity to arrange for alternative healthcare coverage or to make other arrangements.

Appealing the Decision of Termination of an Assistantship s for Inadequate Performance -- If a graduate assistant wishes to appeal a decision of termination of an assistantship for inadequate performance, he/she may file a written appeal within 10 days of receipt of the written notice of termination with the individual to whom the unit administrator reports. In cases where the assistantship is funded through multiple units (e.g., stipend from one budgetary unit and tuition from another), the decision to terminate the assistantship should be made in consultation with both(all) units involved, and any appeal must be considered jointly by the individuals to whom the respective unit administrators report.

IMMEDIATE TERMINATION OF AN ASSISTANTSHIP -- If a supervisor believes a graduate assistant has engaged in an act of research misconduct, the case should be referred to the Office of the Senior Vice President for Research (see Policy RA-10); for other misconduct as dileneated in the Code of Conduct, the case should be referred to the Office of Judicial Affairs. If it has been determined by Judicial Affairs that the graduate assistant did commit an act of misconduct, the assistantship may be terminated upon approval by the unit administrator in consultation with the dean of the Graduate School, without proceeding with a performance improvement meeting. Acts of misconduct may include, but are not limited to, theft, fraud, physical altercation, sexual harassment, etc.

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Approved by the Graduate Council, May 8, 2002.

Revised by special Ad Hoc Committee on Student-Related Polices, August 2005.

DATE LAST REVIEWED: 12/19/06

APPENDIX V

PENNSYLVANIA CLASSIFICATION

A student shall be classified as a Pennsylvania resident for tuition purposes if that student has a Pennsylvania domicile and that student's presence in Pennsylvania is not primarily for educational purposes. Domicile is a person's existing and intended fixed, permanent, and principal place of residence. A student whose presence in the Commonwealth is primarily for educational purposes shall be presumed to be a non-Pennsylvania resident for tuition purposes. The following are considerations that may be used by the University in determining whether a student is a resident for tuition purposes:

1. A student under the age of 21 is presumed to have the domicile of his/her parent(s) or legal guardian(s), unless the student has maintained continuous residence in the Commonwealth for other than educational purposes for a period of at least 12 months immediately prior to his/her initial enrollment at The Pennsylvania State University, and, the student continues to maintain such separate residence.
2. A student who has resided in the Commonwealth for other than educational purposes for at least a period of 12 months immediately preceding his/her initial enrollment at The Pennsylvania State University is presumed to have a Pennsylvania domicile.
3. A student who has not resided continually in Pennsylvania for a period of 12 months immediately preceding his/her initial enrollment at The Pennsylvania State University is presumed to have a non-Pennsylvania domicile.
4. A student requesting to be classified as a Pennsylvania resident for tuition purposes must be a citizen of the United States or a permanent resident. Permanent residents must have received the I-551 stamp approving their permanent resident status. An individual in a nonimmigrant status with the INS is not eligible for classification as a Pennsylvania resident for tuition purposes. Other extraordinary circumstances, which may qualify a student as a Pennsylvania resident for tuition purposes, will be considered on a case-by-case basis.
5. A United States government employee or member of the armed forces who was a resident of Pennsylvania immediately preceding his/her entry into government service and who has continuously maintained Pennsylvania as his/her domicile will be presumed to have a Pennsylvania domicile. Military personnel and their dependents who are assigned to an active duty station in Pennsylvania and who reside in Pennsylvania shall be charged in-state tuition rates.
6. A student receiving a scholarship, guaranteed loan, grant, or other form of financial assistance dependent upon residence in a state other than Pennsylvania is not a Pennsylvania resident for tuition purposes.

RECLASSIFICATION AS PENNSYLVANIA RESIDENT

A student requesting reclassification as a Pennsylvania resident for tuition purposes must demonstrate by clear and convincing evidence that his/her domicile is in Pennsylvania, and that his/her presence in Pennsylvania is not primarily for educational purposes. Each request shall be decided individually on the basis of all facts submitted by the petitioner. Accordingly, it is not possible to list a specific combination of factors or set of circumstances which, if met, would ensure reclassification for tuition purposes.

RECLASSIFICATION PROCEDURE

1. A student may challenge his/her residence classification by filing a written petition with the person or committee designated to consider such challenges at the University. Such person or committee shall consider such petition and render a timely decision that shall constitute an exhaustion of administrative remedies.
2. Any reclassification resulting from a student's challenge or appeal shall be effective at the beginning of the semester or session during which the challenge or appeal was filed or at the beginning of the following semester or session. The decision as to which semester or session becomes the effective date shall rest with the person or committee rendering the decision on reclassification.
3. A student who changes his/her place of residence from Pennsylvania to another state is required to give prompt written notice of this change to the University and shall be considered for reclassification as a non-Pennsylvanian for tuition purposes effective with the date of such change.
4. A dependent resident student whose parent(s) or legal guardian(s) move outside of the Commonwealth may remain a Pennsylvania resident for tuition purposes if he/she continues to maintain a separate domicile within the Commonwealth.

NONRESIDENT STUDENT CLASSIFICATION

A student is initially classified as a nonresident based on information provided by the student when applying for admission to the University. The initial classification is made as follows:

1. Undergraduate Student
   - Penn State Harrisburg—Penn State Harrisburg Academic Services Officer
   - All other locations—Undergraduate Admissions Office, The Pennsylvania State University, University Park, PA 16804-3000.
2. Graduate Student
   - Penn State Harrisburg—Penn State Harrisburg Academic Services Officer
   - All other locations—Dean of the Graduate School
3. Medical Student
   Office of Student Affairs, The Milton S. Hershey Medical Center

A student may challenge his/her residency classification by filing a written petition as follows:

1. Undergraduate Student
   - Penn State Harrisburg—Penn State Harrisburg Financial Officer
   - All other locations—Residency Appeal Officer, University Park
2. Graduate Student
   - Penn State Harrisburg—Penn State Harrisburg Financial Officer
   - All other locations—Residency Appeal Officer , University Park
3. Medical Student
   Controller, The Milton S. Hershey Medical Center

The appropriate University official reviews the student's petition and makes a decision.

The student may appeal that officer's residency decision to the University Appeals Committee on Residence Classification having representation from the Corporate Controller's Office, Undergraduate Admissions Office, and the Graduate School. The committee's decision on appeal shall be final.

PLEASE NOTE: A page of frequently asked questions concerning residency classification for tuition purposes can be found at **www.bursar.psu.edu/faq.cfm**

DATE LAST REVIEWED: 12/19/06

DOCTORAL DEGREES

The Doctor of Philosophy, an academic degree; the Doctor of Education and Doctor of Musical Arts, both professional degrees, are conferred by the University. Recognized as different in purpose, the three programs consequently have different requirements in certain respects.

ADMISSION

A student who has been admitted to the Graduate School and has been accepted by the department or committee in charge of a major program in which the doctorate is offered may begin working toward a doctoral degree. However, the student has no official status as a doctoral student and no assurance of acceptance as a doctoral candidate until the candidacy examination has been passed. This examination is administered by the major department or graduate program and is given early in the student's program.

It is the policy of the Graduate School not to encourage applicants to work for a second doctoral degree. (See Policy on Second Doctorates). However, the President, on recommendation of the dean of the Graduate School, will welcome, as guests, holders of earned doctoral degrees who may be visiting the University Park campus for purposes of noncredit study. Guest privileges apply to persons holding the degree from Penn State or other accredited colleges and universities. Guests may attend seminars and courses and, if space and facilities are available, carry on research. There will be no charge except for laboratory expenses. Arrangements should be made in advance with the dean of the Graduate School.

GENERAL REQUIREMENTS

No specified number of courses completed or credits earned will assure attainment of the doctorate. The general requirements are based upon a period of residence, the writing of a satisfactory dissertation acceptance by the doctoral committee and the Graduate School, and the passing of a comprehensive and a final oral examination. A doctoral program consists of such a combination of course seminars and individual study and research as meets the minimum requirements of the Graduate School and is approved by the doctoral committee for each individual student.

A master's degree is not a prerequisite for the doctorate in some major programs. However, the first year of graduate study leading to the Ph.D. may be substantially the same as that provided for the M.A. or M.S. degree. Similarly, the first year of the D.Ed. program may be essentially the same as that provided for the M.Ed. degree.

GRADE-POINT AVERAGE

A minimum grade-point average of 3.00 for work done at the University is required for doctoral candidacy, for admission to the comprehensive examination, the final oral examination, and for graduation.

TIME LIMITATION

A doctoral student is required to complete the program, including acceptance of the doctoral thesis, within eight years from the date of successful completion of the candidacy examination. Individual programs may set shorter time limits. Extensions may be granted by the Director of Graduate Enrollment Services in appropriate circumstances.

OFF-CAMPUS AND TRANSFER CREDIT

A maximum of 30 credits beyond the baccalaureate at a regionally accredited school not granting the doctorate in the student's major program may be accepted by the Graduate School in partial fulfillment of the requirement for a D.Ed. degree at Penn State. A maximum of two full academic years of work (60 credits) beyond the baccalaureate at a regionally accredited graduate school that grantsthe doctorate in the candidate's major program may be accepted here to apply toward D.Ed. degree requirements. A completed master's degree may be transferred to a D.Ed. program with no intervening time limitation. Because there is no total-credit requirement for the Ph.D. degree program, advanced standing is not awarded for a master's degree. Advanced standing is awarded for only one master's degree.

Subject to the approval of the adviser and the head of the major department or program chair, a student may register for research to be done away from the University Park campus.

Academic work to be so transferred must meet the following criteria:

1. It must have been completed within five years prior to the date of first degree registration at the Graduate School of Penn State (see below);
2. It must appear on an official graduate transcript of an accredited or recognized degree-granting institution;
3. It must be equivalent to "B" quality or higher (grades of B- are not transferrable) on Penn State's grading system;
4. It must be deemed applicable to the student's program by the current academic adviser, approved in writing, and submitted to the Graduate School for approval and action.

Credits earned toward a previously completed postbaccalaureate professional degree program (law, medicine, etc.) are not transferrable. However, up to 10 credits can be transferred from a professional degree program if the degree has not been conferred. All transfer credit must be substantiated by the former institution as having at least B quality whatever grading system is in place (e.g., this includes P/F grading).

ADVISERS AND DOCTORAL COMMITTEES

Following admittance to a degree program, the student should confer with the head of that major department or program concerning procedures and the appointment of an academic adviser. Consultation or arrangement of the details of the student's semester-by-semester schedule is the function of the academic adviser. This person may be a member of the doctoral committee or someone else designated by the head of the major program for this specific duty. The academic adviser may be different from the dissertation adviser.

Doctoral Committee--General guidance of a doctoral candidate is the responsibility of a doctoral committee consisting of four or more active members of the Graduate Faculty, which includes at least two faculty members in the major field, and one outside member, as described below. The dissertation adviser must be a member of the doctoral committee and usually (but is not required to) serves as chair. If the candidate has a minor, that field must be represented on the committee. (See also Major Program and Minor Field under D.Ed.—Additional Specific Requirements in this bulletin.) This committee is appointed by the graduate dean through the Office of Graduate Enrollment Services, upon recommendation of the head of the major program, soon after the student is admitted to candidacy. A person not affiliated with Penn State who has particular expertise in the candidate's research area may be added as a special member, upon recommendation by the head of the program and approval of the graduate dean (via the Office of Graduate Enrollment Services). A special member is expected to participate fully in the functions of the doctoral committee. If the special member is asked only to read and approve the doctoral dissertation, that person is designated a special signatory. Occasionally, special signatories may be drawn from within the Penn State faculty in particular situations.

Chair--The chair or at least one co-chair must be a member of the specific graduate faculty of the doctoral program in which the candidate is enrolled. A retired or emeritus faculty member may chair a doctoral committee if he/she began chairing the committee prior to retirement and has the continuing approval of the department head or program chair. The primary duties of the chair are: (1) to maintain the academic standards of the doctoral program and the Graduate School, (2) to ensure that the comprehensive and final examinations are conducted in a timely fashion, (3) to arrange and conduct all meetings, and (4) to ensure that requirements set forth by the committee are implemented in the final version of the thesis.

Outside Member--While one or more members of the doctoral committee may be from outside the department in which the graduate program resides, an official “outside member” must be appointed, who serves a specific role as described below. The primary responsibilities of this outside member are (1) to maintain the academic standards of the Graduate School and (2) to assure that all procedures are carried out fairly. The outside member represents the Graduate School; and, as such, the outside member shall be a member of the Graduate Faculty but need not have direct expertise in the research area of the candidate. The outside member

may contribute technical expertise, but this role is subordinate to the aforementioned primary responsibilities. In this context, the head of the doctoral program will recommend to the dean (via the Office of Graduate Enrollment Services) a sufficient number of members, exclusive of the outside member, so that sufficient technical expertise is represented on the committee. Thus, the outside member may be in addition to a full complement of committee members with technical expertise in the area. Heads of doctoral programs will seek an outside member who has no conflicts of interest with members of the committee, in such a way as to preclude their fulfilling the primary duties as the outside member. The outside member shall not hold a budgetary or adjunct appointment in the department or academic unit to which the student's doctoral program belongs. The outside member shall also not have a budgetary or adjunct appointment in or other conflict of interest with the unit(s) to which either the chair or the dissertation adviser belongs. The outside member cannot chair or co-chair the committee. This does not preclude other members of the Graduate Faculty regardless of budgetary appointment from serving on the committee, and potentially in dual roles, for example, as co-chair. The committee member representing the minor may serve as the outside member if his or her budgetary appointment satisfies the conditions noted above.

The membership of doctoral committees should be periodically reviewed by the program chair to ensure that its members continue to qualify for service on the committee in their designated roles. For example, if budgetary appointments, employment at the University, etc., have changed since initial appointment to the committee, changes to the commmittee membership may be necessary. If changes are warranted, they should be made as soon as possible to prevent future problems that may delay academic progress for the student (e.g., ability to conduct the comprehensive or final examinations).

Responsibilities of Doctoral Committees--The doctoral committee is responsible for approving the broad outline of the student's program and should review the program as soon as possible after the student's admission to candidacy. Moreover, continuing communication among the student, the committee chair, the research supervisor, and the members of the committee is strongly recommended, to preclude misunderstandings and to develop a collegial relation between the candidate and the committee.

Doctoral Examination--The (entire) committee will prepare and administer the examination, and evaluate the candidate's performance on the examination. If a committee member is unable to attend the final oral defense, the member may sign as a special signatory. A revised committee appointment form will need to be sent to the Office of Graduate Enrollment Services, 114 Kern Building, removing the faculty member as a regular committee member and moving the member to a special signatory. If there are then not enough members serving on the committee (i.e., four or more active members of the Graduate Faculty) another Penn State faculty member will need to replace that member to constitute a legitimate doctoral committee. (Substitutes are not permitted.) These changes and approvals shall occur before the actual examination takes place. The department or program head will notify the Office of Graduate Enrollment Services when the candidate is

ready to have the comprehensive and the final oral examinations scheduled and will report the results of these examinations to that office.

The dissertation adviser, as well as the chair of the doctoral committee (if not the same individual as the dissertation adviser), along with additional members of the committee to total a minimum of three (3), must be physically present at the final oral examination. The graduate student must also be physically present at the exam. (Thus for a five-person committee, two could participate via distance.) No more than one member may participate via telephone; a second member could participate via PicTel. The examination request and a request for exceptions must be submitted to the director of Graduate Enrollment Services for approval at least two weeks prior to the date of the exam. Special arrangements, i.e., requirements for meeting participation via distance, should be communicated to the student and the doctoral committee members well in advance of the examination.

A favorable vote of at least two-thirds of the members of the committee is required for passing a comprehensive or a final oral examination. If a candidate fails an examination, it is the responsibility of the doctoral committee to determine whether another examination may be taken.

The committee examines the dissertation, administers the final oral examination, and signs the approval page of the dissertation. At least two-thirds of the committee must approve the dissertation.

ENGLISH COMPETENCE

A candidate for the degree of Doctor of Philosophy is required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking, as part of the language and communication requirements for the Ph.D. Programs are expected to establish mechanisms for assessing and improving competence of both domestic and international students. Assessments should include pieces of original writing. Programs and advisers should identify any deficiencies before or at the candidacy examination and direct students into appropriate remedial activities. Competence must be formally attested by the program before the doctoral comprehensive examination is scheduled. (International students should note that passage of the minimal TOEFL or IELTS requirement does not demonstrate the level of competence expected of a Ph.D. from Penn State.)

COMMUNICATION AND FOREIGN LANGUAGE COMPETENCE

In addition to demonstrating competence in English as described above, each candidate for the Ph.D. must meet communication and foreign language requirements that have been established within the major program. The candidate should ascertain specific language requirements by contacting the professor in charge of the program, whose name appears with the program description under Graduate Programs, Faculty, and Courses.

Candidates for the Doctor of Education degree may be required to demonstrate competence in foreign languages.

CANDIDACY EXAMINATION

Every student who wishes to pursue a doctorate must take a candidacy examination administered by the Graduate Faculty in the graduate major program. The purpose of the candidacy examination should be to assess whether the student is capable of conducting doctoral research based on evidence of critical thinking or other measures that the Graduate Faculty of the program view as important to a successful doctoral student. It should be taken early in the student's program. The nature of the examination varies with the program and may be the master's examination if so prescribed by the program and understood by the student. The decision to admit or not to admit a student to candidacy must be made by the graduate faculty or a designated committee of graduate faculty in the program. For the Ph.D. student, the examination may be given after at least 18 credits have been earned in graduate courses beyond the baccalaureate. The examination must be taken within three semesters (summer sessions do not count) of entry into the doctoral program.

The student must be registered as a full-time or part-time degree student for the semester (excluding summer session) in which the candidacy examination is taken.

For the D.Ed. student, the examination should be given when the student has earned a total of about 30 credits, including the master's program and work done elsewhere. A student transferring from another graduate school with 30 or more transfer credits must take the candidacy examination prior to earning more than 25 credits at Penn State.

COMPREHENSIVE EXAMINATION

When a candidate for the Ph.D. or D.Ed. degree has substantially completed all course work, a comprehensive examination is given. The examination is intended to evaluate the candidate's mastery of the major (and if appropriate, minor) field. (Note: Some programs require students to pass various "area" examinations, "cumulative" examinations, and the like, or require presentation of a thesis proposal, prior to the comprehensive. These are matters of departmental or program policy, distinct from the general policies of the Graduate School described here.)

A candidate for the Ph.D. must have satisfied the English competence and the communication and foreign language requirement before taking the comprehensive examination.

All candidates are required to have a minimum grade-point average of 3.00 for work done at the University at the time the comprehensive examination is given, and may not have deferred or missing grades.

The student must be registered as a full-time or part-time student for the semester in which the comprehensive examination is taken.

The examination is scheduled and announced officially by the Office of Graduate Enrollment Services upon recommendation of the department or program head. Two weeks' notice is required by the Office of Graduate Enrollment Services for scheduling this examination, which may be open to the public at the department's discretion. It is given and evaluated by the entire doctoral committee and may be either written or oral, or both. A favorable vote of at least two-thirds of the members of the committee is required for passing. In case of failure, it is the responsibility of the doctoral committee to determine whether the candidate may take another examination. The results are reported to the Office of Graduate Enrollment Services.

The dissertation adviser, as well as the chair of the doctoral committee (if not the same individual as the dissertation adviser), along with additional members of the committee to total a minimum of three (3), must by physically present at the comprehensive examination. The graduate student must also be physically present at the exam. (Thus for a five-person committee, two could participate via distance.) No more than one member may participate via telephone; a second member could participate via PicTel. The examination request and a request for exceptions must be submitted to the director of Graduate Enrollment Services for approval at least two weeks prior to the date of the exam. Special arrangements, i.e., requirements for meeting participation via distance, should be communicated to the student and the doctoral committee members well in advance of the examination.

When a period of more than six years has elapsed between the passing of the comprehensive examination and the completion of the program, the student is required to pass a second comprehensive examination before the final oral examination will be scheduled.

FINAL ORAL EXAMINATION

The doctoral candidate who has satisfied all other requirements for the degree will be scheduled by the Office of Graduate Enrollment Services, on the recommendation of the department or program head, to take a final examination. Two weeks' notice is required by the Office of Graduate Enrollment Services for scheduling this examination. Normally the final oral examination may not be scheduled until at least three months have elapsed after the comprehensive examination was passed, although the director of Graduate Enrollment Services may grant a waiver in appropriate cases. It is the responsibility of the doctoral candidate to provide a copy of the dissertation to each member of the doctoral committee at least one week before the date of the scheduled examination.

Both the dissertation adviser and the student are responsible for ensuring the completion of a draft of the dissertation and for adequate consultation with members of the dissertation committee well in advance of the oral examination. Major revisions to the dissertation should be completed before this examination.

The dissertation should be in its final draft, with appropriate notes, bibliography, tables, etc., at the time of the oral examination; both the content and style should be correct and polished by the time this final draft of the dissertation is in the hands of the committee.

The final examination of the doctoral candidate is an oral examination administered and evaluated by the entire doctoral committee. It consists of an oral presentation of the dissertation by the candidate and a period of questions and responses. These will relate in large part to the dissertation, but may cover the candidate's entire program of study, because a major purpose of the examination is also to assess the general scholarly attainments of the candidate. The portion of the examination in which the dissertation is presented is open to the public.

The dissertation adviser, as well as the chair of the doctoral committee (if not the same individual as the dissertation adviser), along with additional members of the committee to total a minimum of three (3), must by physically present at the final oral examination. The graduate student must also be physically present at the exam. (Thus for a five-person committee, two could participate via distance.) No more than one member may participate via telephone; a second member could participate via PicTel. The examination request and a request for exceptions must be submitted to the director of Graduate Enrollment Services for approval at least three weeks prior to the date of the exam. Special arrangements, i.e., requirements for meeting participation via distance, should be communicated to the student and the doctoral committee members well in advance of the examination.

The student must be registered as a full-time or part-time degree student for the semester in which the final oral examination is taken.

A favorable vote of at least two-thirds of the members of the committee is required for passing. The results of the examination are reported to the Office of Graduate Enrollment Services. If a candidate fails, it is the responsibility of the doctoral committee to determine whether another examination may be taken.

DISSERTATION ACCEPTANCE

Completion of the requirements of a doctoral degree program entails acceptance of the dissertation, as indicated by the signatures of at least two-thirds of the doctoral committee, including the dissertation adviser, committee chair, and the program chair or department head on its approval page, and by its acceptance as meeting the editorial standards of the Graduate School, so that it constitutes a suitable archival document for inclusion in the University Libraries. Thus it is to be noted that passage of the final oral examination is necessary but not sufficient for award of the degree; the dissertation must be accepted, as the ultimate step.

Ph.D.--ADDITIONAL SPECIFIC REQUIREMENTS

The degree of Doctor of Philosophy is conferred in recognition of high attainment and productive scholarship in some special field of learning as evidenced by:

1. The satisfactory completion of a prescribed period of study and investigation;
2. The preparation and formal acceptance of a dissertation involving independent research;
3. The successful passing of examinations covering both the special subject and the general field of learning of which this subject forms a part.

Residence Requirements--There is no required minimum number of credits or semesters of study, but over some twelve-month period during the interval between admission to the Ph.D. program and completion of the Ph.D. program, the candidate must spend at least two semesters (summer sessions are not included) as a registered full-time student engaged in academic work at the University Park campus, the Penn State Milton S. Hershey Medical Center, or Penn State Harrisburg. Full-time University employees must be certified by the department as devoting half-time or more to graduate studies and/or thesis research to meet the degree requirements. Students should note that 601 cannot be used to meet the full-time residence requirement. (See Credit Loads and Academic Status.)

Continuous Registration--It is expected that all graduate students will be properly registered at a credit level appropriate to their degree of activity. (See Registration.) After a Ph.D. candidate has passed the comprehensive examination and met the two-semester full-time residence requirement, the student must register continuously for each fall and spring semester (beginning with the first semester after both of the above requirements have been met) until the Ph.D. thesis is accepted and approved by the doctoral committee. (Students who are in residence during summers must also register for summer sessions if they are using University facilities and/or faculty resources, except for Graduate Lecturers/Researchers, who are not required to enroll for any credits unless they are first-semester graduate students, or are required to be enrolled by their graduate program.)

Post-comprehensive Ph.D. students can maintain registration by registering for credits in the usual way, or by registering for noncredit 601 or 611, depending upon whether they are devoting full time or part time to thesis preparation. Students may take 601 plus up to 3 additional credits of course work for audit by paying only the dissertation fee. Students wishing to take up to 3 additional credits of course work for credit, i.e., 590, 602, etc., with 601 may do so by paying the dissertation fee and an additional flat fee. Enrolling for either 3 credits for audit or credit will be the maximum a student may take with SUBJ 601 without special approval by the Graduate School. NOTE: Registration for additional credits above this will incur an additional charge at the appropriate tuition per-credit rate (in state or out of state). Students wishing to take more than 3 additional credits of course work must register for 600 or 611 (i.e., not for 601, which is full-time thesis preparation).

Note that the least expensive way for a student to maintain full-time status while working on research and thesis preparation is to register for 601. This clearly is the procedure of choice for international students who need to maintain status as full-time students for visa purposes.

If a Ph.D. student will not be in residence for an extended period for compelling reasons, the director of Graduate Enrollment Services will consider a petition for a waiver of the continuous registration requirement. The petition must come from the doctoral committee chair and carry the endorsement of the department or program chair.

Minor Field--A Ph.D. candidate is not required by the Graduate Faculty to have a minor field of study. However, a department or a committee in charge of a major field may require a candidate to offer work in a minor field, or a student may elect such a program with the permission of the doctoral committee.

A doctoral minor consists of no fewer than 15 graduate credits of integrated or articulated work in one field related to, but different from, that of the major. Programs should consider that a doctoral minor should represent curriculum and study that reflect graduate-level concepts and scholarship, with a preponderance of courses at the 500-level, however, at a minimum, 6 credits must be at the 500-level. A minor normally may be taken only in one of the approved graduate degree programs offered at Penn State, or in a formal graduate minor program that has been approved by the Graduate Council, such as the minors in comparative and international education; gerontology; high performance computing; literary theory, criticism, and aesthetics; linguistics; medieval studies; religious studies; science, technology, and society; second language acquisition; social thought; or women's studies. The minor field chosen must have the approval of the departments or committees responsible for both the major program and the minor field. If more than one minor is being proposed, a separate group of courses must be taken for each (i.e., none of the courses may be used concurrently). If the student received a master's minor in the same field as is being proposed for a doctoral minor, the 15 credits taken must be above and beyond those used for the master's minor. However, credits earned in the master's program over and above those applied to either the master's minor or major may be applied to a minor in the Ph.D. program.

At least one faculty member from the minor field must be on the candidate's doctoral committee.

Dissertation --The ability to do independent research and competence in scholarly exposition must be demonstrated by the preparation of a dissertation on some topic related to the major subject. It should represent a significant contribution to knowledge, be presented in a scholarly manner, reveal an ability on the part of the candidate to do independent research of high quality, and indicate considerable experience in using a variety of research techniques. The contents and conclusions of the dissertation must be defended at the time of the final oral examination.

When a complete draft of the dissertation has been compiled, the student must submit it to the Thesis Office for format review. Submission for format review

must be made by the announced deadline for the semester/session in which the degree will be conferred. After a successful defense and after signed approval by the advisers and/or committee members and the department head or graduate program chair, the final archival copy of the dissertation (incorporating any format changes requested by the Thesis Office), must be uploaded as an eTD (electronic dissertation) by the announced deadline for the semester/session in which the degree will be conferred. It is also expected that the student will provide a final archival copy of the dissertation to the office of the department or program head.

A Thesis Guide, which gives details concerning format and other requirements, can be accessed at: www.gradsch.psu.edu/current/thesis.html (Opens New Window).

D.Ed.--Additional Specific Requirements

The D.Ed. degree is conferred in recognition of advanced preparation of a high order for work in the profession of education as evidenced by:

1. Satisfactory completion of a prescribed period of study;
2. Ability to apply scientific principles to practitioner problems in a variety of education endeavors;
3. Preparation of dissertation demonstrating ability to undertake an educational problem with originality and independent thought;
4. Successful performance on major and minor examinations, showing a satisfactory grasp of the field of specialization and its relation to allied education areas.

Residence Requirement--A minimum of 90 credits, of which at least 30 credits must be earned in residence at University Park campus, or Penn State Harrisburg if the degree is offered at that location, is required for the D.Ed. degree. The D.Ed. candidate may meet the requirements by attending summer sessions unless the major department requires a period of registration during the regular academic year. A candidate may register for a maximum of 30 credits of research in absentia, but none of these may count toward the minimum of 30 credits that must be earned at the University Park campus or Penn State Harrisburg if the degree is offered at that location. It is expected that students will register for a minimum of 15 credits of thesis research.

Major Program and Minor Field--The program of study includes a major and either a minor or a group of general studies. A majority of the courses offered in fulfillment of the requirements must be in the major program of study.

A candidate choosing a major outside the fields of professional education (such as history) shall have a minor consisting of no fewer than 15 graduate credits in professional education, as recommended to the director of Graduate Enrollment Services early in the major program with the approval of a faculty adviser from the minor area.

A candidate choosing a major in one of the approved programs in professional education must also choose either a minor or a group of general studies with the approval of the major program chair. In this case, a minor consists of no fewer than 15 graduate credits in a field considered by the major program committee to provide valuable intellectual and/or professional depth and breadth for the candidate. There must be at least one faculty member from the minor field on the candidate’s doctoral committee. The minor may include courses taken as part of a previous master’s degree program, if the minor is in an area different from the master’s, and if the courses were not a required part of the program, e.g., used to meet a total credit requirement.

An acceptable general studies group consists of at least 15 graduate credits, including those taken as part of a previous master’s degree (up to 6 credits), considered by the major program committee to provide valuable intellectual

breadth for the candidate. (Note that a general studies group is not a minor and is not entered as such on the student's transcript.)

A candidate entering with a master's degree in a field that would normally be regarded as appropriate for a minor may petition the major program committee for a waiver of the minor requirement. If the program chair then approves, a request for a waiver may be submitted by the chair to the director of Graduate Enrollment Services. Waiving the minor requirement does not reduce the residence or total credit requirements for the D.Ed. degree.

Comprehensive Examination--In addition to demonstrating a high level of competence in the subject matter in the major program and minor field, each candidate must show, by a comprehensive examination, an understanding of current theories of education and the ability to apply the techniques and findings of educational research so far as they bear upon the teaching of the subject matter. The candidate must also be able to understand and contribute to the technical and professional literature in the field, and to criticize learned procedures in the light of historical trends and practices in this and other countries. Command of the tools for a thorough study of the problems of education is necessary and must include competence in the use of statistical methods. For certain students the requirements may include a reading knowledge of one or more foreign languages.

All candidates are required to have a minimum grade-point average of 3.00 for academic work done at the University at the time the comprehensive examination is given.

Dissertation--Evidence of a high degree of scholarship, competence in scholarly exposition, and ability to select, organize, and apply knowledge must be presented by the candidate in the form of a written dissertation. The candidate must demonstrate a capacity for independent thought, as well as ability and originality in the application of educational principles or in the development of a new generalization under scientific controls. A dissertation may be based upon a product or project of a professional nature, provided scholarly research is involved. For example, it may be based upon the solution of a professional problem concerned with the development of a curriculum, or a product of creative effort related to education. However, in order to be acceptable as a dissertation, professional project must be accompanied by a written discourse demonstrating the nature of the research and including such theories, experiments, and other rational processes as were used in effecting the final result. The topic and outline of the proposed dissertation must have the approval of the doctoral committee.

When a complete draft of the dissertation has been compiled, the student must submit it to the Thesis Office for format review. Submission for format review must be made by the announced deadline for the semester/session in which the degree will be conferred. After a successful defense and after signed approval by the advisers and/or committee members and the department head or graduate program chair, the final archival copy of the dissertation (incorporating any format changes requested by the Thesis Office), must be uploaded as an eTD (electronic dissertation) by the announced deadline for the semester/session in

which the degree will be conferred. It is also expected that the student will provide a final archival copy of the disseration to the office of the department or program head.

A Thesis Guide, which gives details concerning format and other requirements, can be accessed at: www.gradsch.psu.edu/current/thesis.html (Opens New Window).

D.M.A.--Additional Specific Requirements

The Doctor of Musical Arts requires four semesters in residence. The degree is designed to provide students with a thorough background of preparation and experience in professional-level performance and in the literature of the instrument, while becoming sufficiently knowledgeable about the discipline of music as a whole, in order to teach at the collegiate or university level. This background knowledge would include, but not be limited to, music theory, analysis, and history. Sixty credits are required beyond the Master of Music; if an exceptional student is admitted before completion of a prior Master of Music degree, the student will complete a total of 30 credits in categories equivalent to those required for the M.Mus., in addition to the 60 required for the D.M.A. A candidacy examination will follow upon two semesters completed in residence. The comprehensive examination will occur upon the completion of course work, before the final recital. The culminating experience of the D.M.A. degree is a public performance: three memorized solo recitals are required (the final recital is prepared independently), and two recitals of chamber music. Although no written thesis is required, a lecture-recital is required, with a pre-approved monograph text.

Pennsylvania Department of Education Certificate Candidates

For information, see www.ed.psu.edu/certification (Opens New Window).

PROFESSIONAL DEVELOPMENT CERTIFICATES

Postbaccalaureate candidates who want to pursue course work simply for their professional development and/or a permanent Level II certificate should apply to the Graduate School as special nondegree graduate students.

Master's Degrees

The Graduate School recognizes a difference in purpose, which is reflected in the requirements, for two types of advanced degrees: academic and professional. Of the master's degrees conferred at the University, the Master of Arts and Master of Science are academic in nature. The Master of Arts and the Master of Science degrees have similar requirements, the general major area determining which degree is conferred. Programs for both degrees are strongly oriented towards research and the creation of new knowledge.

The professional master's degree emphasizes practical application of knowledge for solving problems. The professional graduate degrees currently conferred are Master of Agriculture, Master of Applied Statistics, Master of Architectural Engineering, Master of Architecture, Master of Biotechnology, Master of Business Administration, Master of Education, Master of Engineering, Master of Environmental Pollution Control, Master of Fine Arts, Master of Finance, Master of Forest Resources, Master of Geographic Information Systems, Master of Health Administration, Master of Homeland Security, Master of Landscape Architecture, Master of Leadership Development, Master of Manufacturing Management, Master of Music, Master of Music Education, Master of Project Management, Master of Professional Studies, Master of Public Administration, and Master of Software Engineering.

For all master's degrees, a minimum of 30 graduate credits is required. At least 18 credits at the 500-level or above (with at least 6 credits of 500-level in professional master's programs) must be included in the program and a significant culminating or "capstone" experience or other mechanism to demonstrate evidence of analytical ability and synthesis of material is required.

- For *academic* degrees, this culminating experience must include the completion of either a thesis or a suitable essay or paper
- For *professional* degrees, the culminating experience may take other forms, including but not limited to an internship, an exhibition, a production, a comprehensive examination, or a capstone course. The specific form of the culminating experience is determined by the major program.

A degree is not conferred for a mere collection of credits. A well-balanced, unified, and complete program of study is required, including the preparation and acceptance of a high-quality written document (thesis, paper, or project report) or other approved culminating experience. The overall program of the student frequently will exceed the minimum requirements as specified under the Additional Specific Requirements for the degree title.

A student may meet the degree requirements by either full- or part-time enrollment and by attendance in any combination of semesters and summer sessions. The student who interrupts the continuity of registration faces the possibility of not being granted permission to return.

GRADE-POINT AVERAGE

A minimum grade-point average of 3.00 for work done at the University is required for graduation and to maintain good academic standing.

TIME LIMITATION

All requirements for a master's degree (including acceptance of a thesis, paper, or project report as may be specified), whether satisfied on the University Park campus or elsewhere, must be met within eight years of admission to degree status. Individual programs may set shorter time limits. Extensions may be granted by the Director of Graduate Enrollment Services in appropriate circumstances.

ADMISSION

In addition to the general University requirements for admission, adequate undergraduate preparation is required in the program in which the applicant expects to pursue advanced work. The specific courses and the total number of undergraduate credits required in various areas will be determined by the choice of program and can be ascertained from the descriptive statement appearing under the graduate program heading in the latter portion of this bulletin. An applicant who meets the necessary grade-point average but is deficient in course preparation may, under certain circumstances, be admitted to the Graduate School and be allowed to make up the undergraduate deficiencies. Under these circumstances the program will require more than the necessary period of residence. An applicant for admission to the M.Ed. program in most major programs is required to have had at least 18 credits in education and related psychology, and in certain major programs may be required to have had practice teaching.

Requirements concerning courses, language proficiency, minors, comprehensive examinations, and other matters are sometimes made by departments or programs in addition to (but not in conflict with) the regulations of the Graduate School. For details the student should consult the head of the major department or program.

ADVISING

After admission to a degree program, a student should confer with the head of the major department or program concerning the appointment of an adviser. The general guidance of a master's candidate is the responsibility of an adviser, who is a member of the Graduate Faculty, or of a committee appointed in a manner to be determined by the major department or program in which the student is specializing. The adviser or the committee assists the student in planning a

program of study. Although the adviser is frequently the supervisor of the thesis, this is not necessarily the case.

TRANSFER CREDIT

Subject to the limitations given, a maximum of 10 credits of high-quality graduate work done at a regionally accredited institution may be applied toward the requirements for the master's degree. However, credits earned to complete a previous master's degree may not be applied to a second master's degree program at Penn State.

The student should distinguish carefully between the transferability of credit and its applicability in a particular degree program. Approval to apply any transferred credits toward a degree program must be granted by the student's academic adviser and the Graduate School. Transferred academic work must have been completed within five years prior to the date of first degree registration at the Graduate School, must be equivalent to "B" quality (grades of B- are not transferrable) on Penn State's grading system, and must appear on an official graduate transcript. Course work to be transferred must appear on an official graduate transcript of an accredited or recognized degree-granting institution. Credits earned toward a previously**completed** postbaccalaureate professional degree program (law, medicine, etc.) are not transferrable. However, up to 10 credits can be transferred from a professional degree program if the degree has not been conferred.

All transfer credit must be substantiated by the former institution as having at least B quality whatever grading system is in place. Pass-fail grades are not transferable to an advanced degree program unless the "Pass" can be substantiated by the former institution as having at least B quality.

Forms for transfer of credit can be obtained from the Office of Graduate Enrollment Services, 114 Kern Building or the graduate program.

RESIDENCY REQUIREMENTS

Residency requirements have previously been met by a period of enrollment or the completion of a minimum number of credits that are administratively associated with a specific Penn State campus. In some cases this can allow students who never set foot on any Penn State campus to satisfy residency requirements by taking classes offered by distance means. In other cases, it can limit access to graduate education by imposing a burden on students who are location-bound or who can most effectively complete their graduate studies by combining courses offered at different Penn State locations.

For professional degree programs (M.Eng., M.Agr., M.Ed., etc.), it may not always be possible, desirable, or necessary to fulfill residency in the traditional manner. Availability of professional mentors and access to unique facilities at students'

work sites or other locales may, in some instances, confer special advantages in well-designed off-campus degree programs. Professional degree programs that are not "off-campus degree programs" (i.e., those in which less than half of the course credits consist of off-campus courses) implicitly have a substantial involvement of the students with the campus responsible for the program, thus fulfilling the majority of the functions of residency. However, professional degree programs that are offered off-campus must incorporate as many of the essential elements of residency as possible, including faculty–student and student–student interaction, access to instructional and other resources, exposure to and socialization in the field of study, and suitable academic advising.

Policies and guidelines pertaining to the offering of "off-campus" graduate degree programs are available through the dean of the Graduate School, 114 Kern Building, or at the following Web site: www.gradsch.psu.edu/policies/faculty/offcam www.gradsch.psu.edu/policies/faculty/offcampus.html (Opens New Window).

EXAMINATIONS

A candidate may be required to pass in a satisfactory manner written or oral examinations designated by the program. A candidate should consult the major department or program for special requirements.

Examinations to establish credit for work done in absentia or without formal class work may be used to remove undergraduate deficiencies, but not to earn credits toward an advanced degree. Arrangements are made by the student directly with the major department head or program chair.

M.A. and M.S.--Additional Specific Requirements

The Master of Arts and the Master of Science degrees have similar requirements, the general major area determining which degree is conferred. Programs for both degrees are strongly oriented toward research.

A minimum of 30 graduate credits is required, of which at least 20 must be earned at the established graduate campus/center of the University where the program is offered. Some graduate programs require additional credits; the exact number can be determined by consulting the specific program description in the subsequent section, Graduate Programs, Faculty, and Courses. A minor is not required of all candidates for the M.A. or M.S. degree. A department or committee in charge of a major program may require a candidate to offer work in a minor field, or the minor may be elected with the permission of the student's committee.

Any member of the Penn State faculty with at least assistant professor rank may participate in the guidance and examination of master's candidates and sign master's thesis signatory pages. Special signatories occasionally are requested and approved for master's thesis. The supervisor of the master's work must be a member of the Graduate Faculty.

A master's minor consists of no fewer than 6 credits of integrated or articulated work in one field related to, but different from, that of the major. Programs should consider that a minor at the graduate level should represent curriculum and study that reflect graduate-level concepts and scholarship, with a preponderance of courses at the 500-level, however, at a minimum, 3 credits must be at the 500-level. A minor program must be in one of the approved graduate degree programs offered at Penn State and must have the approval of the departments or committees responsible for both the major program and the minor field.

The major department or the committee in charge of the major program is the judge as to the suitability of a field for the minor and of its relevance to the major. The minor field department has the responsibility of accepting or rejecting students, advising on courses to be taken by the candidate in the field, examining the candidate in the area of studies undertaken in the field, and certifying that the minor requirements have been met.

At least 18 credits in the 500 and 600 series, combined, must be included in the program. A minimum of 12 credits in course work (400, 500, and 800 series), as contrasted with research, must be completed in the major program, with a minimum number of 800-level credits as appropriate to the degree and as approved by the graduate program to be applied to degree requirements. A thesis is required of many candidates for these degrees. Details are given in the introductory paragraphs under the major program headings in the latter part of this bulletin. If a student is required to write a thesis, at least 6 credits in thesis

research (600 or 610) must be included in the program. If no thesis is required, at least 18 credits must be in 500-level courses.

A thesis is prepared under the direction of the department or program in which the candidate's major work is taken. Under certain conditions a student may complete the thesis off campus. To do so, satisfactory arrangements must be made in advance with the adviser and the head of the major department or program.

When a complete draft of the thesis has been compiled, the student must submit it to the Thesis Office for format review. Submission for format review must be made by the announced deadline for the semester/session in which the degree will be conferred. After a successful defense and after signed approval by the advisers and/or committee members and the department head or graduate program chair, the final archival copy of the thesis (incorporating any format changes requested by the Thesis Office), must be deposited with the Thesis Office or uploaded to the eTD Web site by the announced deadline for the semester/session in which the degree will be conferred. It is also expected that the student will provide a final archival copy of the thesis to the office of the department or program head.

A Thesis Guide, which gives details concerning format and other requirements, can be accessed at: www.gradsch.psu.edu/current/thesis.html (Opens New Window).

Candidates who are not required to write a thesis must present a suitable essay or paper. Its nature and extent shall be determined by the major program. The department head or program chair shall report to the Office of Graduate Enrollment Services that the student has met the approved requirement. The department or program is responsible for ensuring that the work is finalized by the published deadline for the semester/session. The program head may require one or more copies of the essay for the program's library or files.

Some programs in the field of education offer the M.S. degree but prefer to admit students into the M.Ed. degree program. Other programs that emphasize research prefer to admit only students interested in pursuing the Ph.D. degree.

Requirements for the M.A. degree at Penn State Harrisburg differ somewhat from the above and are outlined under the major programs in American Studies, Humanities, Community Psychology and Social Change, and Applied Psychology. These programs are available only at Penn State Harrisburg.

M.F.R.--Additional Specific Requirements

The Master of Forest Resources (M.F.R.) is a professional degree designed for students who want to specialize in fields of wood products marketing or industries, forest management, silviculture, urban forestry,watershed management, or wildlife and fisheries management. This degree differs from the research-oriented Master of Science degree programs in the School of Forest Resources, because the M.F.R. emphasizes applications, analysis, and synthesis of knowledge rather than creating new information through more traditional types of research. This program is especially attractive to returning students interested in gaining state-of-the-art information rather than thesis research in their specialized field.

Students who have baccalaureate degrees in forestry, wood products, or wildlife and fisheries may complete the M.F.R. degree requirements in one year, whereas those with degrees in related fields generally require longer because of deficiencies in prerequisite undergraduate courses.

A minimum of 30 graduate credits (400- to 500-level courses) is required, of which 20 credits must be earned at an established graduate campus of the University, with at least 18 credits as formal courses (excluding paper writing, colloquia, and independent studies) related to forest resources, wood products, and wildlife and fisheries. At least 18 credits at the 500 level or above (with at least 6 credits in 500 level) must be included in the program, including 6 credits of formal courses. A paper (3 to 6 credits of FOR/W P/W F S 596) and formal oral presentation (1 credit of FOR/W P/WFS 596) are required as part of the 30 credits that demonstrate ability to apply the knowledge gained during the program to the specialized field of interest. The program must also include 3 credits of statistics at the graduate level.

M.G.I.S.--Additional Specific Requirements

The Master of Geographic Information Systems (M.G.I.S.) degree program is for adult professionals who aspire to leadership in the GIS profession but who are able to study only part-time and at a distance.

MGIS is a 35-credit program. Six to 9 credits are earned through an independent project that culminates in a formal public presentation attended by the student's academic adviser. The independent project demonstrates students' ability to apply advanced knowledge and skills in a way that makes a substantial contribution to their professional work.

Designed in consultation with an advisory board of experienced professionals in industry, government, and private practice, the MGIS curriculum nurtures not only technical competence but also the articulacy, analytical skills, and professionalism required for leadership in any organization.

Throughout the program students create and maintain personal e-portfolios that chronicle their achievements, outline long-term professional development strategies, and foster meaningful interactions among fellow students and faculty members.

M.H.A.--Additional Specific Requirements

Penn State's Department of Health Policy and Administration helps students prepare for positions in health care organizations, the nation's second-largest and fastest-growing industry. Master of Health Administration (MHA) graduates become executives in hospitals, health systems, skilled nursing facilities, insurance companies, consulting firms, home health agencies, federal regulating agencies, medical group practices, health maintenance organizations, public health agencies, mental health agencies, and clinics. The curriculum emphasizes strategic thinking, management, communication, and a broad understanding of the U.S. health care system. Areas of study include health law, epidemiology management, payment mechanisms, ethics, managed care, long-term care, health care technology, marketing, and strategic planning.

Satisfactory scores on either the Graduate Management Test (GMAT) or the Graduate Record Examinations (GRE) are required for admission. In addition, a junior/senior grade-point average of 3.00 or better, a relevant personal statement, and two letters of recommendation are necessary. Some work experience in health care is preferred, but not required.

The MHA program is designed to be completed in twenty-one months of full-time study, although it may be completed on a part-time basis. A minimum of 49 credits is required for completion of the degree. Students take 46 preselected Health Policy and Administration credits and 3 credits of electives selected in consultation with an adviser. Students are required to complete a ten-week residency in a health care practice setting. For full-time students, this is completed during the summer between the first and second years of academic study.

Penn State Harrisburg--Based on eight prescribed core courses defined as the foundation of administration in health care, the degree program is designed for part-time professional students already engaged in, or interested in, health administration careers. Three years of relevant experience is an admission requirement. If the applicant's GPA is less than 3.0, GRE or GMAT scores are required.

M.H.S.--Additional Specific Requirements

The M.H.S. is designed to provide students with broad training in issues surrounding homeland security. The target audience may include federal, state, and local public health officials, public affairs administrators, emergency management professionals, health care professionals, first responders, criminal justice and law enforcement personnel, military staff, and members of corporate security.

The Master of Homeland Security requires a minimum of 30 graduate credit hours, of which at least 18 must be in 500-level courses. Each candidate must complete a project report on a topic related to homeland security. The department head or program chair shall report, to the Office of Graduate Enrollment Services, the successful completion of the report and is responsible for ensuring that the work is finalized by the deadline for the semester in which the student intends to graduate.

M.L.A.--Additional Specific Requirements

The Master of Landscape Architecture program is structured as advanced scholarly inquiry within the professional discipline. The intent is to provide specialized expertise in a niche area of landscape architecture to individuals who already have completed a practice-oriented professional program. Prospective students must hold a degree from an accredited program (or foreign equivalent) in landscape architecture or architecture.

Penn State's MLA program offers particular opportunities for study in four expertise areas: community and urban design, through affiliation with the Hamer Center for Community Design Assistance; ecological issues with emphasis on watershed stewardship, through affiliation with the Center for Watershed Stewardship; design computing, through affiliation with the Stuckeman Center for Design Computing; and landscape history, through affiliation with the Historic Places Initiative.

Students may choose one of two curricular tracks in the MLA: a practicum-oriented option in one of the four centers, or pursuit of a unique independent study in conjunction with a center topic or faculty research. In both tracks, students pursue individual inquiry intended to contribute to advancement of the profession: a paper (or papers) in the option track, and in the independent track a major project that forms the focus of the student's curriculum.

A minimum of 44 credits is required, at least 34 credits at University Park campus: 19 credits are studio/research, 4 are in seminar, 21 are supporting electives. The majority of the course work must be at the 500 level.

M.L.D.--Additional Specific Requirements

The Master of Leadership Development is a 36-credit interdisciplinary professional graduate program that blends the social and behavioral sciences with ethical studies to develop outstanding organizational and community leaders. A series of cornerstone, competency, and context courses are required to provide all students with a common body of knowledge. All students must complete a capstone course (LEAD 582 Social Entrepreneurship and Community Leadership) that provides students with an opportunity to enact what is learned in the course work in the context of promoting a positive change in the community. The program is geared to individuals in mid- to upper levels of management and administration who have at least five years of related professional experience.

M.M.M.--Additional Specific Requirements

Master of Manufacturing Management (M.M.M.) is a professional degree conferred jointly by the College of Engineering and the Smeal College of Business, both national leaders in education and research. The M.M.M. degree is administered by the Quality and Manufacturing Management (QMM) program. The M.M.M. degree program is an integrated nine-month academic program (32 credits) with an enrollment limit of forty-five students, combining individuals with backgrounds in business, engineering, science, and industry.

While a student may enter the M.M.M. degree program immediately after completing a baccalaureate degree in engineering, business, or science, an internship with a manufacturing company in the summer before entering the program is required for students with no industrial experience. Upon starting the academic year in the fall, students with an engineering or science background are required to take an introductory core course in business principles, while those with a business background must take an introductory core course in engineering design principles. The introduction business or engineering course, together with the ten remaining core courses are completed over a two-semester period. All core courses have been specifically designed for this program, and most integrate engineering and business concepts in the classroom.

All applicants from industry must submit scores from the Graduate Record Examinations (GRE) or the Graduate Management Admission Test (GMAT). In addition, they must have a minimum of one year of relevant industry work experience and a baccalaureate degree in physical science, engineering, business, or management from an accredited university.

Applicants who are currently enrolled as undergraduates may apply for admission to the program in their senior year. They should have a minimum cumulative grade-point average of 3.0 at the time of application. Additionally, applicants must submit either GRE or GMAT scores. All students whose native language is not English must achieve a minimum score of 600 on the Test of English as a Foreign Language (TOEFL). The TOEFL requirement is waived for international students who have successfully completed undergraduate or graduate work in a U.S. or Canadian college or university.

All students entering the program must be competent in mathematics, statistics, and computer programming.

M.Mus.--Additional Specific Requirements

The program leading to the Master of Music degree provides training for increased professional competence in performance, pedagogy, conducting, composition. It should be distinguished carefully from the research-oriented program that leads to the academic degree of Master of Arts.

Admission requirements include an audition for performance and conducting applicants and submission of a composition portfolio for composition applicants.

A minimum of 36 credits is required, of which 30 must be earned at the University Park campus. At least one-half of the required credits must be at the 500 level.

Depending on the major option, a professional project in performance, conducting, or composition is required. A master's paper and a comprehensive examination also are required in certain areas.

M.M.E.--Additional Specific Requirements

The Master of Music Education degree provides opportunity for advanced study in the art of music, pedagogy, and systematic problem solving. In addition to the traditional academic year program, a "summer only" option is available.

A minimum of 30 credits is required, of which 20 must be earned at the University Park campus. At least 18 credits at the 500 level or above (with at least 6 credits in 500 level) must be included in the program.

Admission requires 12–15 credits in music education methods at the undergraduate level, successful teaching or student teaching experience, and a video taped demonstration of teaching and musical competence. Also required are a master's paper and a comprehensive examination.

M.P.A.--Additional Specific Requirements

The Master of Public Administration (MPA) program is intended for those with career interests in public management, health and human services, government, and other public service and nonprofit organizations. The MPA program is accredited by the National Association of Schools of Public Affairs and Administration. The M.P.A. degree is offered at Penn State Harrisburg.

The M.P.A. degree requires 36 graduate credits—18 in prescribed core courses, 15 in electives, and 3 for a professional master's project. In addition, a 9-credit internship is required of students who do not have at least three years of full-time, relevant work experience, which consists of supervisory, managerial, or professional work. The internship is waived for students with this experience before they enter the program or who gain it during the program.

M.Agr.--Additional Specific Requirements

The Master of Agriculture is a professional degree with an industrial orientation. A student, according to individual objectives, may obtain intensive training encompassing a wide spectrum of subject matter area or intensive training in a specialized area. The program emphasizes the development of professional skills in the communication of technical knowledge and its application to the solution of current and future technical, economic, and social problems of individuals and groups.

The head of the department or program chair appoints a three-member committee to guide and monitor the candidate's professional development. Members of this committee must represent at least two departments. The chair of the appointed committee serves as the candidate's adviser. The candidate will inform the committee of personal aspirations and background early in the program. The committee will suggest to the student how best to achieve these goals and the standard of professional competence required for the Master of Agriculture degree.

A minimum of 30 graduate credits is required, of which 18 credits must be at the 500 level or above. A maximum of 10 credits may be earned in special problem-type courses.

Students in the Master of Agriculture degree program can major in Agricultural Economics, Agronomy, Animal Science, Forest Resources, Horticulture, Plant Pathology, Rural Sociology, Soil Science, or Wildlife and Fisheries Science.

The candidate must present an acceptable paper on a selected professional problem or a report of internship training. Up to 3 graduate credits will be given for an acceptable paper. The candidate may be required to provide one or more copies of the paper for the University.

The candidate's committee shall report, through the department head or program chair, to the Office of Graduate Enrollment Services the title of the paper and that a draft of the work has been submitted by the published draft deadline for the semester. The department or program is responsible for ensuring that the work is finalized by the published deadline for the semester.

M.P.M.--Additional Specific Requirements

The Master of Project Management is a 30-credit graduate program that emphasizes all aspects of project management theory and practice. The M.P.M. is interdisciplinary and utilizes problem-based learning as well as a combination of face-to-face and Web-based instructional methods to transcend time and space, and to support effective teaching and learning. The M.P.M. curriculum requires the completion of eight courses (24 credits) in which students are required to apply course concepts to project management situations in their employing organizations. In addition, an applied research project (6 credits) focusing on some aspect of project management is required.

M.P.S. -- Additional Specific Requirements

The Master of Professional Studies is a professional degree. Programs leading to the M.P.S. degree provide opportunities for students to increase their knowledge and competencies in specific careers (as practitioners). The M.P.S. is often considered the "terminal" degree in the field and students entering often need not have undergraduate training in the field, as the curriculum provides foundation material assuming a diversity of backgrounds.

A minimum of 30 graduate credits is required, of which at least 18 credits must be at the 500-level and above, with a minimum of 6 credits of 500-level course work. A significant culminating or "capstone" experience or other mechanism to demonstrate evidence of analytical ability and synthesis of material is required. These may typically include, but are not limited to, a paper, an internship, an exhibition, a production, a comprehensive examination, or a capstone course. The specific form of the culminating experience is determined by the major program.

The department head or program chair shall report to the Office of Graduate Enrollment Services the nature of the culminating experience and is responsible for ensuring that the work is finalized by the deadline for the semester in which the student intends to graduate.

M.S.E.--Additional Specific Requirements

The Master of Software Engineering degree is a professional degree that focuses on exploring and examining software engineering practices and solutions that address emerging industry issues, such as e-commerce and enterprise integration.

The program is designed to meet the educational needs of technical professionals who want to build upon their software engineering knowledge.

Applicants for admission should hold an undergraduate degree in an appropriate technical field. Applicants not holding a technical degree should present a minimum of three years' work experience in the software profession. All applicants must have proficiency in a high-level language and in the principles of computer architecture, or complete prerequisite courses upon admission to the program.

The degree program requires completion of 36 credits of graduate course work, including a 3-credit advanced studio leading to the development of an actual software product, participation in a research institute, or a 3-credit professional paper.

For maximum career flexibility, students may broaden their study by selecting approved courses from allied fields, such as artificial intelligence, computer science and engineering, and management information systems.

Master of Accounting (M.Acc.)

The Master of Accounting is designed to prepare students to enter careers in public accounting, corporate accounting, management accounting, governmental accounting, financial analysis, and law enforcement. The program is designed to allow students to complete the educational requirements for becoming a certified public accountant in Pennsylvania as well as most other states. A minimum of 30 graduate credits is required, with a least 18 credits earned in courses at the 500- or 800-level of which at least 6 credits must be earned in 500-level courses. A capstone course (with a final project) integrating material learned in the other program courses is required.

M.E.M. -- Additional Specific Requirements

The Master of Engineering Management is developed for students with a background in engineering or science. Applicants with a four-year undergraduate degree in engineering, mathematics, physics, computer science, or a related discipline will be considered. All students in the Master of Engineering Management program must complete a minimum of 33 credits, including 18 credits in core courses at the 500 level and completion of the capstone course.

M.Arch.--Additional Specific Requirements

The Master of Architecture degree is a postprofessional degree intended for persons already holding an accredited Bachelor of Architecture degree. (Postprofessional architecture degrees are not eligible for NAAB accreditation.) The M.Arch. is a 30-credit program that requires 24 credits of course work and 6 credits of thesis or thesis project. At least 18 credits must be at the 500 or 600 levels, and at least 24 credits must be taken in residence at University Park. The core courses consist of a total of 12 credits. The capstone of the M.Arch. degree program is a master's thesis or thesis (design) project, requiring the student to identify and formulate an area of inquiry within which to do original research and then to complete a project or a written thesis.

M.A.S.--Additional Specific Requirements

The professional Master of Applied Statistics degree requires a minimum of 30 graduate credits of which 24 must be courses from the Department of Statistics. Twenty-one credits must be at the 500 level. The program has been approved for both in residence at University Park campus and online via the World Campus.

M.B.A.--Additional Specific Requirements

Master of Business Administration degree programs are offered at the University Park campus, Penn State Great Valley, Penn State Harrisburg, and Penn State Erie.

University Park Campus--The purpose of the MBA program at the University Park campus is to develop professional managerial knowledge and skills as these are applied to decisions in complex organizations. The curriculum was developed by the graduate business faculty to blend technical rigor, managerial theory, and integrative learning experiences through case studies and other teaching methods.

A minimum of 48 graduate credits is required, with a minimum of 42 credits at the 500 level. Twenty-six credits must be in specific core courses. Also required are 22 credits in portfolio and breadth electives. Work for this degree may be started in the fall semester only. Applications for this AACSB-accredited M.B.A program must include the results of the Graduate Management Admission Test.

Penn State Harrisburg--The goals of the Harrisburg MBA program are to provide graduates with a foundation for personal and professional growth and lifelong learning; a firm grounding in the academic disciplines underlying the field of business; participative strengths; and decision making, problem solving, and critical thinking skills. Major emphasis is placed on the social, legal, and ethical context of business—particularly ethical values needed in the conduct of business. Program faculty place high value on teaching and currency of curriculum, an emphasis on oral and written communication, collaborative learning, and cross-functional integregration of concepts. The students served by the MBA program are, primarily, employees of area business, government, and not-for-profit organizations who reside within the Capital Region and study on a part-time basis. However, either full- or part-time study is possible. The M.B.A. is also offered as a concurrent MBA/Ph.D. program with the College of Medicine at the Penn State Milton S. Hershey Medical Center Department of Pharmacology, and concurrent MBA/J.D. degree program with The Dickinson School of Law.

The M.B.A. requires a minimum of 30 graduate credits, and is offered at the college's Middletown campus and in Lancaster, Pennsylvania. Eighteen of these credits are in prescribed areas of business, including accounting, finance, management, marketing, and information systems. An additional 12 credits are elective, permitting students to select courses in such areas as e-business, human resource managements, financial analysis, or general business to meet their personal and professional goals. Depending on their level of preparation, some students may need to take additional course work beyond the baccalaureate to permit them to begin their advanced business studies with a common conceptual foundation and adequate understanding of the integrated nature of the business enterprise. Applications to this AACSB-accredited program must include results of the Graduate Management Admission Test and two letters of recommendation. In addition, applicants whose first language is not English or who have not

received a prior degree from an institution in which the language of instruction was English must provide scores on the Test of English as a Foreign Language (TOEFL).

Penn State Erie--The Penn State Erie M.B.A. is a general degree emphasizing development of the planning and problem-solving skills crucial in middle and upper management. Course work emphasizes the integration of business functions and the practical application of theory in the business world, using simulated problems and actual situations students are experiencing at work. Many students are fully employed professionals who bring a wealth of knowledge and experience to the classroom. Both full- and part-time study is possible and the program can be completed by attending evening classes. The Master of Business Administration degree program consists of three parts:

1. Foundation Core Courses (18 credits): The courses introduce students to the ethical, legal, social, political, technological, and societal environment of business, accounting, economics, finance, management, marketing, operations management, and the application of quantitative methods to the analysis of business problems. The foundation core is required of all applicants who have not completed an undergraduate degree in business or previous undergraduate or graduate course work relevant to the foundation core requirements.
2. Advanced Required Courses (15 credits): These courses build on the knowledge base established in the foundation core and provide greater depth of knowledge in the subject areas included. This component of the MBA program consists of five 3-credit courses that cover advanced topics in cost management, information systems management, managing a diverse workforce, global operations and supply chain management, and strategic management and business policy.
3. Elective Courses (15 credits): All students are required to take 15 credits of elective courses covering advanced topics of their choice. Electives must include at least 3 credits of community outreach-oriented and 3 credits of internationally focused course work from the program-approved list of courses.

Penn State Great Valley--The M.B.A. at Great Valley's School of Graduate Professional Studies is designed to meet the needs of the working professional desiring to advance her or his career. The M.B.A. requires 45 credits for degree completion. Courses are categorized into four groups: core, advanced, eleective, and capstone. Students may be exempt from up to 15 credits form teh core courses based on academic preparatioin and test scores. Students entering the program are expected to meet preprogram requirements that build a foundation for effective communication skills and quantitative analysis.

In addition to the general M.B.A. program, options are available in Biotechnology and Health Industry Management, and New Ventures and Entrepreneurial Studies. Classes are offered evenings and Saturdays in seven-week sessions, and the program may be completed in as little as 18 months. M.B.A. students are admitted year-round at the beginning of each of the seven-week sessions. Applications must include the results of a Graduate Management Admissions Test. For more

information, refer to the Web at http://www.gv.psu.edu (Opens New Window).

M.Ed.--Additional Specific Requirements

The programs leading to the degree of Master of Education provide preparation for increased professional competence in education. They should be distinguished carefully from the research-oriented programs that lead to the academic degrees of Master of Arts or Master of Science. In most major programs the requirements for admission include 18 credits in education and related fields.

A minimum of 30 graduate credits is required for the degree, of which at least 20 must be earned at the campus/center where the degree program is offered; at least 24 must be in course work. This degree is also offered in certain programs at Penn State Harrisburg and Penn State Great Valley.

Major Programs in the Fields of Education--A student can major in one of the approved programs in professional education and proceed under the guidance of a graduate faculty member of the appropriate major. At least 18 credits at the 500 level or above (with at least 6 credits in 500 level) must be included in the program. Most programs of this type require at least 6 credits to be earned outside the major as providing valuable breadth for the candidate. However, this policy differs among programs. Specific information about such requirements is found under the individual program listings in this bulletin or from the program's coordinator. It is important for potential students to obtain the degree requirements of the programs in which they are interested, because many programs specify degree requirements in excess of 30 credits and the manner in which credits are to be earned: required, elective, in or out of the major.

Major Programs Outside the Fields of Education--A student who wants to earn an M.Ed. in a specific subject-matter field, such as economics, mathematics, German, or a broader area, can choose such a program as a major and take a majority of work in it under the guidance of the department offering that major. The candidate is required to earn 6 credits in education as directed by the faculty of one of the approved graduate programs in professional education.

Culminating Experience--All M.Ed. programs require a significant culminating or “capstone” experience. Each program has established the specific manner for meeting the requirement, which may take the form of a thesis, production, paper, exhibition, comprehensive examination or other similar experience serving to demonstrate comprehensive and in-depth knowledge of the field of study. The nature and extent of this work and when it is to be undertaken within the program of study shall be determined by the major program and reported to the Office of Graduate Enrollment Services of the Graduate School.

Thesis or Paper--The thesis or paper must be of considerable proportion and must be clearly and definitively indicative of the capacity to describe a serious intellectual investigation, study, critical analysis, or evaluation; to acquire, integrate, and analyze information; to draw conclusions logically; and to present

the experience adequately and professionally in writing. The requirements of the Graduate School regarding a thesis must be met. Programs may impose other requirements regarding the master's paper, including submission of more than one copy for disposition at the program level.

Exhibition or Production--The capstone experience must be of comparable rigor as that required for a thesis or master's paper. While the format of the experience will differ among programs, all such capstone experiences must result in definitive evidence of satisfaction of the above noted qualities. Some tangible written report is required, although the length and nature of this report are to be left to the department or program.

Other Capstone Experience--If the program wishes to use some other mechanism to demonstrate culminating evidence of analytical ability and synthesis of material, it may do so upon approval by the Graduate Council. The program or department must report to Graduate Enrollment Services evidence that the student has met the approved requirement.

M.Eng.--Additional Specific Requirements

The Master of Engineering degree programs provide training for advanced professional competence in several fields of engineering. This professional master's degree emphasizes practical application of knowledge for solving problems and should be should be distinguished carefully from the research-oriented programs that lead to the academic degree of Master of Science. A minimum of 30 graduate credits is required, of which 20 must be earned at the campus/center where the degree program is offered. At least 18 credits must be earned in graduate courses (500 series).

Culminating Experience--All M.Eng. Programs require a significant culminating or "capstone" experience. Each program has established the specific manner for meeting the requirement, which may take the form of a paper, writing portfolio, or other similar experience serving to demonstrate comprehensive and in-depth knowledge of the field of study. The nature and extent of this work and when it is to be undertaken within the program of study shall be determined by the major program and reported to the Office of Graduate Enrollment Services of the Graduate School.

Work for this degree is not required to be done specifically at the University Park campus. A complete program of study can be pursued at Penn State Harrisburg or Penn State Great Valley.

M.E.P.C.--Additional Specific Requirements

The Master of Environmental Pollution Control (M.E.P.C.) is an intercollege professional degree program designed to improve competence in various fields of the control, management, and prevention of environmental pollution. The degree should be distinguished from the research-oriented program that leads to the academic degree of master of science, since the M.E.P.C. emphasizes application, analysis, and synthesis of knowledge rather than creating new information through traditional research.

A minimum of 30 graduate credits is required, of which 20 must be earned at the campus where the degree program is offered. Special requirements include 1112 credits of core courses covering air pollution, water quality, solid/hazardous waste management, and policy/risk assessment. At least 18 credits at the 500 level or above (with at least 6 credits in 500 level) must be included in the program, which includes 1 credit of E P C 590 and up to 3 paper-writing (596) credits offered through the student's department of affiliation.

A scholarly master's paper must be completed by all M.E.P.C. candidates. It must be of considerable proportion and must demonstrate the ability to formulate objectives, acquire and document relevant information, critically analyze, draw logical conclusions, and relate findings to professional problems and practices.

M.F.A.--Additional Specific Requirements

The programs leading to the Master of Fine Arts degree provide professional training in art, creative writing, and theatre. The M.F.A. is one of two terminal degrees in the arts. (The other is the research-oriented Ph.D.) The M.F.A. is a 48- to 60-credit degree and usually requires two to three years to complete.

The greater number of credits in the major should be at the 500 level, but the needs of the student will be considered in arranging the best combination of courses and research for preparing the candidate in a particular field.

A professional creative project is required. This project will include a monograph (an artist's statement for the M.F.A. in studio art) in support of the creative or interpretative aspect of the program. Continuance in the program is dependent upon the student's academic and artistic progress as evaluated at the end of each semester.

University Course Descriptions

COURSE-NUMBERING SYSTEM

UNDERGRADUATE COURSES (1 to 399): General courses accepted in fulfillment of requirements for the bachelor's degrees.

ADVANCED UNDERGRADUATE COURSES (400 to 499): Courses open to graduate students and to juniors and seniors and, with the special written permission of the head of the department or the chair of the program sponsoring the course, to qualified students in earlier semesters.

GRADUATE COURSES (500 to 699; 800 to 899): Courses restricted to students registered in the Graduate School, seniors with an average of at least 3.50, and other students who have been granted permission to enroll by the dean of the Graduate School. These courses are described in the Penn State*Graduate Degree Programs Bulletin.*

MEDICAL COURSES (700-799): Courses restricted to students registered in the College of Medicine.

LAW COURSES (900-999): Courses restricted to students registered in The Dickinson School of Law.

COMMON COURSE NUMBERS

The following courses for which students may register have been set up for common use by major programs to encourage innovation and provide flexibility in designing graduate programs. For courses 594, 595, 596, 597, 598, and 599, special titles may be requested by a graduate program for a given semester, through the Senate Curriculum Coordinator, 101 Kern Building, University Park campus.

590. COLLOQUIUMContinuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.

594. RESEARCH TOPICSSupervised student activities on research projects identified on an individual or small-group basis. A specific title may be used in each instance and will be entered on the students transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.

595. INTERNSHIPSupervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required. A specific title may be used in each instance and will be entered on the students transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc. Prerequisite: prior approval of proposed assignment by instructor.

596. INDIVIDUAL STUDIESCreative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses. A specific title may be used in each instance and will be entered on the students transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.

597, 598. SPECIAL TOPICSFormal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester. A specific title may be used in each instance and will be entered on the students transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.

599. FOREIGN STUDIES (12 per semester, maximum of 4) Courses offered in foreign countries by individual or group instruction. A specific title may be used in each instance and will be entered on the students transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.

600, 610. THESIS RESEARCH—In registering for thesis research a student uses the appropriate number (600, 610) preceded by the abbreviation designating the major field. The numbers 600 (on campus) and 610 (off campus) are available for credit in thesis research in all graduate major programs. The bursar assesses charges for these courses at the current rate of tuition, according to the student’s status at the time of registration.

601, 611. THESIS PREPARATION—The numbers 601 and 611, with associated special fees, are available to Ph.D. degree candidates who have passed the comprehensive examination and met the two-semester residence requirement. They may be used for thesis preparation work during its later stages, when the academic activity of the candidate consists partly (611) or solely (601) of work on the completion of research and writing of the dissertation. (See also Course-Numbering System.)

SUBJ 601 and SUBJ 611 do not carry academic credit. They are entered on the academic transcript to indicate the registration and the nature of the candidate’s academic activity. A candidate registered for SUBJ 601 is classified as a full-time student, while one registered for SUBJ 611 is classified as a part-time student. (See also Thesis Preparation, in the General Information section of this bulletin.)
The numbers 600, 601, 610, and 611 may not appear in the Schedule of Courses for each semester.

602. SUPERVISED EXPERIENCE IN COLLEGE TEACHING—May be offered by any graduate program in a department that also offers undergraduate courses. A graduate program with no counterpart undergraduate program may offer SUBJ 602 when cooperative arrangements are made with an admin-istrative unit that does not offer graduate degrees but that uses graduate assistants in its teaching. SUBJ 602 may be offered in any semester and is subject to the following restrictions:

1. SUBJ 602 will not be counted in fulfilling any specific credit requirement for an advanced degree.
2. SUBJ 602 will be graded (A, B, C, D, F). The grade will appear on the student’s transcript.
3. SUBJ 602 will not be used in calculating grade-point averages.
4. SUBJ 602 shall be offered only in those graduate programs that want to provide opportunity for supervised and graded teaching experience. Enrollment will be restricted to students for whom the major program is prepared to provide such experience.

5. SUBJ 602 will be counted as a part of the student's credit load unless the program specifies otherwise.

SUBJ 603. FOREIGN ACADEMIC EXPERIENCE (1–12)—Foreign study and/or research approved by the graduate program for students enrolled in a foreign university constituting progress toward the degree.

Accounting (ACCTG)

ACCTG 403 **Auditing** (3) Financial compliance, internal, and operational audits; standards and procedures; sampling; EDP auditing; professional issues; application of concepts through written responses.
Effective: Spring 2008
Prerequisite: ACCTG 371 orACCTG 471

ACCTG 403W **Auditing** (3) Financial, compliance, internal, and operational audits; standards and procedures; sampling; EDP auditing; professional issues; application of concepts through written responses.
Effective: Spring 2008
Prerequisite: ACCTG 371 orACCTG 471

ACCTG 404 **Managerial Accounting: Economic Perspective** (3) Accounting techniques as planning, control, and motivating devices in business and other organizations; accounting data for decision making and performance evaluation.
Effective: Spring 2008
Prerequisite: ACCTG 211, SCM 200 orSTAT 200, ECON 002

ACCTG 405 **Principles of Taxation I** (3) Elements of tax policy and tax-planning concepts for personal and business decision making; with emphasis on taxation of individuals.
Effective: Spring 2008
Prerequisite: ACCTG 211;B A 301 orFIN 301

ACCTG 406 **Principles of Taxation II** (3) Impact of federal tax structure on business decisions, research methodology, tax planning; ethical considerations of tax practice.
Effective: Spring 2008
Prerequisite: ACCTG 405

ACCTG 410 **Federal Taxation II** (3) An examination of the rules and forms used to compute the federal tax liability of corporations and partners.
Effective: Spring 2008
Prerequisite: ACCTG 310

ACCTG 411 **Accounting Practicum: VITA** (3) Introduces students to practical aspects of tax preparation through the IRS' VITA program and completion of a tax research project.
Effective: Spring 2008
Prerequisite: ACCTG 310

ACCTG 413 **Auditing Internship** (3) Full-time auditing experience for at least 10 weeks with approved firms. Students who have passed ACCTG 414 may not schedule this course.
Effective: Spring 2008
Prerequisite: ACCTG 403 orACCTG 403W

ACCTG 422 **Accounting Systems** (3) Understanding flow and documentation of accounting information and internal controls in the context of accounting cycles.
Effective: Spring 2008
Prerequisite: ACCTG 312

ACCTG 426 **Financial Statement Analysis** (3) The exploration of conventional and advanced methods of analyzing financial statements, including the assessment of earnings quality.
Effective: Spring 2008
Prerequisite: FIN 301

ACCTG 431 **Advanced Auditing** (3) Examination of legal liability, EDP, statistical sampling, SEC reporting, internal control, and financial reporting in specialized industries.
Effective: Spring 2008
Prerequisite: ACCTG 403 orACCTG 403W

ACCTG 432 **Accounting Information Systems** (3) Systems analysis tools and techniques; internal control concepts; development of computer control procedures.
Effective: Spring 2008
Prerequisite: ACCTG 371 orACCTG 471, MIS 204

ACCTG 433 **Computer Audit and Control** (4) Management application controls for EDP systems; EDP audit techniques; evaluation of system reliability.
Effective: Spring 2008
Prerequisite: or concurrent:ACCTG 403 orACCTG 403W

ACCTG 440 **Advanced Management Accounting** (3) Management accounting topics such as decision models, quantitative techniques, variance analysis, and their use in accounting.
Effective: Spring 2008
Prerequisite: ACCTG 340

ACCTG 450 **Advanced Accounting** (3) Accounting theory and practice for business combinations, branches, international operations, partnerships, consolidated financial statements, corporate liquidations, nonprofit organizations, estates, and trusts.
Effective: Spring 2008
Prerequisite: ACCTG 472

ACCTG 461 (IL) **International Accounting** (3) Study of international accounting issues with emphasis on need, use, and interpretation of financial accounting required in global business environment.
Effective: Spring 2008
Prerequisite: ACCTG 211

ACCTG 462 **Governmental and Not-for-Profit Accounting** (3) Provides an understanding of governmental and not-for-profit accounting theory, procedures, and financial statements.
Effective: Spring 2010
Prerequisite: ACCTG 311 orACCTG 471

ACCTG 463 **Accounting Theory** (3) An analysis of the development of accounting theory and its current and future impact on accounting.
Effective: Spring 2008
Prerequisite: ACCTG 471

ACCTG 471 **Intermediate Financial Accounting I** (3) Theory and practice issues in income concepts and value measurement; GAAP; revenues, costs, assets, liabilities, and equities.
Effective: Spring 2008
Prerequisite: ACCTG 211 orACCTG 311

ACCTG 472 **Intermediate Financial Accounting II** (3) Off-balance-sheet financing; special issues in cost capitalization, liabilities, and equities; matching; funds flow statements; statement analysis; inflation accounting.
Effective: Spring 2008
Prerequisite: ACCTG 371 orACCTG 471

ACCTG 473 **Advanced Financial Accounting** (3) Reporting for multi-corporate enterprises, business combinations, quasi-reorganizations, and selected contemporary reporting problems.
Effective: Spring 2010
Prerequisite: ACCTG 472

ACCTG 481 **Financial Statement Analysis: Accounting Based Evaluation and Decision Making** (3) An accounting based evaluation and decision making approach to analyzing financial statements by studying business and firm valuation.
Effective: Spring 2008
Prerequisite: or concurrent:ACCTG 472

ACCTG 489 **Seminar in Accounting** (3) New trends and concepts in accounting; applications and impact on problem solving and decision making.
Effective: Spring 2008
Prerequisite: permission of program

ACCTG 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2003

ACCTG 494H **Research Project** (1-3 per semester/maximum of 6) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2005

ACCTG 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2008
Prerequisite: prior approval of proposed assignment by instructor

ACCTG 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1992

ACCTG 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

ACCTG 497A **Forensic Accounting** (3) Forensic Accounting.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ACCTG 497A **Forensic Accounting** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ACCTG 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest. .
Effective: Summer 2003

ACCTG 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.

Effective: Summer 2007

ACCTG 501 **Research Methods in Accounting** (3) An introduction to the methods and techniques of contemporary research in accounting.
Effective: Fall 1992
Prerequisite: ACCTG 504, ACCTG 507 a course in statistical inference

ACCTG 503 **Seminar in Auditing** (3) The attest function of independent public accountants, verification of financial statements; problems of evidence, independence, ethics, professional responsibilities.
Effective: Fall 1992
Prerequisite: ACCTG 403W

ACCTG 504 **Seminar in Managerial Accounting** (3-6) Accounting and the managerial processes of planning, control, and decision making.
Effective: Fall 1992

ACCTG 507 **Seminar in Financial Accounting** (3) Theoretical basis of financial accounting.
Effective: Fall 1992

ACCTG 508 **Contemporary Issues in Accounting** (3) Selected problems of current interest to the accounting profession.
Effective: Fall 1992

ACCTG 511 **Financial and Managerial Accounting** (3) Fundamental financial and managerial accounting concepts and issues from the viewpoint of the report user.
Effective: Fall 1992

ACCTG 512 **Financial Accounting Theory and Reporting Problems** (3) Measurement and reporting of financial information for external purposes, with particular attention to current problems in asset and income measurement.
Effective: Fall 1992
Prerequisite: ACCTG 511

ACCTG 514 **Seminar in Federal Taxation** (3) The federal tax structure, including legal, economic, and government implications; focusing on business decisions, research methodology, and tax planning.
Effective: Fall 1992

ACCTG 515 **Development of Accounting Thought** (3) Development of accounting thought from ancient civilization to the present.
Effective: Fall 1992

ACCTG 516 **Seminar in Not-For-Profit Accounting** (3) Measurement and structuring of financial information for managerial planning and control and external reporting.
Effective: Fall 1992

ACCTG 524 **Managerial Accounting** (3) Concepts and techniques of accounting for planning, control, and motivation.
Effective: Fall 1992
Prerequisite: ACCTG 511

ACCTG 550 **Taxation and Management Decisions** (2) Framework for understanding the effects of taxes on business decisions and for devising effective tax planning strategies.
Effective: Summer 2002
Prerequisite: B A 511, B A 521

ACCTG 560 **Accounting and Business Analysis** (2) Develop ability to assess the relation between accounting data in financial statements and the economic fundamentals represented.
Effective: Summer 2002
Prerequisite: B A 521

ACCTG 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1992

ACCTG 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1992

ACCTG 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 1992

ACCTG 597A **Empirical Research in Accounting** (4) Formal courses given on a topical or special interest subject which

may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ACCTG 597D **Research Methods in Accounting** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ACCTG 597E **Research in Analytical Modeling** (4) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ACCTG 597K **Advanced Empirical Research** (4) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ACCTG 599 (IL) **Foreign Study--Accounting** (1-12) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in established exchange program

ACCTG 600 **Thesis Research** (1-15) No description.
Effective: Fall 1992

ACCTG 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1992

ACCTG 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) The student assists in teaching one of the following courses: Acctg. 16, 101, 104, 201, 202, 206, or 400.
Effective: Fall 1992

ACCTG 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1992

ACCTG 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1992

ACCTG 803 **Forensic Accounting and Litigation Support** (3) Study of investigative accounting, consulting and litigation support activities undertaken in forensic accounting engagements.
Effective: Summer 2009
Prerequisite: ACCTG 403W andACCTG 472 Prerequisite or concurrent:ACCTG 881

ACCTG 806 **Taxes and Business Planning** (3) Effects of tax regimes on decision-making, tax planning and market outcomes. Also, ethics, tax research, and policy.
Effective: Summer 2009
Prerequisite: ACCTG 405

ACCTG 873 **Advanced Topics in Financial Reporting** (3) Financial disclosure and reporting for complex business enterprises and activities; current issues in financial reporting.
Effective: Summer 2009
Prerequisite: ACCTG 471 andACCTG 472

ACCTG 881 **Financial Statement Analysis** (3) Analysis of financial reports to identify business strategy, assess performance and economic standing, and value claims.
Effective: Summer 2009
Prerequisite: ACCTG 471 andACCTG 472 Prerequisiste or concurrent:B A 531

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Acoustics (ACS)

ACS 401 **General Acoustics** (3) Basic principles of acoustics; perception of sound; electroacoustic transducers and fundamentals of sound techniques. Offered for Communications Disorders and some nonscience majors.
Effective: Fall 1983
Prerequisite: 3 credits of Communication Disorders

ACS 402 **Introduction to Acoustics** (3) Basic principles of acoustics and perception of sound; fundamentals of applications: electroacoustic transducers, noise measurement and control, architectural and building acoustics, underwater sound. Offered for science and engineering majors.
Effective: Fall 1983
Prerequisite: PHYS 203

ACS 403 **Modern Electronics for Engineering Acoustic Applications** (3) A wide-ranging coverage of modern electronic technology and the application of this technical base to acoustics and acoustical problems.
Effective: Fall 1982
Prerequisite: PHYS 202

ACS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

ACS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

ACS 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1996

ACS 501 **Fundamentals of Acoustics I** (2) Vibrational concepts of acoustics: natural frequency and modes, resonances of lumped parameter systems, strings, elastic rods, beams and membranes.
Effective: Spring 1991
Prerequisite: PHYS 202, PHYS 203 ; engineering mathematics including differential equations

ACS 502 **Fundamentals of Acoustics II** (2) Acoustical wave phenomena: propagation, transmission, reflection and energy; periodic and transient waves; plane, spherical, and standing waves.
Effective: Spring 1991
Prerequisite: PHYS 202, PHYS 203 ; engineering mathematics including differential equations

ACS 505 **Experimental Techniques in Acoustics** (2) Properties of acoustical and vibrational transducers, electronic and other instrumentation used in fundamental data measurement, acquisition and analysis.
Effective: Fall 1990
Prerequisite: ACS 501, ACS 502

ACS 506 **Experimental Techniques in Ocean Acoustics** (2) Development of measurement techniques and experimental procedures for making acoustic measurements in the ocean.
Effective: Summer 1991
Prerequisite: ACS 501, ACS 502, ACS 505

ACS 510 **Fundamentals of Acoustics** (5) In-depth presentation of the fundamental principles of acoustics; designed to prepare students to take advanced courses in acoustics.
Effective: Summer 1983

ACS 511 **Underwater Sound Propagation** (3) Theoretical and empirical treatment of sound propagation in the ocean, including effects of the environment, characteristics of targets, and transducers.
Effective: Winter 1978

ACS 512 **Sonar Engineering** (3) Theoretical and empirical treatment of problems related to the use of underwater sound in target detection and ranging.
Effective: Fall 1983

ACS 513 **Digital Signal Processing** (3) Discrete linear systems, transforms, digital filter design and applications, discrete fourier transforms, spectrum analysis.
Effective: Spring 1984

ACS 514 **Electroacoustic Transducers** (3) The theory, design, and calibration of passive, linear, reciprocal electroacoustic transducers for use in both air and water media.
Effective: Fall 1986
Prerequisite: PHYS 443 orACS 510

ACS 515 **Acoustics in Fluid Media** (3) Wave propagation in stationary and moving fluids; acoustic radiation and scattering; standing waves in ducts and cavities.
Effective: Fall 1986
Prerequisite: E MCH 524A;PHYS 443 orACS 510

ACS 516 **Acoustical Data Measurement and Analysis** (3) Presents the engineering applications of recent developments in correlation and spectral analysis to acoustical measurement problems.
Effective: Fall 1983

ACS 517 **Techniques for Solving Acoustic Field Problems** (3) Transient and time-harmonic acoustic radiation and scattering problems involving various boundary conditions, solved by exact, approximate, and numerical methods.
Effective: Fall 1983
Prerequisite: E MCH 524B, ACS 515

ACS 518 **Adaptive Signal Processing** (3) Basic concepts and application of adaptive signal processing techniques; adaptive filters, beamformers; optimum space/time processors and their adaptive implementation; adaptive algorithms.
Effective: Spring 2008
Prerequisite: E E 460 orMATH 409;E E 562

ACS 519 **Sound-Structure Interaction** (3) Acoustic radiation from and effects of fluid-loading on vibrating infinite and finite plates and shells. Acoustic transmission through and reflection from elastic plates and shells, acoustic excitation of elastic plates and coupling between panels and acoustic spaces.
Effective: Summer 1991
Prerequisite: ACS 501, ACS 502, E MCH 524B ; orE MCH 525

ACS 521 (E MCH 521) **Stress Waves in Solids** (3) Recent advances in Ultrasonic Nondestructive Evaluation: waves; reflection and refraction; horizontal shear; multi-layer structures; stress; viscoelastic media; testing principles.
Effective: Spring 1998
Prerequisite: E MCH 524A, E MCH 524B

ACS 530 **Flow-Induced Noise** (3) Introduction to the basic and applied aspects of flow-induced noise created by subsonic flows of various complexities.
Effective: Summer 2004
Prerequisite: ACS 501 andACS 502

ACS 537 **Noise Control Engineering I** (3) As the first of three courses, this course provides an orientation to the program and covers fundamentals of noise control.
Effective: Spring 2003
Prerequisite: BS in engineering or related field or instructor approval

ACS 538 **Noise Control Engineering II** (3) This course applies fundamentals of noise control covered in Noise Control Engineering I to the noise generation, propagation, measurement and effects.
Effective: Spring 2003
Prerequisite: BS in engineering or related field or instructor approval

ACS 539 **Noise Control Engineering III** (3) This course covers advanced methods for the analyses of noise and vibration and treatments for control of noise and vibration.
Effective: Spring 2003
Prerequisite: BS in engineering or related field or instructor approval

ACS 573 (M E 573) **Designing Quiet Structures** (3) Course integrates structural dynamics, acoustics and optimization into unified method for designing quiet structures virtually for early product development.
Effective: Fall 2007
Prerequisite: M E 470 andACS 502

ACS 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

ACS 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2005

ACS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

ACS 596A **Analysis of Adjoint Modeling** (2) This course will study adjoint modeling usage by P. Hursky in underwater acoustics using the parabolic equation method.
Effective: Summer 2010 Ending: Summer 2010

ACS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

ACS 597A **Fundamentals of Acoustics** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ACS 597B **Introduction to Acoustics in Fluid Media** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ACS 597C **Outdoor Sound Propagation** (3) This course discusses outdoor sound propagation, where acoustics meets the great outdoors. The course will touch on a wide variety of outdoor sound, but the majority of the topics will focus on propagation near the ground.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ACS 502 orACS 597B or equivalentE MCH 524A or equivalent

ACS 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1996

ACS 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

ACS 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

ACS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

ACS 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Adult Education (ADTED)

ADTED 456 **Introduction to Family Literacy** (3) Explores comprehensive family literacy models, focusing upon families, services, outcomes, and roles and responsibilities of individuals, organizations, and communities.
Effective: Spring 2008
Prerequisite: Associate Degree or 60 undergraduate credits

ADTED 457 **Adult Literacy** (3) Surveys adult basic and literacy education programs and best practices; applies recent research on adult and family literacy.
Effective: Spring 2008
Prerequisite: Associate Degree or 60 undergraduate credits

ADTED 458 **Early Literacy Development and Parental Involvement** (3) Focuses on young children's language and literacy development, including parental and staff support, grounded in scientifically based reading research.
Effective: Spring 2008
Prerequisite: Associate degree or 60 undergraduate credits

ADTED 459 **Interactive Literacy: Parents and Children** (3) Focuses on literacy and language interactions between parents and their young children (including English language learners), implementing intentional/planned learning.
Effective: Spring 2008
Prerequisite: Associate Degree or 60 undergraduate credits

ADTED 460 **Introduction to Adult Education** (3) History, methods, agencies, program areas, and problems of adult education in the United States.
Effective: Fall 2001

ADTED 470 (CI ED 470) **Introduction to Distance Education** (3) An introduction to the history, philosophy, organizations, learning theories, and instructional procedures used in American and foreign distance education.
Effective: Summer 1996

ADTED 496 **Independent Studies** (1-18) Creative projects supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

ADTED 497 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1996

ADTED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1996

ADTED 498A **Teaching Adults Responsibly** (3) Virtues operating in particular teaching situations are examined. Also examined are opportunities and challenges enabling and constraining those virtues.
Effective: Summer 2010 Ending: Summer 2010

ADTED 498A **Teaching Adults Responsibly** (3) Virtues operating in particular teaching situations are examined. Also examined are opportunities and challenges enabling and constraining those virtues.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ADTED 501 **Foundations of Medical Education** (3) This course provides an overview of medical education, and considers how it operates as a specific form of adult education.
Effective: Summer 2010
Prerequisite: ADTED 460

ADTED 505 **The Teaching of Adults** (3) Examination of direct and indirect teaching; contracts, application of current technology, andragogy, motivation, evaluation; knowledge of research.
Effective: Summer 1996
Prerequisite: ADTED 460

ADTED 506 **Program Planning in Adult Education** (3) Intensive study of theoretical foundations, policies, evaluation models, methods, and materials in program planning in adult education.
Effective: Summer 1996
Prerequisite: ADTED 460, ADTED 505

ADTED 507 **Research and Evaluation in Adult Education** (3) Guided discussion and reading in selected research and evaluation methods and trends as applied in adult education settings.
Effective: Summer 1996
Prerequisite: ADTED 460 ; introductory statistics course; introductory research design course

ADTED 508 (CI ED 508) **Globalization and Lifelong Learning** (3) Examination of globalization discourses and their relationships, implications and impacts on lifelong learning processes and contexts.
Effective: Summer 2004

ADTED 509 (CI ED 509) **Language, Literacy, Identity, and Culture in a Global Context** (3) Examines the relationship between issues of language, identity and culture for adult learners in an increasingly global context.
Effective: Spring 2004
Prerequisite: ADTED 508

ADTED 510 **Historical and Social Issues in Adult Education** (3) Social and historical foundations of adult education in the United States and selected nations.
Effective: Summer 1996
Prerequisite: ADTED 460

ADTED 531 **Course Design and Development in Distance Education** (3) In depth study of the practices of designing courses taught by print, broadcast, and telecommunications media to adult distance learners.
Effective: Summer 1996
Prerequisite: ADTED 470, INSYS 415

ADTED 532 **Research and Evaluation in Distance Education** (3) Study of previous, current, and needed research strategies, and issues concerning evaluation in distance education.
Effective: Fall 2001

ADTED 540 **Serving Adult Learners in Higher Education** (3) Seminar on the characteristics and needs of adult students in the higher education context: motivations, persistence, faculty development, advising/ counseling.
Effective: Summer 1996
Prerequisite: ADTED 460

ADTED 541 (WMNST 541) **Women and Minorities in Adult Education** (3) Seminar on women and minority adults as learners and leaders in the various contexts of adult education.
Effective: Spring 1998
Prerequisite: ADTED 460

ADTED 542 **Perspectives on Adult Learning Theory** (3) Introduction to adult education learning theory, principles, and models of adult learning by adults alone, in groups, and in communities.
Effective: Fall 1997

ADTED 549 (HI ED 549) **Community Junior College and the Technical Institute** (2-3) Distinctive contributions to meeting the need for postsecondary education; development, functions, curriculum and instruction, government, administration, and finance.
Effective: Summer 1996

ADTED 550 **Qualitative Research in Adult Education** (3) Introduction to the theory, principles, and practice of qualitative research.
Effective: Fall 1997

ADTED 551 **Qualitative Data Analysis** (3) Students learn to analyze data qualitatively by engaging in, and continuously reflecting on the process.
Effective: Summer 2004
Prerequisite: ADTED 550 andINSYS 574

ADTED 552 **Participatory Action Research** (3) Examines origins, historical development, main characteristics, methodological assumptions and models, practice of participatory action research adult education and community development.
Effective: Summer 2004

ADTED 560 (LL ED 560) **Teaching Reading to College Students and Adults** (3) Reading literacy for adults, including college reading, Adult Basic Education (ABE), and General Educational Development (GED) programs.
Effective: Summer 1996
Prerequisite: LL ED 440 or teaching experience

ADTED 561 **Family Literacy** (3) Examines the research related to the four components of family literacy, program effectiveness, and theoretical underpinnings.
Effective: Summer 2004

ADTED 562 **Politics, Language and Pedagogy: Applying Paulo Freire today** (3) Examines the work of Paulo Freire as it applies to community action projects.
Effective: Spring 2004
Prerequisite: ADTED 508 andADTED 509

ADTED 564 (CI ED 564) **Social and Cultural Contexts of Learning and Work** (3) Examines the relationship between learning and work with special attention given to how certain forms of learning are legitimized.
Effective: Summer 2004
Prerequisite: CI ED 500, ADTED 542

ADTED 570 (CI ED 570) **Comparative and International Adult Education** (3) Critical and comparative analysis of adult education theory and practice outside North America, including international agency involvement.
Effective: Summer 1996
Prerequisite: ADTED 460

ADTED 572 (CI ED 572) **Policy Studies in Lifelong Learning** (3) Examine lifelong learning policies and the relationship between lifelong learning issues and problems, policy development, policy actors and institutional structures.
Effective: Summer 2004
Prerequisite: ADTED 508

ADTED 575 **Administration of Adult Education** (3) Organization of a program of adult education; legal status, finances, selection of teachers, learning personnel, housing; other administrative problems.
Effective: Summer 1996
Prerequisite: ADTED 506 orEDLDR 480

ADTED 580 **Adult Education Research Seminar** (1-3) A seminar dealing with specific research topics and methods in adult education. Open to advanced students in adult education.
Effective: Summer 1996
Prerequisite: ADTED 507, EDPSY 400, EDPSY 475

ADTED 588 **Professional Seminar: Research and Adult Education** (3) Review of research in adult education, current and past, with analysis of its directions, effects, methodology, quality, financing, and prospects.
Effective: Summer 1996
Prerequisite: ADTED 460, ADTED 507

ADTED 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1996

ADTED 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1997

ADTED 595 **Internship in Adult Education** (3-9) Supervised student internship in adult education agency.
Effective: Summer 1996
Prerequisite: ADTED 460

ADTED 596 **Individual Studies** (1-9) Creative projects including non-thesis research, supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

ADTED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1996

ADTED 597A (CI ED 597A) **Cross-Cultural Research Methods in Education** (3) This course will expose students to comparative and cross-cultural research methods and how this methodology can assist in conducting research will diverse ethnic/cultural groups.
Effective: Summer 2010 Ending: Summer 2010

ADTED 597B **Beyond Critical Thinking: Critical Theory, Learning and Critique** (3) Beyond Critical Thinking: Critical Theory, Learning and Critique Examination of the origin, implication, and impact of critical theory on teaching and learning processes and contexts.
Effective: Summer 2010 Ending: Summer 2010

ADTED 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1996

ADTED 600 **Thesis Research** (1-15) No description.
Effective: Summer 1996

ADTED 601 **Dissertation Research** Ph.D. Dissertation research.
Effective: Summer 2004
Prerequisite: passing score on the Ph.D. comprehensive examination

ADTED 602 **College Teaching** (1-3) Experience in teaching in the Adult Education Program.
Effective: Fall 2006
Prerequisite: Advanced standing in the Adult Education graduate program.

ADTED 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1996

ADTED 611 **Dissertation Research** Ph.D. dissertation research
Effective: Summer 2004
Prerequisite: passing score on the Ph.D. comprehensive examination

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Aerospace Engineering (AERSP)

AERSP 401A **Spacecraft Design--Preliminary** (3) Conceptual and preliminary design of a spacecraft, its constituent subsystems, and related systems, to satisfy a given set of specifications.
Effective: Spring 2007
Prerequisite: AERSP 309 . Prerequisite or concurrent:AERSP 450

AERSP 401B **Spacecraft Design--Detailed** (2) Detailed design of the constituent subsystems and related support systems for a spacecraft.
Effective: Spring 2007
Prerequisite: AERSP 301, AERSP 401A

AERSP 402A **Aircraft Design--Preliminary** (3) Conceptual and preliminary design of an aircraft, its constituent subsystems, and related systems, to satisfy a given set of specifications.
Effective: Spring 2007
Prerequisite: AERSP 306 . Prerequisite or concurrent:AERSP 413

AERSP 402B **Aircraft Design--Detailed** (2) Detailed design of the constituent subsystems and related support systems for an aircraft.
Effective: Spring 2007
Prerequisite: AERSP 301, AERSP 402A

AERSP 403 **Design of Air Transport Systems** (3) Air transportation; vehicle technology; vehicle-airport-route design interface; ATC, energy, environmental, human, and regulatory considerations in design.
Effective: Summer 1984
Prerequisite: AERSP 306

AERSP 404H **Flight Vehicle Design and Fabrication II** (3 per semester/maximum of 12) Project management, design, fabrication, aerodynamic and structural testing, and flight evaluation of an advanced composite flight vehicle.
Effective: Spring 2000
Prerequisite: AERSP 204H

AERSP 406W **Structures and Dynamics Laboratory** (2) Experiments in static deformations and stresses, vibrations, and control of aerospace structures.
Effective: Spring 2007
Prerequisite: or concurrent:ENGL 202C

AERSP 407 **Aerodynamics of V/STOL Aircraft** (3) Rotary wing aircraft; VTOL and STOL performance; propeller-wing combinations; jet flap; high lift devices.
Effective: Fall 1984
Prerequisite: AERSP 312

AERSP 410 **Aerospace Propulsion** (3) Analysis and performance characteristics of reciprocating engine, turbo-jet, turbo-prop, turbo-fan, ram-jets, and chemical rockets. Aerothermodynamics of inlets, combustors, and turbomachinery.
Effective: Fall 1983
Prerequisite: AERSP 312

AERSP 411 **Aeroelasticity** (3) Structural deformations under static and dynamic loads; static aeroelastic phenomena; unsteady two-dimensional incompressible and compressible flow; flutter.
Effective: Spring 2007
Prerequisite: AERSP 312

AERSP 412 **Turbulent Flow** (3) Homogeneous turbulence; spectral transfer of energy, viscous dissipation; turbulent shear flow: mixing-length theory, eddy viscosity, scaling laws, energy budget.
Effective: Winter 1978
Prerequisite: one course in fluid mechanics

AERSP 413 **Stability and Control of Aircraft** (3) Static and dynamic stability and control of aircraft; open and closed loop systems.
Effective: Fall 1989
Prerequisite: AERSP 304, AERSP 306

AERSP 420 **Principles of Flight Testing** (3) In-flight and analytical studies of airplane performance, stability, and control; reduction of data; instrumentation; flight test techniques.
Effective: Fall 1983
Prerequisite: AERSP 306

AERSP 423 **Introduction to Numerical Methods in Fluid Dynamics** (3) Finite difference methods applied to solving viscid/inviscid fluid dynamics problems, error control, numerical stability.
Effective: Spring 2008
Prerequisite: AERSP 312 orM E 320;MATH 250 orMATH 251;CMPSC 201 orCMPSC 202

AERSP 424 **Advanced Computer Programming** (3) Engineering and scientific programming topics: object oriented programming, parallel programming, and various modern languages (e.g. C++, Java, and Ada).
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 202;MATH 220

AERSP 425 **Theory of Flight** (3) Advanced wing and airfoil theory, conformal mapping, slender body theory.
Effective: Spring 2001
Prerequisite: AERSP 306

AERSP 430 **Space Propulsion and Power Systems** (3) Analysis and performance of chemical and nuclear rockets, electric propulsion systems. Introduction to solar, chemical, thermoelectric, and nuclear power sources.
Effective: Fall 2007
Prerequisite: AERSP 410 orM E 432

AERSP 440 **Introduction to Software Engineering for Aerospace Engineers** (3) Software engineering for safety- and mission-critical systems, including requirements, management, processes, designs, programming, validation/ verification, and other aspects of software development.
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 202

AERSP 450 **Orbit and Attitude Control of Spacecraft** (3) Principles of mechanics and vector analysis applied to basic concepts of satellite motion and control, rocket ballistics, and gyroscopic instruments.
Effective: Fall 1987
Prerequisite: AERSP 304, AERSP 309

AERSP 460 **Aerospace Control Systems** (3) Design and analysis of feedback control systems for aerospace applications; stability, root locus, time- and frequency-domain, state-space methods.
Effective: Summer 2006
Prerequisite: AERSP 304

AERSP 470 **Advanced Aerospace Structures** (3) Design and analysis of aerospace structures. Plates and sandwich panels; composite materials; structural dynamics; aeroelasticity; damage tolerance.
Effective: Spring 2008
Prerequisite: AERSP 301 . Prerequisite or concurrent:AERSP 304, E MCH 315

AERSP 473 (E MCH 473) **Composites Processing** (3) An introduction to the principles of mechanics governing manufacturing, computer-aided design, and testing of composite materials and structures.
Effective: Summer 1988
Prerequisite: E MCH 471

AERSP 490 (E E 471, NUC E 490) **Introduction to Plasmas** (3) Plasma oscillations; collisional phenomena; transport properties; orbit theory; typical electric discharge phenomena.
Effective: Spring 2008
Prerequisite: E E 330 orPHYS 467

AERSP 492 (E E 472) **Space Astronomy and Introduction to Space Science** (3) The physical nature of the objects in the solar system; the earth's atmosphere, ionosphere, radiation belts, magnetosphere, and orbital mechanics.
Effective: Spring 2008
Prerequisite: E E 330 orPHYS 400

AERSP 494 **Aerospace Undergraduate Thesis** (1-3 per semester/maximum of 6) Individual problem investigations reported in written thesis and seminar lectures. Cooperative research with faculty guidance on topics of current interest.
Effective: Fall 1992
Prerequisite: seventh-semester standing

AERSP 494H **Aerospace Undergraduate Thesis** (1-3 per semester/maximum of 6) Individual problem investigations reported in written thesis and seminar lectures. Cooperative research with faculty guidance on topics of current interest.
Effective: Fall 2007
Prerequisite: seventh-semester standing

AERSP 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1992

AERSP 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1983

AERSP 497B **Experimental Methods and Projects** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AERSP 497D **Special Topics in Aerodynamics** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AERSP 497I **Spacecraft/Environment Interactions** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AERSP 497K **Aerospace Projects Lab** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow

subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AERSP 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2006

AERSP 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2008

AERSP 504 **Aerodynamics of V/STOL Aircraft** (3) Jet wings, high lift devices, propellers and ducted propellers, circulation and boundary layer control, unsteady airfoil theory.
Effective: Fall 1983
Prerequisite: AERSP 407

AERSP 505 **Aero- and Hydroelasticity** (3) Interaction of elastic systems having several degrees of freedom with fluid flows in various configurations.
Effective: Winter 1978

AERSP 506 **Rotorcraft Dynamics** (3) Modeling and analysis techniques for dynamic response, vibration, aeroelastic stability, and aeromechanical stability of rotary-wing vehicles.
Effective: Fall 2007
Prerequisite: AERSP 504, E MCH 571

AERSP 507 **Theory and Design of Turbomachinery** (3) Theory and principles of machinery design: compressors, turbines, pumps, and rotating propulsors; opportunity to work out design examples.
Effective: Winter 1978

AERSP 508 **Foundations of Fluid Mechanics** (3) Mathematical review, fluid properties, kinematics, conservation laws, constitutive relations, similarity principles, the boundary layer, inviscid flow, vorticity dynamics, wave motion.
Effective: Spring 1972

AERSP 509 **Dynamics of Ideal Fluids** (3) Irrotational flow theory, two-dimensional and axisymmetric flows, airfoil theory, complex variables, unsteady phenomena; flow with vorticity, finite wing theory.
Effective: Winter 1978
Prerequisite: AERSP 508

AERSP 510 **Compressible Flow** (3) Classification and solution of compressible flow problems, high-speed gasdynamics, unsteady motion, transonic and hypersonic flows, atmospheric reentry.
Effective: Fall 1983

AERSP 511 **Aerodynamically Induced Noise** (3) Review of fluid mechanics. General theory of aerodynamic sound. Noise radiation from jets, boundary layers, rotors and fans. Structural response.
Effective: Winter 1978

AERSP 512 **Viscous Flow** (3) Stress-deformation relations; Newtonian fluids, Navier-Stokes equations; exact, asymptotic laminar solutions; instability, transition; similitude and turbulent boundary layer.
Effective: Winter 1978

AERSP 514 **Stability of Laminar Flows** (3) The stability of laminar motions in various geometries as influenced by boundary conditions and body forces of various kinds.
Effective: Winter 1978

AERSP 518 **Dynamics and Control of Aerospace Vehicles** (3) Dynamical problems of aircraft and missiles, including launch, trajectory, optimization, orbiting, reentry, stability and control, and automatic control.
Effective: Fall 1987
Prerequisite: AERSP 413 orAERSP 450

AERSP 524 (M E 524) **Turbulence and Applications to CFD: DNS and LES** (3) First of two courses: Scalings, decompositions, turbulence equations; scale representations, Direct and Large-Eddy Simulation modeling; pseudo-spectral methods; 3 computer projects.
Effective: Spring 2006 Ending: Fall 2010
Prerequisite: a graduate-level course in fluid mechanics

AERSP 524 (M E 524) **Turbulence and Applications to CFD: DNS and LES** (3) First of two courses: Scalings, decompositions, turbulence equations; scale representations, Direct and Large-Eddy Simulation modeling; pseudo-spectral methods; 3 computer projects.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: AERSP 508 orM E 521

AERSP 525 (M E 525) **Turbulence and Applications to CFD: RANS** (3) Second in two courses: Scalings, decomposition,

turbulence equations; Reynolds Averaged Navier Stokes (RANS) modeling; phenomenological models; 3 computer projects.

Effective: Spring 2006 Ending: Fall 2010
Prerequisite: AERSP 524

AERSP 525 (M E 525) **Turbulence and Applications to CFD: RANS** (3) Second in two courses: Scalings, decomposition, turbulence equations; Reynolds Averaged Navier Stokes (RANS) modeling; phenomenological models; 3 computer projects.

Effective: Spring 2011 Future: Spring 2011
Prerequisite: AERSP 508 orM E 521

AERSP 526 (M E 526) **Computational Methods for Shear Layers** (3) Study of numerical solution methods for steady and unsteady laminar or turbulent boundary-layer equations in two and three dimensions.
Effective: Fall 2007
Prerequisite: AERSP 423 orM E 523

AERSP 527 (M E 527) **Computational Methods in Transonic Flow** (3) Numerical solution of partial differential equations of mixed type, with emphasis on transonic flows and separating boundary layers.
Effective: Fall 2007
Prerequisite: AERSP 423 orM E 523

AERSP 528 (M E 528) **Computational Methods for Recirculating Flows** (3) Numerical solution techniques for laminar/turbulent flow with large recirculation zones. Both primitive variable and stream function-vorticity equations used.
Effective: Fall 2007
Prerequisite: M E 523

AERSP 529 **Advanced Analysis and Computation of Turbomachinery Flows** (3) Review of numerical methods; three-dimensional inviscid flow computation, two- and three-dimensional viscous flow effects and computation; recent advances.
Effective: Fall 2007
Prerequisite: AERSP 423;AERSP 507 orM E 422

AERSP 530 **Aerothermochemistry of Advanced Propulsion Systems** (3) Physics and chemistry needed to analyze high performance rocket propulsion systems including reacting high temperature radiating gas and plasma flows.
Effective: Fall 2007
Prerequisite: AERSP 312 orM E 420

AERSP 535 (M E 535) **Physics of Gases** (3) An introduction to kinetic theory, statistical mechanics, quantum mechanics, atomic and molecular structure, chemical thermodynamics, and chemical kinetics of gases.
Effective: Spring 2010

AERSP 540 (E E 571, NUC E 540) **Theory of Plasma Waves** (3) Solutions of the Boltzmann equation; waves in bounded and unbounded plasmas; radiation and scattering from plasmas.
Effective: Spring 2008
Prerequisite: E E 471

AERSP 550 **Astrodynamics** (3) Applications of classical celestial mechanics to space flight planning. Determination and construction of orbital parameters by approximation methods. Perturbation techniques.
Effective: Fall 1987
Prerequisite: AERSP 450 orE MCH 410 orPHYS 419

AERSP 560 **Finite Element Method in Fluid Mechanics and Heat Transfer** (3) Application of finite element techniques to viscous/unsteady fluid flow/heat transfer problems.
Effective: Summer 2000
Prerequisite: AERSP 312, AERSP 313

AERSP 571 (E MCH 571, M E 571) **Foundations of Structural Dynamics and Vibration** (3) Modeling approaches and analysis methods of structural dynamics and vibration.
Effective: Fall 2007
Prerequisite: AERSP 304, E MCH 470, M E 450 orM E 470

AERSP 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

AERSP 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

AERSP 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 1983

AERSP 597A **Experimental Methods** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AERSP 597C **Statistical Orbit Determination** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AERSP 597D **Special Topics in Aerodynamics** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AERSP 597F **Behavior of Advanced Structures** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AERSP 597G **Theory and Application of Global Navigation Satelite Systems** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AERSP 597I **Spacecraft/Environment Interactions** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AERSP 597K **Small Scale Turbomachinery Design** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AERSP 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Fall 2008

AERSP 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

AERSP 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

AERSP 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Provides an opportunity for supervised and graded teaching experience in aerospace engineering courses.
Effective: Fall 1983

AERSP 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 2006

AERSP 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

AERSP 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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African and African American Studies (AAA S)

AAA S 400 **African Studies Seminar** (3 per semester/maximum of 9) A study of the Organization of African Unity (OAU) leading to participation in the Model OAU Conference in Washington, D.C.
Effective: Spring 2001
Prerequisite: AAA S 110, AAA S 191

AAA S 401 **Afro-American Studies Seminar** (3) A seminar examining theoretical and methodological issues in Afro-American Studies.
Effective: Spring 2001
Prerequisite: AAA S 100, AAA S 101

AAA S 403 **South Africa Today** (3) A course examining the South African government's policy of apartheid: its history, why it exists, how it works, and the prospects for change.
Effective: Fall 2001
Prerequisite: AAA S 110

AAA S 404 (IL) **Eastern and Central African Societies** (3) Cultural and historical studies of Eastern and Central Africa employing a multidisciplinary approach.
Effective: Spring 2006
Prerequisite: AAA S 191, AAA S 192

AAA S 405 **African Studies Methodologies** (3) Multidisciplinary research techniques for studying in and about Africa.
Effective: Spring 1997

AAA S 409 (US) (SOC 409) **Racial and Ethnic Inequality in America** (3) The impact of inequality and discrimination on individual and group identity among various racial and ethnic groups.
Effective: Summer 2005
Prerequisite: SOC 001

AAA S 409U (US) (SOC 409U) **Racial and Ethnic Inequality in America** (3) The impact of inequality and discrimination on individual and group identity among various racial and ethnic groups.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: SOC 001

AAA S 410 (WMNST 410) **Spirit, Space, Survival: Contemporary Black Women** (3) How recent Black women have used spirit and space to survive.
Effective: Spring 1995
Prerequisite: AAA S 101

AAA S 412 (US;IL) (THEA 412) **African American Theatre** (3) Exploration of the development of African American theatre from its roots in Africa through the Diaspora to the present time.
Effective: Summer 2005
Prerequisite: THEA 100

AAA S 415 (US;IL) (HIST 415) **Race, Gender, and Politics in the United States and South Africa** (3) This thematic course will compare key issues, figures, and events in the historical development of the United States and South Africa.
Effective: Summer 2005
Prerequisite: AAA S 100, AAA S 102, AAA S 110, AAA S 192 orHIST 152

AAA S 416 (US;IL) (S T S 416, WMNST 416) **Race, Gender and Science** (3) The class will focus on race and gender as products of science, and how societal values shape scientific activity.
Effective: Summer 2008
Prerequisite: 6 credits in S T S WMNST or AAA S

AAA S 422 (US) (CAS 422) **Contemporary African American Communication** (3) A focused study on the continuities between African and African American culture and communication.
Effective: Summer 2005
Prerequisite: SPCOM 100

AAA S 431 (US;IL) (HIST 431) **Black Liberation and American Foreign Policy** (3) This course deals with American foreign policy and Black liberation in Africa since 1945.
Effective: Summer 2005
Prerequisite: AAA S 100, AAA S 192;PL SC 001 orPL SC 014

AAA S 432 (IL) (HIST 432) **Between Nation and Empire: The Caribbean in the 20th Century** (3) An exploration of the political evolution of the Caribbean Region over the course of the 20th Century.
Effective: Summer 2005
Prerequisite: AAA S 250

AAA S 434 (IL) (PL SC 434) **War and Development in Africa** (3) This course will examine the relationship between war and development in sub-Saharan Africa in the post colonial era.
Effective: Summer 2006
Prerequisite: PL SC 114 orPL SC 003 orAAA S 110

AAA S 440 (US;IL) (PL SC 440, I B 440) **Globalization and Its Implications** (3) This course explores the socioeconomic

implications of globalization.
Effective: Spring 2008
Prerequisite: AAA S 100 orAAA S 110 orPL SC 003 orPL SC 014 orPL SC 020 orPL SC 022

AAA S 443 (IL) (PL SC 443) **Ethnic Conflict in Africa** (3) This course explores the various causes and impacts of ethnic conflicts in the African context.
Effective: Summer 2005
Prerequisite: AAA S 100, AAA S 110, PL SC 001, PL SC 003, PL SC 007, PL SC 014, PL SC 017, PL SC 020 orAFRAS 301

AAA S 445Y (US) (LER 445Y, PL SC 445Y) **Politics of Affirmative Action** (3) Examines history, politics, and economics of the use of special programs to advance racial interests in the U.S.
Effective: Spring 2008
Prerequisite: AAA S 100 level course andPL SC 001 orPL SC 007

AAA S 454 (IL) (PL SC 454) **Government and Politics of Africa** (3) Contemporary African Politics, institutions, and ideologies; patterns of change, social forces, and nation building in selected African states.
Effective: Summer 2005
Prerequisite: 3 credits from:AAA S 110, PL SC 003, PL SC 020 orPL SC 022

AAA S 459 (IL) (PL SC 459) **Culture and World Politics** (3) Role of culture in world politics.
Effective: Summer 2006
Prerequisite: PL SC 014

AAA S 460 (US;IL) (PHIL 460) **African American Philosophy** (3) Major works by African American Philosophers, on topics of race, freedom, citizenship, nationhood, law and society.
Effective: Fall 2009
Prerequisite: AAA S 100 orPHIL 009 and 5th semester standing

AAA S 464 (IL) (PL SC 464) **Globalization, Extractive Industries, and Conflict in Africa** (3) Socioeconomic and environmental impacts of extractive industries in Africa.
Effective: Summer 2008
Prerequisite: AAA S 110 or at least one of the following:PL SC 003 orPL SC 014 orPL SC 022

AAA S 465 (US) (HIST 465) **Civil Rights and American Politics 1933-1968** (3) The civil rights struggle and its impact upon American politics.
Effective: Summer 2005
Prerequisite: AAA S 100, HIST 021, HIST 152, PL SC 001 orPL SC 002

AAA S 469 (US) (ENGL 469) **Slavery and the Literary Imagination** (3) The impact of slavery on the petitions, poetry, slave narratives, autobiographies, and novels of African Americans.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

AAA S 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

AAA S 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

AAA S 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Fall 2001
Prerequisite: prior approval of proposed assignment by instructor

AAA S 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1994

AAA S 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1994

AAA S 497A (LL ED 497B) **Children's/Young Adult Africana Literature and Literacy** (3) Students will read and respond to a selection of children's/adolescent texts from/about Africa and the Africa diaspora to gain an understanding of how authors contruct Black identities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AAA S 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

AAA S 530 **Globalization in Africa** (3) Students will examine globalization and its socioeconomic implications in Africa.
Effective: Fall 2008

AAA S 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

AAA S 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1996

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Agribusiness Management (AG BM)

AG BM 407 **Farm Planning and Financial Management** (3) Economic principles applied to the management of farms, with particular emphasis on the financial aspects of management.
Effective: Spring 2003
Prerequisite: AG BM 101, AG BM 106

AG BM 408 **Financial Decision Making for Agribusiness** (3) Develop financial management and business analysis skills, integrating previous course work and finance training; principles of financial management, planning, control.
Effective: Spring 2004
Prerequisite: AG BM 308W, B A 301

AG BM 420 **Agribusiness Markets & Prices** (3) Understand and forecast price level and volatility for commodities, differentiated products, services. Why markets work and why they may not.
Effective: Spring 2004
Prerequisite: 6 credits in Agribusiness Management Business Administration Agricultural Economics and/or Economics

AG BM 440 **Food Product Innovation Management** (3) A problem-based course designed to enhance decision-making skills in the context of industry's approach to developing new food products.
Effective: Fall 2003
Prerequisite: AG BM 302 or junior/senior standing in Food Science

AG BM 460 **Managing the Food System** (3) Firm management in the food system; coordination with suppliers and customers, including supply chain management, strategic thinking, risk management.
Effective: Spring 2003
Prerequisite: AG BM 320, AG BM 338

AG BM 495A **Internship in Agribusiness and Rural Development** (1-6) Supervised field experience in an agribusiness or rural development setting.
Effective: Spring 2003
Prerequisite: prior approval by department

AG BM 495B **Internship in International Agribusiness** (6) Supervised field experience related to student's major, minor, or option.
Effective: Spring 2003
Prerequisite: prior approval by department

AG BM 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2003

AG BM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2004

AG BM 497B **United Kingdom Study Abroad Program** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AG BM 497B **United Kingdom Study Abroad Program** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AG BM 499 (IL) **Foreign Studies - Agribusiness Management** (1-12) Study in selected countries of agricultural economic institutions and current agricultural economic problems.
Effective: Spring 2006

AG BM 499A (IL) **United Kingdom Study Abroad Program** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AG BM 499A (IL) **United Kingdom Study Abroad Program** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

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Agricultural Communications (AGCOM)

AGCOM 462W **Advanced Agricultural Writing** (3) Practice in journalistic writing strategies to report scientific and technical information in the agricultural/environmental sciences to general audiences.
Effective: Spring 2001
Prerequisite: a grade of C or better required inCOMM 260W or equivalent coursework

AGCOM 495 **Internship** (1-3) Supervised field experiences related to student's professional interest in agricultural communications; limited to minors in agricultural communications.
Effective: Summer 1993
Prerequisite: a grade of C or better required inCOMM 260W ; and prior approval of the professor-in-charge of Minor

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Agricultural Economics (AG EC)

AG EC 404 (CED 404) **Methods in Natural Resource and Environmental Economics** (3) Empirical research methodology in the areas of environmental and natural resource economics.
Effective: Fall 2009 Ending: Summer 2010
Prerequisite: AG EC 201 orECON 302, ECON 428

AG EC 429 (E RRE 429) **Natural Resource Economics** (3) Optimal management of resources; roles of markets and other institutions; resources and economic development; public policy.
Effective: Summer 2002 Ending: Summer 2010
Prerequisite: ECON 302

AG EC 430 (CEDEV 430) **Principles of Community Economic Development** (3) Concepts, strategies and techniques of local economic analysis, planning and development; case studies and decision-making exercises.
Effective: Spring 2004
Prerequisite: introductory course in economics

AG EC 431W (E RRE 431W) **Economic Analysis of Environmental and Resource Policies** (3) Economic Analysis of environmental and natural resource policies, benefit-cost analysis, non-market valuation techniques, resource damage assessment.
Effective: Spring 2003 Ending: Summer 2010
Prerequisite: ECON 302

AG EC 450 (IL) **International Development, Renewable Resources, and the Environment** (3) Theories of agricultural and economic development, with particular attention to interactions between development, renewable resources, and the environment.
Effective: Summer 2005 Ending: Summer 2010
Prerequisite: 6 credits in agricultural economics or economics

AG EC 501 (AEREC 501) **Agricultural Production Economics I** (3) Application of microeconomic theory to problems and decisions of farm households and agricultural firms.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: ECON 502

AG EC 502 (CEDEV 502, AEREC 502) **Economics of Natural Resources and Rural Development** (3) Emphasis will be placed on the application of economic concepts to problems and policies in rural areas.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: ECON 502, ECON 503

AG EC 503 (AEREC 503) **Agricultural Marketing** (3) Economic analysis of food marketing firms and institutions; identification and measurement of dimensions of market performance; public policy.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: ECON 502

AG EC 510 (AEREC 510) **Econometrics I** (3) General linear model, multicolinearity, specification error, autocorrelation, heteroskedasticity, restricted least squares, functional form, dummy variables, limited dependent variables.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: ECON 490 orSTAT 462 orSTAT 501

AG EC 511 (AEREC 511) **Econometrics II** (3) Stochastic regressors, distributed lag models, pooling cross-section and time- series data, simultaneous equation models.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: AG EC 510

AG EC 519 (AEREC 519) **Resource and Environmental Economics I** (3) Theories and methods for economic analysis of natural resource and environmental policies with applications to current issues.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: ECON 502

AG EC 525 (AEREC 525) **Research Methods in Rural Social Sciences** (3) Scientific method in planning and conducting research.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: 9 credits in social sciences

AG EC 527 (AEREC 527) **Quantitative Methods I** (3) Quantitative techniques applied to agricultural economic issues.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: ECON 502

AG EC 533 (CEDEV 533, AEREC 533) **Rural Development Research Methods and Topics** (3) Advanced theories and methods for rural economic development research.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: AG EC 502, AG EC 511, ECON 521

AG EC 534 (AEREC 534) **Agricultural Production Economics II** (3) Current problems and methods of analysis in production economics research.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: ECON 521, AG EC 527, AG EC 511

AG EC 536 (AEREC 536) **Agricultural Commodity Markets** (3) Specification, identification, and estimation of models for use in the evaluation and control of agricultural market behavior.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: AG EC 510 orAG EC 511 orECON 521

AG EC 538 (AEREC 538) **Policy for the Food and Agriculture Sector** (3) Policy formation; policies for food and agriculture, consequences for farmers, consumers, resources; farm program benefits and costs; current issues.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: AG EC 511, ECON 521, ECON 522

AG EC 541 (AEREC 541) **Resource and Environmental Economics II** (3) Key theories and analytical methods of resource and environmental economics.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: AG EC 511, AG EC 519, ECON 521

AG EC 550 (AEREC 550) **International Economic Development and Agriculture** (3) The economic development process with particular emphasis on agriculture.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: ECON 502

AG EC 589 (AEREC 589) **Seminar in Econometric Theory** (3) Theories and methods relevant to the application of statistical methods to economics.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: AG EC 510, AG EC 511

AG EC 590 (AEREC 590) **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2003 Ending: Fall 2010

AG EC 594 (AEREC 594) **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2004 Ending: Fall 2010

AG EC 595 (AEREC 595) **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 2004 Ending: Fall 2010

AG EC 596 (AEREC 596) **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2003 Ending: Fall 2010

AG EC 597 (AEREC 597) **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2003 Ending: Fall 2010

AG EC 598 (AEREC 598) **Special Topics** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 2004 Ending: Fall 2010

AG EC 599 (IL) (AEREC 599) **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005 Ending: Fall 2010

AG EC 600 (AEREC 600) **Thesis Research** (1-15) No description.
Effective: Spring 2004 Ending: Fall 2010

AG EC 601 (AEREC 601) **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 2004 Ending: Fall 2010

AG EC 602 (AEREC 602) **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching of undergraduate recitation classes with faculty instruction supervision.
Effective: Spring 2004 Ending: Fall 2010

AG EC 610 (AEREC 610) **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 2004 Ending: Fall 2010

AG EC 611 (AEREC 611) **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 2004 Ending: Fall 2010

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Agricultural Science (AG SC)

AG SC 495 **Internship** (1-10) Independent study and supervised field experience related to the student's professional interest. Intended for Agricultural Science majors.
Effective: Summer 1985
Prerequisite: fifth-semester standing in the Agricultural Science major with a G.P.A. of 2.00 or greater and prior approval of proposed plan before registration

AG SC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1985

AG SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

AG SC 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

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Agricultural Systems Management (A S M)

A S M 420 **Off-Road Power Units** (3) Cabs, traction, power allocation, and electronic systems for tractors and other off-road vehicles; requirements for production agriculture, logging, and construction.
Effective: Spring 2008
Prerequisite: or concurrent:A B E 306 orA S M 320

A S M 422 **Environmental Systems for Agricultural Buildings** (3) Planning and layout of environmental control systems for agricultural production and storage buildings; functional planning of agricultural buildings.
Effective: Summer 1994
Prerequisite: A S M 221

A S M 424 **Selection and Management of Agricultural Machinery** (3) Function and operation of field and farmstead machines; energy, quality, and loss considerations; selection and utilization; precision agriculture technology.
Effective: Spring 2008
Prerequisite: or concurrent:A B E 306 orA S M 320

A S M 425 **Physical Principles in Agricultural Processing** (3) Dimensions and units, mass and energy balances, fluid flow, heat transfer in the context of specific agricultural process applications.
Effective: Spring 2010
Prerequisite: A S M 221

A S M 426 **Management of Safety and Health Issues in Production Agriculture and Related Businesses** (3) Management of safe workplaces and workers, hazard identification, employee training, legal responsibilities, and program development for farms and related businesses.
Effective: Summer 2002
Prerequisite: A S M 326

A S M 428 **Electric Power and Instrumentation in Agriculture** (3) Basic principles and applications of electric circuits for power distribution, electric motors, automatic controls, and instrumentation used in agriculture.
Effective: Spring 2001
Prerequisite: A S M 221, A S M 310

A S M 429W **Agricultural Systems Analysis and Management** (3) Theory of systems thinking; optimization and quantitative techniques for analysis of agricultural production and processing systems.
Effective: Spring 2010
Prerequisite: A S M 422, A S M 425

A S M 490 **Agricultural Systems Management Seminar** (1) Senior seminar to prepare Agricultural Systems Management graduates for positions in business, industry, government service and to foster continuing professional growth. .
Effective: Spring 2001
Prerequisite: sixth-semester standing

A S M 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1994
Prerequisite: prior approval of proposed assignment by instructor

A S M 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1994

A S M 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1994

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Agricultural and Biological Engineering (A B E)

A B E 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2008 Ending: Summer 2010

A B E 500 **Research Methods in Agricultural and Biological Engineering** (3) Introduction to research philosophy(ies), methodologies, issues and policies; measures of research quality; research report writing; research ethics.
Effective: Spring 1997

A B E 504 **Mechanics and Properties of Particulate Materials** (3) Constitutive equations for cohesionless and cohesive particulate materials; measurement of properties; application to storage, flow, and consolidation.
Effective: Spring 1996

A B E 513 **Applied Finite Element, Finite Difference, and Boundary ELement Methods** (3) Applications of numerical methods in the areas of structures, fluid dynamics, heat and mass transfer, and machine design.
Effective: Fall 1996

A B E 517 **Surface Transport of Agricultural Pollutants** (3) Understanding and modeling the surface transport processes of agricultural pollutants; particularly erosion, sediment transport, and movement of sediment-attached constituents.
Effective: Spring 1996

A B E 559 **Biological and Agricultural Systems Simulation** (3) Continuous simulation modeling of biological and physical systems, numerical simulation techniques, validation and verification, difference measures, sensitivity analysis.
Effective: Spring 2006
Prerequisite: MATH 111 orMATH 141

A B E 562 (E MCH 562) **Boundary Element Analysis** (3) Numerical solution of boundary value problems using fundamental solutions; application to problems in potential theory, diffusion, and elastostatics.
Effective: Spring 1996
Prerequisite: A B E 513 orE MCH 461 orE MCH 560

A B E 568 **Food Safety Engineering** (3) Predictive microbiology and modeling, conventional and novel detection and enumeration methods, conventional and novel processing methods, applied to plant layout, construction materials, and equipment design for microbial food safety.
Effective: Spring 2008
Prerequisite: A B E 308

A B E 572 **Wood Engineering** (3) Advanced topics in wood engineering including LFRD, diaphragms, SIPs, non-prismatic members, creep models, post-frame and composite wood systems.
Effective: Spring 2001
Prerequisite: A B E 462 orW P 412

A B E 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1996

A B E 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1996

A B E 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1996

A B E 600 **Thesis Research** (1-15) No description.
Effective: Spring 1996

A B E 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 1996

A B E 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in development of instructional materials, organizing and conducting lectures, laboratories, and evaluating students in undergraduate Agricultural Engineering courses (1-499).
Effective: Spring 1996

A B E 610 **Thesis Research Off Campus** (1-15) No description.

Effective: Spring 1996

A B E 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 1996

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Agricultural and Extension Education (AEE)

AEE 400 **Educational Programs in Agriculture for Developing Countries** (3) Development and implementation of educational programs in agriculture in developing countries.
Effective: Summer 1999
Prerequisite: INTAG 100 orINTAG 481

AEE 412 **Methods of Teaching Agriculture and Environmental Science** (4) Instructional strategies and media; directing individual and group learning activities; assessing student performance and quality of instruction in vocational agriculture.
Effective: Fall 2001

AEE 413 **Program Planning and Instructional Development** (3-4) A course in planning, developing, and organizing school-based curriculum, summer programs, advisory councils, and facilities for environmental/ agricultural education.
Effective: Fall 2001

AEE 418 **Effective Laboratory Development for Agricultural and Environmental Science** (1-4) Current problems and practices; issues and policies; relationships involving other educational services and agencies.
Effective: Spring 2000

AEE 424 **Workforce Guidance in Agricultural Industry** (1-4) Opportunities and developments in agricultural industry, on-farm agricultural work, professional agricultural positions, and off-farm, nonprofessional agricultural occupations.
Effective: Spring 2000

AEE 426 **Adult Education in Agriculture and Natural Resources** (1-4) Organization, conduct, and appraisal of instruction in agriculture to include farming and off-farm agricultural occupations.
Effective: Summer 1999
Prerequisite: AEE 311

AEE 430 (RPTM 430) **Environmental Education Methods and Materials** (3) Methods and materials for developing, implementing, and evaluating environmental education programs within formal and non-formal educational settings.
Effective: Spring 2005
Prerequisite: AEE 100 orRPTM 325

AEE 434 **Agricultural and Environmental Development** (1-6) Intensive professional and technical treatment of various subject-matter fields to aid teachers in maintaining competence.
Effective: Summer 1999
Prerequisite: senior-year standing or experience as a teacher or extension agent

AEE 437 (AN SC 437) **Equine Facilitated Therapy** (3) Equine Facilitated Therapy uses equine-related activities to contribute positively to the wellbeing of people with disabilities.
Effective: Spring 2002

AEE 440 **Communication Methods and Media** (3) Mass media techniques for reporting and promoting extension and related programs, including message preparation, presentation, and strategy development.
Effective: Spring 2001
Prerequisite: 3 credits in communication

AEE 450 **Program Design and Delivery** (3) Principles, methods, and practices of extension education in agriculture, community resource development, family living, environmental affairs, 4-H, and youth programs.
Effective: Spring 2004
Prerequisite: 6 credits in social or behavioral sciences

AEE 460 **Foundations in Leadership Development** (3) This course explores historical and contemporary leadership theories, models and perspectives within social, cross-cultural, and political contexts.
Effective: Spring 2001
Prerequisite: AEE 360

AEE 465 **Leadership Practices: Power, Influences, and Impact** (3) Explores the leader role as it relates to issues of purpose, social responsibility, political influences, and legal constraints.
Effective: Spring 2000

AEE 490 **Colloquium** (1-3) Seminars consisting of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1999

AEE 495 **Internship in Agricultural and Extension Education** (1-15) Participation in the total program of instruction in agriculture in a selected high school.
Effective: Summer 1999
Prerequisite: AEE 412, AEE 413

AEE 495A **Student Teaching in AG** (1-12) Participation in the total program of instruction in agriculture in a selected high

school.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: AEE 412, AEE 413

AEE 495C **Student Teaching in Environmental Science** (1-12) Participation in the total program of instruction in agriculture in a selected high school.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: AEE 412, AEE 413

AEE 495D **Internship - Leadership** (3) Participation in the total program of instruction in agriculture in a selected high school.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: AEE 412, AEE 413

AEE 495D **Internship in Agricultural and Extension Education** (1-15) Participation in the total program of instruction in agriculture in a selected high school.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: AEE 412, AEE 413

AEE 495D **Internship - Leadership** (1-15) Participation in the total program of instruction in agriculture in a selected high school.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: AEE 412, AEE 413

AEE 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1999

AEE 496A **Introduction to Research Methods - McNair Scholars** (3) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AEE 496B **McNair Scholar Reserach** (3) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AEE 497 **Special Topics** (1-9) Formal courses given on topical or special interest subjects which may be offered infrequently.
Effective: Fall 1999

AEE 497A **An International Experience in Extension Education, Guanajuato Mexico** (1) Formal courses given on topical or special interest subjects which may be offered infrequently.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AEE 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1999

AEE 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

AEE 501 **Foundations of Agricultural and Extension Education** (3) Historical development, social and philosophical foundations, and current status in relation to the total vocational-technical education program.
Effective: Spring 2000

AEE 502 **Teaching Agriculture** (3) Vocational education objectives, learning theory, class instruction, cooperative occupational experience, and evaluation.
Effective: Spring 2000

AEE 505 (CEDEV 505) **Leadership Development** (3) Exploration, understanding, and application of leadership roles, strategies, and principles in group and community settings.
Effective: Spring 2010

AEE 508 **Administration and Supervision of Agricultural and Extension Education** (3) Basics of vocational funding, supervision, leadership, and management for agricultural education.
Effective: Spring 2004

AEE 509 **Contemporary Research in Agricultural and Extension Education** (1-6) Analysis of contemporary research issues in agricultural education and extension education through lecture, review of literature, discussion, speakers, and active participation.

Effective: Spring 2004

AEE 511 **Youth Leadership Development in the Agricultural and Life Sciences** (3) This course will address youth leadership development theories and emphasize formal and nonformal youth programs in agricultural and life sciences.
Effective: Summer 2006

AEE 515 (R SOC 515) **Engagement Through Outreach Scholarship in Higher Education** (3) To develop an understanding of outreach scholarship as a nonformal educational system and its relationship to relevant social systems.
Effective: Summer 2002
Prerequisite: 9 credits in education communication and/or social sciences

AEE 520 **Scientific Method in the Study of Agricultural and Extension Education** (1-4) Methods of procedure in investigation and experimentation in education, accompanied by a critical examination of studies made in agricultural education.
Effective: Spring 2000

AEE 521 **Basic Applied Data Analysis in Agricultural and Extension Education** (1-4) Continuation of AEE 520; emphasis upon statistical techniques for students' individual problems.
Effective: Spring 2000

AEE 524 **Change in Education** (1-3) Analysis of occupational needs of students and employment prospects; organization of courses of study and other activities of teachers.
Effective: Spring 2000

AEE 530 **Teaching and Learning in Agricultural Science** (3-4) Organization, planning and delivery of effective college teaching methods, matching/learning styles, evaluation of instruction and learning.
Effective: Spring 2000

AEE 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 2000

AEE 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 2007
Prerequisite: prior approval of proposed assignment by instructor

AEE 596 **Individual Studies** (1-9) Creative projects including non-thesis research, supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1999

AEE 596A **Agriculture in the Classroom** (1-3) Development of instructional materials and participaton workshops designed to integrate agricultural science concepts into local school curricula.
Effective: Summer 2010 Ending: Summer 2010

AEE 596A **Developing Youth Leadership/FFA** (3) An understanding of how adolescents develop and emerge as leaders in their families, schools, organizations, and communities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AEE 596D **Qualitative Methods and Analysis** (3) Introduction to basics of qualitative information analysis using the NVivo 8 program.
Effective: Summer 2010 Ending: Summer 2010

AEE 596D **Applied Multivariate SPSS Techniques** (3) Survey of common SPSS multivariate data analysis techniques used in social science research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: approval of program

AEE 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 1999

AEE 597A **Foundations of Leadership Development** (3) An applied overview of organizational and community leadership models.
Effective: Summer 2010 Ending: Summer 2010

AEE 597B **Strenthening Agricultural Education in Developing Countries** (3) Students will investigate international agricultural systems of education.

Effective: Summer 2010 Ending: Summer 2010

AEE 597B **Multivariate Date Analysis Seminar** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AEE 597B **Multivariate Data Analysis Seminar** (3) Survey of common multivariate data anlysis techniques used in social science research. .
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AEE 597C **Agriculture in the Classroom** (1-3) Development of instructional materials and participation in workshops designed to integrate agricultural science concepts into local school curricula.
Effective: Summer 2010 Ending: Summer 2010

AEE 597D **SPSS 18.0 Analysis for Multivariate Statistics** (3) Utilization of SPSS 18.0 to analyze quantitative data.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: basic data analysis course or permission of program

AEE 597D **SPSS 17.0 Applications in AEE** (1-3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AEE 597E **Curriculum Development - PAAE Conference** (1) Teachers will develop lesson plans for secondary ag education based on workshop sessions at the 2010 PAAE Conference.
Effective: Summer 2010 Ending: Summer 2010

AEE 597F **Today's Food and Fiber Industry** (3) This course will be structured around visitations of farms and food and fiber business. At each stop, participants will experience how these businesses and farms produce, process, and market food and fiber. During the tours, the food chain, safety, quality, and potential occupations of each commodity wil be highlighted. The time between stops will be used to review and discuss the business just visited, summarize the commodity, and discuss possible activities for education settings.
Effective: Summer 2010 Ending: Summer 2010

AEE 597G **Program Design and Delivery** (3) Development of instructional materials and participation in workshops designed to integrate agricultural science concepts into local school curricula.
Effective: Summer 2010 Ending: Summer 2010

AEE 600 **Thesis Research** (1-15) No description.
Effective: Fall 1999

AEE 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1999

AEE 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Involves experience in teaching undergraduate agricultural education courses under the supervision of the faculty.
Effective: Fall 1999

AEE 610 **Thesis Research Off-Campus** (1-15) No description.
Effective: Fall 1999

AEE 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1999

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Agriculture (AG)

AG 400 **Biometry/Statistics in the Life Sciences** (4) Application of statistical techniques to experimental and survey research in the life sciences.
Effective: Fall 1986
Prerequisite: 6 credits in the natural sciences

AG 451 (FOR 451) **Artificial Intelligence and Expert Systems for Agriculture and Natural Resource Management** (3) Application of artificial intelligence in agriculture and natural resources, with emphasis on expert systems.
Effective: Spring 1992
Prerequisite: one course in computer science or computer applications

AG 494 **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1994

AG 494H **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

AG 495 **Internship** (1-18) Independent study and supervised field experience related to the student's major. Written and oral critique of activity required.
Effective: Spring 1993
Prerequisite: approval of proposed assignment by instructor prior to advance registration deadline in semester preceding that semester in which the assignment is to be carried out

AG 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1991

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Agroecology (AGECO)

AGECO 418 (SOILS 418, AN SC 418) **Nutrient Management in Agricultural Systems** (3) Comprehensive review of nutrient flow in animal agricultural systems, environmental regulations, and environmental stewardship practices.
Effective: Summer 2003

AGECO 438 (AGRO 438) **Principles of Weed Management** (4) Weedy plant taxonomy, biology and ecology of weedy plant populations, and integration of biological, chemical, cultural and biological controls.
Effective: Fall 2009
Prerequisite: 6 credits in plant sciences

AGECO 457 (CI ED 457) **Principles of Integrated Pest Management** (3) Integrated study of pest complexes and their management, emphasizing ecological principles drawing on examples from a range of agricultural, forestry and urban systems. This course is designed for sixth, seventh, and eighth semester students and graduate students.
Effective: Spring 2010
Prerequisite: Must take two or more of the following:ENT 313 and/orPPATH 405 and/orPPATH 318 and/orHORT 238

AGECO 461 **Emerging Issues in Agroecosystem Management** (3) A discussion-based capstone course that elucidates the interdisciplinary issues facing agriculture today.
Effective: Fall 2009
Prerequisite: SOILS 101

AGECO 490 **Agroecology Colloquium** (3) Students will be discussing topics related to the major and develop presentations in consultation with the course instructor.
Effective: Spring 2006
Prerequisite: 3 credits in agroecosystems science

AGECO 495 **Agroecology Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2005

AGECO 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2006

AGECO 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2004

AGECO 499 (IL) **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Agroecosystems Science (AGESS)

AGESS 460 **Integrated Pest Management Systems Design** (3) This course will provide students with the principles and concepts necessary to develop the components of Integrated Pest Management systems.
Effective: Fall 2009
Prerequisite: AGECO 201, AGRO 438, ENT 313, ENT 316, PPATH 405

AGESS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1999

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Agronomy (AGRO)

AGRO 410W **Crop Science** (4) Study of the relation of crop plants to their environment, crop ecology, and the physiology of crop growth.
Effective: Spring 1996
Prerequisite: AGRO 028, BIOL 102

AGRO 423 **Forage Crop Management** (3) Application of agronomic, ecological, and physiological principles to the production and management of pasture and forage crops.
Effective: Winter 1978
Prerequisite: AGRO 028

AGRO 425 **Field Crop Management** (3) Application of agronomic, ecological, and physiological principles to management systems for the efficient production of the major field crops.
Effective: Winter 1978
Prerequisite: AGRO 028

AGRO 438 (AGECO 438) **Principles of Weed Management** (4) Weedy plant taxonomy, biology and ecology of weedy plant populations, and integration of biological, chemical, cultural and biological controls.
Effective: Fall 2009
Prerequisite: 6 credits in plant sciences

AGRO 438B **Weed Identification** (1) Identification of 150 weeds common to the Northeastern United States.
Effective: Summer 1999
Prerequisite: 6 credits in plant sciences

AGRO 460 (BIOTC 460) **Advances and Applications of Plant Biotechnology** (3) This course provides a comprehensive overview and current status of plant biotech research. The course provides knowledge of plant systems that fall in the category of GMOs.
Effective: Spring 2009
Prerequisite: BIOL 230W orB M B 251

AGRO 489 **Supervised Experience in College Teaching** (1-3) Participate with instructors in teaching an undergraduate agronomy course; assist with teaching, evaluation, and development of instructional materials.
Effective: Summer 1996
Prerequisite: AGRO 028 approval of instructor

AGRO 490 (SOILS 490) **Colloquium** (1) Continuing written and oral presentations developed by students in consultation with the course instructor.
Effective: Fall 1993
Prerequisite: seventh-semester standing

AGRO 495 **Internship** (1-5) Supervised field experience related to the student's major.
Effective: Fall 1981
Prerequisite: approval of proposed assignment by instructor prior to registration.

AGRO 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

AGRO 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

AGRO 501 **Graduate Student Dialogue** (1) Orientation discussion group for incoming graduate students. Review departmental policies and learn about the diverse faculty programs in the department.
Effective: Summer 2009

AGRO 510 **Ecology of Agricultural Systems** (3) Examination of ecological concepts and research on agroecosystem processes and dynamics via discussion and analysis of review and research papers.
Effective: Summer 2006
Prerequisite: BIOL 546 orHORT 445 or the equivalent (Classic Ecology Population Ecology or Plant Ecology)

AGRO 517 **Crop Ecology and Physiology** (3) Ecological and physiological factors affecting the productivity of crop plants.
Effective: Spring 1996
Prerequisite: AGRO 410W

AGRO 518 **Responses of Crop Plants to Environmental Stress** (3) Physiological and ecological aspects of the response of crop plants to environmental stresses in establishment, persistence, and reproduction.
Effective: Spring 1996
Prerequisite: AGRO 410W

AGRO 555 **Effective Scientific Communications** (3) Instruction and practice in verbal communication of scientific information to technical and non-technical audiences through realistic exercises with invited audiences.

Effective: Spring 2001 Ending: Fall 2010

AGRO 555 **Effective Scientific Communications** (2) Instruction and practice in verbal communication of scientific information to technical and non-technical audiences through realistic exercises with invited audiences.
Effective: Spring 2011 Future: Spring 2011

AGRO 590 (SOILS 590) **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1993

AGRO 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are surpervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

AGRO 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

AGRO 597A **Effective Scientific Communication** (2) Instruction and practice in verbal and written communication of scientific information to technical and non-technical audiences.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AGRO 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

AGRO 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

AGRO 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised training in teaching methodology for classroom and laboratory type instruction. Supervision provided by faculty member responsible for course.
Effective: Fall 1983

AGRO 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

AGRO 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

AGRO 851 **Applied Plant Population Biology** (3) Lectures and exercises designed to develop student competency in plant selection to promote ecological diversity and genetically superior plants.
Effective: Summer 2010

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Air Force (AIR)

GENERAL MILITARY COURSE

AIR 451 **National Security Affairs/Preparation for Active Duty I** (3) This course examines the national security process, regional studies, advanced leadership ethics, and Air Force doctrine.
Effective: Spring 2000

AIR 452 **National Security Affairs/Preparation for Active Duty II** (3) Topics focus on preparation for military service after commissioning and current issues affecting the Air Force way of life.
Effective: Spring 2000

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American Studies (AM ST)

AM ST 400 **Early America to 1765** (3) American society and culture in the colonial period.
Effective: Fall 2007
Prerequisite: 6 credits in American Studies or History

AM ST 401 **Revolution and Early Republic, 1765-1815** (3) American society and culture during the period of the Revolution and the Early Republic.
Effective: Fall 2007
Prerequisite: 6 credits of American Studies or History or 5th semester standing

AM ST 402 **Antebellum and Civil War Era, 1815-1876** (3) Social and cultural conditions, sectional rivalry, political crises, warfare, and Reconstruction from 1815 to 1876.
Effective: Fall 2007
Prerequisite: 6 credits in American Studies or History

AM ST 404 **Industrial America** (3) An analysis of American politics, literature, society, and economics from the 1870s to World War II.
Effective: Fall 2007
Prerequisite: 6 credits of American Studies or History

AM ST 405 **Cold War** (3) Examination of social and cultural currents in American life from World War II to 1990.
Effective: Fall 2007
Prerequisite: 6 credits of American Studies or History

AM ST 406 **Contemporary America** (3) A study of the historic and cultural currents of life in the United States during the recent past.
Effective: Fall 2007
Prerequisite: HIST 021 or 6 credits of American Studies

AM ST 410 (INART 410) **Early Pennsylvania Decorative Arts and Furniture** (3) The study of Pennsylvania and related furniture, pottery, paintings, and decorative arts of the seventeenth, eighteenth, and early nineteenth centuries.
Effective: Spring 2008

AM ST 412 **American Eras** (3) Examination in depth of various and distinctive American time periods; subtitle expresses specific content. (May be repeated for credit.)
Effective: Fall 2007
Prerequisite: 6 credits of American Studies or History

AM ST 415 (INART 415) **Nineteenth Century Pennsylvania Architecture and Restoration** (3) Interior and exterior design of early Pennsylvania architecture; understanding and evaluation of and experience in restoration.
Effective: Spring 2008
Prerequisite: AM ST 410

AM ST 417 **American Beliefs and Myths** (3) A study of symbols, beliefs, and myths in the American experience; subtitles express specific content. (May be repeated for credit.)
Effective: Fall 2007
Prerequisite: 6 credits of American Studies

AM ST 421 (PHIL 401) **American Philosophy** (3) Survey of key figures and movements in American thought, including the Transcendentalists, the Pragmatists, and contemporary developments.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy or 6 credits of philosophy at the 200-level or 5th semester standing

AM ST 422 (RL ST 422) **Religion and American Culture** (3 per semester, maximum of 6) Selected topics, problems, or historical movements in American religion; relation between religion and American culture.
Effective: Summer 1996

AM ST 430 (US) (WOMST 430) **Women in American Society** (3) A historical study of women's roles and experiences in the United States.
Effective: Fall 2007
Prerequisite: 6 credits of American Studies Sociology or Women's Studies

AM ST 431 **National Character** (3) An examination of the characteristics of the American people and other national groups.
Effective: Fall 2007
Prerequisite: AM ST 301 or 6 credits in American Studies

AM ST 432 **Ethnicity and the American Experience** (3) Theoretical and conceptual framework of ethnic studies: examination of specific issues related to major American ethnic and racial groups.
Effective: Fall 2007

AM ST 435 **Americans at Work** (3) A study of occupational and organizational cultures in America.
Effective: Fall 2007

Prerequisite: 6 credits in American Studies or Labor and Industrial Relations or Sociology

AM ST 439 **American Regional Cultures** (3-6) An interdisciplinary study of the culture of a region of the United States, such as the south or the west.
Effective: Fall 2007
Prerequisite: seventh-semester standing

AM ST 441 (US) (KINES 441) **History of Sport in American Society** (3) Background, establishment, and growth of sport in America from colonial times to the present.
Effective: Fall 2007
Prerequisite: KINES 141 or 3 credits of United States history

AM ST 448 (ANTH 448) **Ethnography of the United States** (3) Ethnographic descriptions of various dimensions of life in the United States.
Effective: Fall 2007
Prerequisite: ANTH 045

AM ST 460 **American Art and Architecture of the Seventeenth and Eighteenth Centuries** (3) Survey of American painting, sculpture, decorative arts, and architecture of seventeenth and eighteenth centuries with special emphasis on non-British cultures.
Effective: Fall 2007

AM ST 461 **American Art and Architecture of the Nineteenth Century** (3) A survey of American painting, sculpture, decorative arts, and architecture of the nineteenth century.
Effective: Fall 2007

AM ST 462 **American Art and Architecture of the 20th Century** (3) A survey of American painting, sculpture, decorative arts, and architecture of the twentieth century.
Effective: Fall 2007

AM ST 472 (ENGL 434) **Topics in American Literature** (3) Focused study of a particular genre, theme, or problem in American literature. (May be repeated for credit.)
Effective: Fall 2007
Prerequisite: 6 credits of ENGL ENLSH or LIT

AM ST 475 (US) (ENGL 431) **Black American Writers** (3 per semester, maximum of 6) A particular genre or historical period in the development of Black American literature.
Effective: Fall 2007
Prerequisite: ENGL 015 orENGL 030

AM ST 476 (ENGL 492, WMNST 491) **American Women Writers** (3) A study of selected American women writers.
Effective: Spring 2008
Prerequisite: 6 credits of ENGL

AM ST 479 **American Expressive Forms** (3) Examination in depth of various and distinctive American expressive forms; subtitle expresses specific content. (May be repeated for credit.)
Effective: Fall 2007
Prerequisite: 6 credits in American Studies

AM ST 480 **Museum Studies** (3) An introduction to the basic purposes, philosophies, and functions of a museum, with emphasis on the problems of museum administration. (May be repeated for credit.)
Effective: Fall 2007
Prerequisite: 6 credits in American Studies

AM ST 481 **Historic Preservation** (3) A study of preservation practices and programs in America.
Effective: Fall 2007
Prerequisite: 6 credits in American Studies

AM ST 482 **Public Heritage** (3) A study of public heritage practices and programs in America. (May be repeated for credit.)
Effective: Fall 2007
Prerequisite: 6 credits in American Studies

AM ST 483 **Oral History** (3) A study of oral history techniques and issues in America.
Effective: Fall 2007
Prerequisite: 6 credits in American Studies

AM ST 484 **Archives and Records Management** (3) A study of archives and records management in America.
Effective: Fall 2007
Prerequisite: 6 credits in American Studies

AM ST 491W **American Themes, American Eras** (3-6) Interdisciplinary American culture course on major themes and eras such as the American Revolutionary Era or the 1930s.
Effective: Fall 2007
Prerequisite: seventh-semester standing

AM ST 493 (ENGL 493) **The Folktale in American Literature** (3) A survey of the literary uses of the folktale and legendary materials, with particular concentration on the literature of America.
Effective: Spring 1986

Prerequisite: ENGL 015 orENGL 030

AM ST 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

AM ST 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

AM ST 495 **Internship** (1-6) Supervised internship for undergraduate or graduate American Studies majors at a museum or another cultural, historical, or arts agency.
Effective: Fall 2007
Prerequisite: senior-level status for undergraduate students; 18 credits of course work in major for graduate students; approval of program required

AM ST 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

AM ST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

AM ST 497A **Community Based Learning: Writing Local Jewish History** (3) Students in this course will participate in community-based learning (CBL) in Berks County, PA and will also conduct and report research about CBL.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AM ST 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

AM ST 500 **Theory and Methods** (3) Introduction to graduate work in American Studies through exploration of the approaches, materials, and interpretations of the field.
Effective: Fall 2007

AM ST 502 **Problems in American Studies** (3-6) A variable-content course, addressed each term to a specific problem, topic, or period in American culture.
Effective: Summer 1970

AM ST 510 **U.S. Literature and Culture** (3) Studies exploring the relationship between literature and culture in American Studies.
Effective: Summer 2007

AM ST 511 **Pivotal Books** (3-9) Exploration of a number of books which have been particularly influential in shaping thinking about American civilization.
Effective: Fall 2007

AM ST 520 **Topics in Popular Culture** (3) A detailed exploration of aspects of American popular culture, including popular culture's relationship to society and scholarship.
Effective: Summer 2007

AM ST 530 **Topics in American Folklore** (3) A detailed exploration of aspects of folklore and folklife in America.
Effective: Fall 2007

AM ST 531 **Material Culture and Folklife** (3) Investigation of American material culture and folklife, including topics such as traditional design, cultural landscape, architecture, art, craft and food.
Effective: Summer 2007

AM ST 533 **American Civilization in the Eighteenth Century** (3-9) Detailed investigation of specific topics in eighteenth-century American civilization.
Effective: Fall 2007

AM ST 534 **American Civilization in the Nineteenth Century** (3-9) Representative interdisciplinary investigation of social, historical, economic, and aesthetic forces predominant in nineteenth-century America.
Effective: Fall 2007

AM ST 535 **American Civilization in the Twentieth Century** (3-9) Detailed investigation of specific periods or topics in twentieth-century American civilization.
Effective: Fall 2007

AM ST 536 **American Civilization in the Twenty-first Century** (3) Detailed investigation of specific topics in twenty-first century American civilization.
Effective: Summer 2007

AM ST 540 **Ethnography and Society** (3) An advanced course on ethnographic theories, methods, and case studies, emphasizing current controversies and new strategies in field work.
Effective: Summer 2007

AM ST 550 **Seminar in Public Heritage** (3) A study of the ways Americans use and understand heritage in public settings.
Effective: Summer 2007
Prerequisite: AMSTD 482

AM ST 551 **Seminar in Local and Regional Studies** (3) Detailed investigation of local and regional historical themes and topics, emphasizing research methods.
Effective: Summer 2007

AM ST 560 **Seminar in Race and Ethnicity** (3) Studies exploring issues of race and ethnicity in America that can be addressed with theories and methods of American Studies.
Effective: Summer 2007

AM ST 561 **Seminar in Gender and Culture** (3) Thematic study of gender issues in American history and culture.
Effective: Summer 2007

AM ST 570 **Topics in American Art** (1-6) Various themes within the American arts will be explored under this rubric.
Effective: Fall 2007

AM ST 575 **Museum Internship** (3) A supervised museum internship experience featuring a "hands on" introduction into aspects of the curatorial profession.
Effective: Fall 2007

AM ST 579 **Readings in American Studies** (3-9) Directed readings in selected areas of American Studies.
Effective: Fall 2008
Prerequisite: AM ST 500

AM ST 580 **Projects in American Studies** (1-6) Independent exploration within American Studies; evidenced by major paper, film, exhibition or specialized examination.
Effective: Fall 2007

AM ST 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2007

AM ST 591 **Seminar in American Studies** (3) An advanced seminar covering particular themes and issues in American Studies.
Effective: Fall 2007
Prerequisite: AM ST 500

AM ST 592 **Field Experience in American Studies** (3) Field projects and study tours to off-campus sites using American Studies methodologies.
Effective: Summer 2007
Prerequisite: AMSTD 500

AM ST 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

AM ST 595 **Internship** (1-12) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Fall 2008

AM ST 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

AM ST 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2007

AM ST 600 **Thesis in American Studies** (6) A thesis supervised by the American Studies Program.
Effective: Summer 2007
Prerequisite: AMSTD 500

AM ST 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 2008

AM ST 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Fall 2008
Prerequisite: AM ST 500 and permission of the doctoral program director

AM ST 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 2008

AM ST 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 2008

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Animal Science (AN SC)

AN SC 400 **Application of Management Principles** (1) Students will learn to apply business management skills to the animal production environment through interactive discussions and assignments.
Effective: Summer 1998
Prerequisite: seventh-semester standing

AN SC 405 **Advanced Canine Nutrition and Management** (3) Application of biological principles to the care and nutrition of dogs; interactive discussions of contemporary nutrition and management issues.
Effective: Spring 2002
Prerequisite: AN SC 305 andAN SC 400 ; or permission of program

AN SC 407 **Advanced Horse Management** (3) Detailed study of anatomy and physiology of the horse as related to nutrition, reproduction, athletic ability, unsoundness and control of diseases and parasites. Detailed discussion of management practices, facility design and contemporary issues.
Effective: Summer 1999
Prerequisite: AN SC 327, AN SC 400

AN SC 410 **Advanced Dairy Herd Management** (4) Application of dairy herd management principles using case studies and actual dairy farm situations.
Effective: Spring 2004
Prerequisite: AN SC 310 . Prerequisite or concurrent:AN SC 400

AN SC 413 **Transgenic Biology** (3) The principles and concepts used to generate genetically engineered animals by pronuclear, knockout, and cloning methods; and applied biotechnology applications.
Effective: Summer 2002
Prerequisite: a course in Molecular Biology and/or Biochemistry and/or Genetics

AN SC 414 **Comprehensive Animal Biotechnology** (3) A comprehensive review of the multidisciplinary area of animal biotechnology examining historical developments, current progress, and future directions.
Effective: Spring 2003
Prerequisite: 3 credits in molecular biology genomics genetics or biotechnology courses

AN SC 417 **Horse Judging** (2) Evaluation and selection of halter and performance horses, and presentation of oral reasons.
Effective: Spring 2002

AN SC 418 (AGECO 418, SOILS 418) **Nutrient Management in Agricultural Systems** (3) Comprehensive review of nutrient flow in animal agricultural systems, environmental regulations, and environmental stewardship practices.
Effective: Summer 2003

AN SC 419W **Applied Animal Welfare** (3) Assessment of management practices impacting animal welfare; devoted to livestock species, companion animals, captive exotic species, and animals in research.
Effective: Spring 2009
Prerequisite: AN SC 201 or 6 credits of biology

AN SC 420 **Animal Nutrition and Feed Technology** (4) Feedstuff evaluation, quality control, handling, storage: life cycle feeding of beef cattle, dairy cattle, sheep, swine, horses, and poultry.
Effective: Spring 1994
Prerequisite: AN SC 301

AN SC 421 **Poultry Evaluation and Selection** (2) Introduction and application of standards and principles used to evaluate live poultry and poultry products.
Effective: Summer 2004
Prerequisite: permission of program

AN SC 422 **Dairy Cattle Evaluation and Selection** (3) Methods used in evaluation of production and type traits and their role in selecting dairy breeding stock domestically and internationally.
Effective: Summer 1998
Prerequisite: AN SC 322

AN SC 423 **Comparative Physiology of Domestic Animals** (3) A comparative approach to understanding body function in domesticated avian and mammalian species.
Effective: Summer 1999
Prerequisite: BIOL 110

AN SC 424 **Livestock Breeding Evaluation and Selection** (3) Evaluation and selection of beef cattle, sheep, swine, and horses; critical analysis of performance records and genetic evaluations.
Effective: Summer 1999
Prerequisite: AN SC 324

AN SC 425 (VB SC 425) **Principles of Avian Diseases** (3) Principles of pathogenesis and control of diseases in poultry and other avian populations. Case material used where appropriate.
Effective: Spring 2009
Prerequisite: AN SC 201, BIOL 110 4 credits in microbiology and 3 credits of anatomy and/or physiology

AN SC 426 **Advanced Judging and Selection** (2 per semester, maximum of 4) Development of critical thinking and communication skills through evaluation and selection of animals and animal products.
Effective: Summer 1998
Prerequisite: AN SC 322

AN SC 427 **Milk Secretion** (3) Development and physiology of the mammary gland and factors which affect the amount and composition of milk produced.
Effective: Spring 2009
Prerequisite: AN SC 201 3 additional credits in dairy science

AN SC 429 **Advanced Beef Cattle Production** (3) Application of scientific and business principles to practical production and management issues using case studies or selected live settings.
Effective: Summer 2010
Prerequisite: AN SC 309

AN SC 431W **Physiology of Mammalian Reproduction** (4) Physiological processes of reproduction in animals, including the use of current and emerging technologies.
Effective: Summer 1999
Prerequisite: 3 credits in animal physiology

AN SC 432 **Techniques in Livestock Reproduction** (2) Demonstration and practice in estrus detection, inseminating techniques, pregnancy detection, embryo recovery and transfer methods.
Effective: Fall 2008
Prerequisite: AN SC 431W

AN SC 437 (AEE 437) **Equine Facilitated Therapy** (3) Equine Facilitated Therapy uses equine-related activities to contribute positively to the wellbeing of people with disabilities.
Effective: Spring 2002

AN SC 442 **Quantitative Inheritance and Animal Breeding** (3) Genes in populations: additive and nonadditive gene effects; selection and mating systems.
Effective: Fall 1983
Prerequisite: 3 credits in genetics and breeding; 3 credits in statistics

AN SC 447 **Applied Equine Behavior** (3) Theory and application of behavior principles as they apply to horses in free-running and domestic situations.
Effective: Spring 2009
Prerequisite: AN SC 201, AN SC 327 and fifth-semester standing; or fifth-semester standing and six credits in biology; or permisssion of the instructor

AN SC 450 **Dairy Farm Management Systems** (3) Capstone course emphasizing integration of dairy farm management principles into whole farm systems.
Effective: Summer 1998
Prerequisite: AN SC 310, AN SC 400, AN SC 410

AN SC 457 **Equine Reproduction and Breeding Farm Management** (3) Advanced aspects of equine reproduction will be covered, including collection of semen, processing it for shipment, and insemination of mares.
Effective: Summer 2008
Prerequisite: AN SC 327, AN SC 407

AN SC 467 **Equine Nutrition and Feeding** (3) Equine gastrointestinal anatomy and physiology; energy and nutrient requirements for body functions; applied interrelationships between nutrition, health, and performance.
Effective: Summer 2008
Prerequisite: AN SC 301, AN SC 327

AN SC 479 (BIOL 479) **General Endocrinology** (3) Endocrine mechanisms regulating the morphogenesis, homeostasis, and functional integration of animals.
Effective: Fall 2009
Prerequisite: BIOL 141 orBIOL 472

AN SC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

AN SC 496A **Teaching Assistant** (2) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AN SC 496A **Animal Sciences Teaching Assistant** (2) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AN SC 496H **AN SC Honors Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AN SC 496H **Animal Sciences Honors Independent Study** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AN SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

AN SC 497B **Advanced Turkey Management** (3) Basics of embryology, incubation, brooding, rearing, ventilation, nutrition, processing and carcass yield of domestic turkeys.
Effective: Summer 2010 Ending: Summer 2010

AN SC 497B **Animal Genomics** (3) Approaches and techniques used to sequence and analyze genomes and their application in animal breeding, production and technology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AN SC 497B **Companion Animal Behavior** (3) Genetic, physiological and environmental bases of canine and feline behavior with applications to management, welfare and behavior modification.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AN SC 497C **Animal Biotech Lab** (2) Laboratory based course that exposes students to molecular biology techniques with applied emphasis on livestock agriculture and animal biotechnology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AN SC 497C **Riding Instructor Training** (1) Management of equestrian riding lessons, teaching techniques, lesson plans, program planning, events coordination, time management and handling of mounted groups.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AN SC 497D **Dairy Challenge** (1) Students will complete whole farm evaluations to gain experience identifying limitations to productivity and profitability of dairies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

AN SC 497D **Dairy Challenge** (1) Students will complete whole farm evaluations to gain experience identifying limitations to productivity and profitability of dairies.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AN SC 497E **Advanced Beef Production** (3) Advanced beef cattle management; application of scientific and business principles to practical beef cattle management using case studies. Must be 7th semester standing.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: AN SC 201 andAN SC 309

AN SC 497E **The Clocks That Time Us** (3) Biological clocks of varying time scales are found in all living organisms and directly control virtually every physiological and behavioral processes in the body. Consequently, the understanding of how clocks function is important to our understanding of biology itself. This class will examine the molecular, cellular and systems level mechanisms that animals utilize to adapt to rhythmic changes in the physical environment, in particular focusing on the mechanisms of biological clock functions as they relate to real world outcomes.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AN SC 497F **Advanced Swine Production** (2) An on-line course to provide the student with an in depth exposure to one or more aspects of swine production.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: AN SC 306

AN SC 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

AN SC 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

AN SC 500 **Foundation Readings in Animal Science** (1 per semester/maximum of 2) Scientific articles that have significantly impacted the animal sciences will be read and discussed.
Effective: Summer 2009

AN SC 502 **Scientific Scholarship** (2) Consideration of the scientific method and thinking relative to scholarship, grantsmanship, and the mechanism of grantsmanship.
Effective: Summer 1996

AN SC 506 (NUTRN 506) **Ruminology** (3) Physiological, biochemical, and microbiological activities occurring within the rumen and the relation of rumen function to animal response.
Effective: Summer 1987
Prerequisite: at least one course in each of the following areas: animal nutrition physiology microbiology and biochemistry

AN SC 510 **Animal Science Research Methods** (3) Application of scientific method; experimental design and procedures; analyzing, interpreting, and reporting research results.
Effective: Fall 1983
Prerequisite: 3 credits of 400-level statistics

AN SC 514 **Animal Growth and Development** (3) Cellular, metabolic, and nutritional aspects of fetal and postnatal tissue growth; role of the endocrine system in regulation of animal growth.
Effective: Fall 1983
Prerequisite: 3 credits in biochemistry; 3 credits in physiology

AN SC 515 **Advanced Physiology of Reproduction in Farm Animals** (1-6) Advanced physiology of reproduction in farm animals.
Effective: Fall 1983
Prerequisite: 3 credits each of reproductive physiology systemic physiology and endocrinology

AN SC 590 **Colloquium** (1-9; 1 per semester) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 2009

AN SC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

AN SC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

AN SC 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1995

AN SC 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

AN SC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

AN SC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Experience in developing, organizing, and conducting lectures/laboratories; evaluation and counseling students and related resident education activities.
Effective: Fall 1983

AN SC 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 2008

AN SC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

AN SC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

NOTE: Also see course listed under Animal Nutrition, Poultry Science, and Veterinary Science.

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Anthropology (ANTH)

ANTH 401 **Human Evolution: The Material Evidence** (3) Human origins as seen in the fossil record and comparative biology of humans and their primate relatives.
Effective: Fall 1986
Prerequisite: ANTH 021

ANTH 405 **Primatology** (3) Nonhuman primate origins, evolution, comparative physical and behavioral characteristics, ecological context, phylogeny and taxonomy; and their importance in anthropology.
Effective: Spring 2001
Prerequisite: ANTH 021

ANTH 406W **Problems in Human Evolution** (3) Investigation of human evolution in terms of the history of ideas and contemporary research on genetic and evolutionary processes.
Effective: Summer 1996
Prerequisite: ANTH 021 or 3 credits in biology 3 credits in statistics

ANTH 408 **Anthropological Demography** (3) Analysis of demographic studies in traditional and very small populations.
Effective: Fall 2003
Prerequisite: 3 credits in anthropology

ANTH 410 **Osteology** (4) Introduction to the systematic study of the human skeleton from an evolutionary developmental biological perspective.
Effective: Spring 2007
Prerequisite: 3 credits in anthropology 3 credits in the biological sciences or concurrent enrollment inANTH 401 orANTH 501

ANTH 411 **Skeletal Forensic Anthropology** (3) An introduction to anthropological forensic science with an emphasis on what can be learned from human skeletons and archaeological recovery methods.
Effective: Spring 2007
Prerequisite: ANTH 021 orANTH 410 or Forensic Science major

ANTH 412 **Settlement Demography** (3) Examination of the demography and ecology of human settlement systems in the preindustrial past.
Effective: Summer 2008
Prerequisite: ANTH 408

ANTH 413 **Molecular Forensic Anthropology** (3) An introduction to the field of the application of DNA methods to estimating forensically useful phenotypes.
Effective: Summer 2006
Prerequisite: ANTH 021 or Forensic Science major

ANTH 420 (J ST 420) **Archaeology of the Near East** (3) Culture of the Near East and India from Paleolithic times through the Bronze Age.
Effective: Summer 1999
Prerequisite: ANTH 008, ANTH 009, ANTH 011 orANTH 012

ANTH 421 **Intro to Geospatial Science in Anthropology and Archaeology** (3) This course is a practical, data driven, introduction to applications of Geospatial tools in anthropological and archaeological research.
Effective: Summer 2009
Prerequisite: ANTH 001 orANTH 002

ANTH 422 **Meso-American Archaeology and Ethnography** (3) Survey of ethnohistorical and ethnographic patterns of Meso-American society; origin and development of ancient civilization in Mexico, Guatemala, and Honduras.
Effective: Spring 1999
Prerequisite: ANTH 008, ANTH 009, ANTH 011 orANTH 012

ANTH 423 **The Evolution of American Indian Culture** (3) Historic and archaeological sources used to trace American Indian lifestyles from the first immigrants to the period of Euro-American contact.
Effective: Spring 1999
Prerequisite: 3 credits in anthropology

ANTH 424 **Andean Ethnology and Archaeology** (3) Cultures of the Andes from earliest settlements to Inka Empire; includes discussion of life in modern Andean communities.
Effective: Spring 2002
Prerequisite: ANTH 002, ANTH 045

ANTH 426W **Archaeological Laboratory Analysis** (3) Scientific laboratory methods used in the analysis of ceramic and lithic artifacts.
Effective: Summer 2004
Prerequisite: ANTH 007, ANTH 008, ANTH 009 orANTH 011

ANTH 427W **Forensic Archaeology** (3) Application of archaeological techniques to crime scene investigations, with practical experience in field and laboratory contexts.
Effective: Summer 2007
Prerequisite: ANTH 002

ANTH 428 **Archaeological Methods and Theory** (3) Scientific methods as applied to archaeological data: evolution, ecology, diffusion, and cyclicism theory.
Effective: Spring 1999
Prerequisite: ANTH 007, ANTH 008, ANTH 009, ANTH 011 orANTH 012

ANTH 429 **Paleoethnobotany** (3) Introductory course in paleoethnobotany, the study of the interrelationships between people of the past, natural environment, and plant resources.
Effective: Spring 2010
Prerequisite: ANTH 002

ANTH 431 **Advanced Geospatial Science for Anthropologists and Archaeologists** (3) This course is an intensive, data driven, treatment of the use of geographic information systems in anthropological and archaeological research.
Effective: Summer 2009
Prerequisite: ANTH 421

ANTH 432 **Environmental Archaeology** (3) Introductory course in Environmental Archaeology, with empahsis on method and theory in the subfields archaeobotany, pedoarchaeology, and zooarchaeology.
Effective: Spring 2010
Prerequisite: ANTH 002

ANTH 433 **Archaeological Ethics and Law** (3) Introductory course that examines prominent ethical and legal issues in archaeology integral to modern applied research and practice.
Effective: Spring 2010
Prerequisite: ANTH 002

ANTH 440 **South American Tribal Societies** (3) Ethnographic survey of tribal societies in South America. Special emphasis on non-Andean area.
Effective: Fall 1986

ANTH 441 (IL) **From Stone Ax to Uzi: Tradition and Change in the New Guinea Highlands** (3) This course explores cultural change and innovation among tribal peoples of Highland New Guinea from stone tool technology to globalization.
Effective: Fall 2009
Prerequisite: ANTH 045

ANTH 442 (IL) **Indians and Peasants of Mexico and Central America** (3) Indian culture and society in Mexico and Central America.
Effective: Summer 2005
Prerequisite: ANTH 001 orANTH 045

ANTH 444 **Primitive Warfare** (3) Critical overview of the ethnography and theory of primitive warfare.
Effective: Summer 2002
Prerequisite: ANTH 045 ; andANTH 002 orANTH 021

ANTH 445W **Ethnographic Film** (3) Comparisons of written and visual ethnography; critical assessment of ethnographic film; cross-cultural variation.
Effective: Summer 2000
Prerequisite: ANTH 001 orANTH 045

ANTH 446 **Mating and Marriage** (3) An examination of human mating mainly from the viewpoint of behavioral ecology, centering on the species-typical institution of marriage.
Effective: Summer 2006
Prerequisite: ANTH 045, ANTH 021

ANTH 447 (IL) **Peoples and Cultures of Africa** (3) Ethnographic survey of peoples and cultures of Africa.
Effective: Summer 2005
Prerequisite: AAA S 110 orANTH 045

ANTH 448 (AM ST 448) **Ethnography of the United States** (3) Ethnographic descriptions of various dimensions of life in the United States.
Effective: Fall 2007
Prerequisite: ANTH 045

ANTH 450 **Comparative Social Organization** (3) Social structure and cultural change among nonliterate societies.
Effective: Fall 1986
Prerequisite: ANTH 045

ANTH 450W **Comparative Social Organization** (3) Social structure and cultural change among nonliterate societies.
Effective: Summer 1996
Prerequisite: ANTH 045

ANTH 451 **Economic Anthropology** (3) Different approaches to the study of the economics of non-Western societies, emphasizing the interrelationships between noneconomic factors and economic behavior.
Effective: Fall 1986
Prerequisite: ANTH 045

ANTH 452 **Critical Readings in Social Organization** (3) Critical overview of approaches to kinship and social organization.
Effective: Fall 2001
Prerequisite: ANTH 045

ANTH 453 **Anthropology of Religion** (3) Traditional and modern religions and historical and contemporary religious movements from an anthropological perspective.
Effective: Fall 2003
Prerequisite: ANTH 001 orANTH 045

ANTH 454 **Political Anthropology** (3) Comparative study of institutions which control force in nonstate societies.
Effective: Fall 1986

ANTH 455 **Global Processes and Local Systems** (3) Ethnographic, comparative, historic, evolutionary treatment of global economic, political, and cultural processes and their consequences for local systems.
Effective: Fall 2001
Prerequisite: ANTH 045

ANTH 456 **Cultural Ecology** (3) Survey of the methods and concepts of cultural ecology, focusing on the interaction between cultural and geographical systems.
Effective: Fall 1986
Prerequisite: 3 credits in anthropology

ANTH 457 (US;IL) (J ST 457, SOC 457) **Jewish Communities: Identity, Survival, and Transformation in Unexpected Places** (3) Examines the global array of smaller Jewish communities that have flourished outside the main urban centers of Jewish settlement.
Effective: Summer 2006
Prerequisite: ANTH 001 orANTH 045, HEBR 010, J ST 010, SOC 001, SOC 005, SOC 007, SOC 015

ANTH 458 **Ethnographic Field Methods** (3) Course introduces students to ethnographic field methods, includes student projects and simple analyses that don't require statistical sophistication.
Effective: Spring 2009
Prerequisite: ANTH 045

ANTH 459 **Applied Anthropology** (3) A survey of the development of applied anthropology and the current issues facing anthropologists working in non-academic settings.
Effective: Summer 2002
Prerequisite: ANTH 045

ANTH 460 (BIOL 460) **Human Genetics** (3) The human genome, its variation, origins, and relation to disease and other traits.
Effective: Fall 2007
Prerequisite: BIOL 230W or 3 credits in genetics

ANTH 460H (BIOL 460H) **Human Genetics** (4) Gene mapping in humans; molecular basis of genetic disease; genomic structure; immunogenetics; and genetic evidence for human evolutionary history.
Effective: Fall 2001
Prerequisite: 3 credits in genetics orANTH 021 orBIOL 222 orBIOL 230W ; and 3 credits in statistics

ANTH 461 **Molecular Anthropology** (3) Provides framework to understand current issues in biology, genetics, and anthropology as they relate to the evolution of our species.
Effective: Spring 2005
Prerequisite: 3 credits in biological anthropology or 3 credits in biology

ANTH 462 **The Biometry of Human Reproduction** (3) A survey of statistical studies of human fertility and reproductive biology.
Effective: Spring 2008
Prerequisite: BIOL 177, STAT 451

ANTH 463 **Quantitative Analysis of Morphological Data** (3) The application of morphometric methods to anthropological data: phenotypes of organisms, artifacts, and traits.
Effective: Fall 2004
Prerequisite: ANTH 002 orANTH 021;STAT 200 ; 3 additional credits in anthropology

ANTH 464 (BIOL 464) **Sociobiology** (3) The study of the adaptive function of social behavior, the comparative analysis of social organization, and the ecology of sociality.
Effective: Fall 1986
Prerequisite: 6 credits in biology or anthropology

ANTH 465H **Fifteen Great Biology Papers** (3) Reading and discussion of the most influential papers in the history of biology that illustrate exceptional insight and elegant reasoning.
Effective: Spring 2003
Prerequisite: ANTH 021 or 3 credits in evolutionary biology or genetics and 3 credits in statistics

ANTH 466 **The Skull** (3) Survey of the mammalian skull from many perspectives including evolution, development, anatomy, function, and variability of the skull.
Effective: Spring 2003
Prerequisite: ANTH 021

ANTH 470H **Our Place in Nature** (3) An evolutionary and genetic consideration of our understanding of human beings as a part of the natural world.
Effective: Fall 2001
Prerequisite: 3 credits each in genetics evolutionary biology and statistics

ANTH 471H **Biology, Evolution, and Society** (3) Exploration of the genetic theory of evolution and development, its

history and application within Biology and beyond.
Effective: Spring 2008
Prerequisite: ANTH 021, BIOL 222, BIOL 230, BIOL 322 orBIOL 460 ; 3 credits in statistics

ANTH 473 **Genetics of Human Disease** (3) Human genetic variation and evolution as reflected in disease patterns; methods for assessing and quantifying such disease patterns.
Effective: Spring 1995
Prerequisite: 3 credits in statistics; 3 credits in biology

ANTH 473W **Genetics of Human Disease** (3) Human genetic variation and evolution as reflected in disease patterns; methods for assessing and quantifying such disease patterns.
Effective: Summer 1995
Prerequisite: ANTH 021 or 3 credits in biology; 3 credits in statistics

ANTH 474 **Ecology of Gender** (3) Survey of the human biology and cultural ecology of gender.
Effective: Summer 1988
Prerequisite: ANTH 021 orBIOL 101

ANTH 476W (WMNST 476W) **Anthropology of Gender** (3) Cross-cultural construction of gender and sex roles; theories of gender construction; case studies and practical effects.
Effective: Spring 2001
Prerequisite: 3 credits in women's studies or anthropology

ANTH 477 (US;IL) **Language, Culture, and Society** (3) Relationships among language, culture and society, with an anthropological emphasis.
Effective: Spring 2007
Prerequisite: ANTH 045 orANTH 001

ANTH 478 (IL) **Cannibalism** (3) Explores the cultural institution of cannibalism, uses of the "cannibal" label, and cannibalism's meaning among those who practiced it.
Effective: Spring 2010
Prerequisite: ANTH 045

ANTH 492 **Intermediate Field Methods** (3-6) On-site experience in collecting archaeological, behavioral, or biological data.
Effective: Spring 2001
Prerequisite: ANTH 002

ANTH 493 **Field Techniques** (3-6) Training in techniques involving analyses of archaeological, behavioral, or biological data.
Effective: Spring 2001
Prerequisite: ANTH 002

ANTH 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

ANTH 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

ANTH 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2000
Prerequisite: prior approval of proposed assignment by instructor

ANTH 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall ouside the scope of formal courses.
Effective: Fall 1986

ANTH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1986

ANTH 497A **Archaeological Ethics and Law** (3) Course introduces students to a variety of legal and ethical issues in archaeology that span local to international scales.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ANTH 497A **Ethnography of the Bari** (3) An exploration of the culture of the Bari people of Colombia and Venezuela from a largely ecological perspective. Particular attention is given to their subsistence strategy (a combination of slash-and-burn agriculture, fishing, and hunting): their history of warfare with surrounding peoples; and their reproductive ecology, especially that informed by their belief in "partible paternity," in which a child is held to be the product of all the men who had intercourse with the mother during her pregnancy.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: permission of program

ANTH 497B **Taphonomy and Paleoecology** (3) This course presents information on how animal bones are preserved and become fossils (taphonomy).
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ANTH 497B **The Evolution of Human** (3) The goal of this course is to bring students in contact with the primary literature on human sexuality and sexual selection.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ANTH 497H **The Ancient Economy** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ANTH 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

ANTH 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

ANTH 499A (IL) (CAMS 499A) **Landscape Archaeology** (3) This course introduces student to the basics of archaeological surveys.
Effective: Summer 2010 Ending: Summer 2010

ANTH 499B (IL) (CAMS 499B) **GIS for Archaeologists** (3) This course gives students hands-on introduction to the use of GIS program in archaeological research.
Effective: Summer 2010 Ending: Summer 2010

ANTH 499C (IL) (CAMS 499C, J ST 499C, HIST 499C) **Archaeological Field School** (3-6) This course introduces students to the basics of archaeological field methods.
Effective: Summer 2010 Ending: Summer 2010

ANTH 499D (IL) (CAMS 499D, J ST 499D, HIST 499D) **Conservation and Public Archaeology** (3) The conservation and public archaeology option will entail hands-on conservation of on-site architectural remains.
Effective: Summer 2010 Ending: Summer 2010

ANTH 501 **Human Evolution: The Material Evidence** (3) Human origins as seen in the fossil record and comparative biology of humans and their primate relatives.
Effective: Spring 2002
Prerequisite: ANTH 401

ANTH 508 **Research Problems in Culture History** (3-9) No description.
Effective: Spring 1987

ANTH 509 **Research Design in Anthropological Fieldwork** (3) A survey of research design, sampling strategies, potential biases, confounding problems, and the limits of inference in anthropological fieldwork.
Effective: Summer 1990
Prerequisite: STAT 451

ANTH 521 **Current Literature in Archaeology** (1) Seminar designed to expand general knowledge of archaeology through exposure to current research and related issues in contemporary archaeology.
Effective: Fall 2000

ANTH 530 **Individual Readings in Anthropology** (1-6) Reading or research in selected aspects of general anthropology.
Effective: Spring 1987

ANTH 541 **Current Literature in Cultural Anthropology** (1) This seminar is designed to expand general knowledge of cultural anthropology through exposure to current research/related issues in contemporary cultural anthropology.
Effective: Spring 2002

ANTH 545 **Seminar in Anthropology** (1-9) Critical analysis of research in selected areas of anthropology.
Effective: Spring 1987

ANTH 556 **Social Organization of Traditional Societies** (3) Cultural bases of social organization of traditional societies.
Effective: Summer 1990

ANTH 559 **Behavioral Anthropology** (3) Ecological anthropology, emphasizing the adaptive aspects of subsistence,

including foraging and settlement pattern.
Effective: Spring 2001 Ending: Fall 2010

ANTH 559 **Human Ecology** (3) Ecological anthropology, emphasizing the adaptive aspects of subsistence, including foraging and settlement pattern.
Effective: Spring 2011 Future: Spring 2011

ANTH 560 **History of Anthropological Theory** (3) Survey of origin and development of anthropology in the Nineteenth Century and trends during the Twentieth Century.
Effective: Fall 1986
Prerequisite: ANTH 450

ANTH 561 **Field Methods in Anthropology** (3-9) Individual field work in any aspect of anthropology, supervised by staff of professional rank.
Effective: Spring 1987

ANTH 562 **Laboratory Methods in Anthropology** (3-9) Supervised laboratory research, utilizing materials from physical anthropology or archaeology or cultural anthropology.
Effective: Spring 1987

ANTH 563 **Current Literature in Biological Anthropology** (1) Seminar designed to expand general knowledge of Biological Anthropology through exposure to current research and issues in contemporary Biological Anthropology.
Effective: Fall 2001

ANTH 564 **Topics in Sociobiology and Behavioral Ecology** (3) Critical analysis of specialized topics in sociobiology and behavioral ecology.
Effective: Spring 2002
Prerequisite: an introductory course in anthropology or biology

ANTH 565 (WMNST 565) **Women and Development** (3) Interaction of women and development.
Effective: Spring 1994

ANTH 566 **Infectious Diseases in Anthropological Populations** (3) Surveys infectious diseases in history and prehistory; introduces concepts from microbiology, immunology, and epidemiology, applies them to past human populations.
Effective: Spring 2002

ANTH 571 **Principles of Human Evolutionary Biology** (3) Mechanisms and quantification of human genetic variation and survey of evolutionary aspects of human ecology, life cycle, and population biology.
Effective: Spring 2002

ANTH 575 **Population, Food, and Traditional Farming** (3) This course explores the relationship between demographic processes (fertility, mortality, migration) and traditional farming, especially farming near the subsistence level.
Effective: Summer 2009
Prerequisite: ANTH 408

ANTH 579 (SOC 579) **Spatial Demography** (3) This graduate course will expose students to spatial analysis tools and analytical methods applied to demographic research.
Effective: Spring 2008
Prerequisite: Graduate course in statistics i.e. SOC 574 or ANTH 509

ANTH 588 **Method and Theory in Archaeology** (3) Methodological strategies and tactics in archaeological research; major theories in cultural anthropology as applied to archaeological data.
Effective: Spring 2002

ANTH 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1987

ANTH 593 (BIOL 593, ENT 593) **Tropical Field Studies (Organization for Tropical Studies)** (8) An intensive field course concentrating on field problems, experimental design, and data analysis in tropical habitats.
Effective: Summer 1993
Prerequisite: approval by the Committee on Tropical Studies

ANTH 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2001

ANTH 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1987

Prerequisite: prior approval of proposed assignment by instructor

ANTH 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

ANTH 597A **Maya History, from Ancient to Modern Times** (3-6) A graduate seminar examining the core themes in study of Maya civilization in the ancient, colonial, and modern periods.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ANTH 597B (APLNG 597B) **Cross-cultural Research** (3) This course focuses on theory and methods in cross-cultural research at a global level and multiethnic research within particular societies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ANTH 599 (IL) **Foreign Studies** (1-12 per semester, maximum of 24) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

ANTH 600 **Thesis Research** (1-15) No description.
Effective: Fall 1986

ANTH 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1986

ANTH 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the profession at the Pennsylvania State University.
Effective: Fall 2003

ANTH 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2002

ANTH 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1986

ANTH 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1986

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App Yth Fam&Comm Edu (AYFCE)

AYFCE 438 (US) **Living in an Increasingly Diverse Society** (1-3) Students in this course will explore selected dimensions of diversity through lecture, discussion, speakers, active participation, and experiential learning.
Effective: Spring 2011 Future: Spring 2011

AYFCE 439 **Contemporary Youth Issues** (3) This course focuses on empirically-supported interventions that promote resiliency and reduce risk for problem behaviors among youth in community settings.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: a minimum of six credits in courses that focus on youth and/or families

AYFCE 455 **Extension Youth Development Programs and Volunteer Management** (3) A study of 4-H/Extension youth programs and the variety of roles played by volunteer leaders.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: 6 credits of social or behavioral sciences

AYFCE 470 **Consumer and Financial Skills** (3) Consumer and financial issues formal and non formal educators need to be informed about to function in today's society.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: Six credits of social and behavioral sciences and six credits of quantification (math)

AYFCE 495 **Internship in Youth and Family Education Programs** (6-18) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

AYFCE 495A **Internship in Youth and Family Education Programs** (6-18) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

AYFCE 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Future: Spring 2011

AYFCE 496A **Independent Studies - Youth and Family Education** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

AYFCE 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Future: Spring 2011

AYFCE 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Future: Spring 2011

AYFCE 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2011 Future: Spring 2011

AYFCE 535 **Youth Civic Development** (3) This course critically examines processes enabling youth to become members of local communities and "citizens" of nations and global societies.
Effective: Spring 2011 Future: Spring 2011

AYFCE 550 **Program Development and Evaluation in Youth, Families and Communities** (3) Examination of concepts, theories, models, and procedures relative to program development and evaluation in youth, families and communities.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: AEE 450;AEE 520

AYFCE 555 **Volunteer Program Management** (3) The study and application of concepts and principles of volunteerism and administration relevant to volunteer program management.
Effective: Spring 2011 Future: Spring 2011

AYFCE 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 2011 Future: Spring 2011

AYFCE 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or

internships. Written and oral critique of activity required.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

AYFCE 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Future: Spring 2011

AYFCE 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2011 Future: Spring 2011

AYFCE 600 **Thesis Research** (1-15) No description.
Effective: Spring 2011 Future: Spring 2011

AYFCE 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 2011 Future: Spring 2011

AYFCE 840 **Applied Youth Development** (3) Background and current issues related to youth development programs in their application to actual youth programs in community settings.
Effective: Spring 2011 Future: Spring 2011

AYFCE 845 **Intergenerational Programs and Practices** (3) Background, intervention strategies, and issues related to developing intergenerational programs and practices aimed at addressing vital social and community issues.
Effective: Spring 2011 Future: Spring 2011

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Applied Linguistics (APLNG)

APLNG 410 **Teaching American English Pronunciation** (3) Study and application of principles of North American English phonetics and theories of teaching pronunciation.
Effective: Fall 2001

APLNG 412 **Teaching Second Language Writing** (3) This course provides opportunities for exploring various perspectives on theory, research, and pedagogial applications in second language writing.
Effective: Summer 2003

APLNG 482Y (IL) **Introduction to Applied Linguistics** (3) Application of theories of language to psycholinguistics, philosophy of language, anthropological linguistics, sociolinguistics, bi/multilingualism, second language acquisition and teaching.
Effective: Spring 2006

APLNG 484 **Discourse-Functional Grammar** (3) Develop a working knowledge of the structure of English and apply such knowledge to research and/or classroom situations.
Effective: Fall 2004

APLNG 491 **Theory: Second Language Acquisition** (3) An investigation into current issues in the theoretical bases of second language acquisition.
Effective: Fall 2006

APLNG 493 (IL) **Teaching English as a Second Language** (3) Theory, research, and pedagogy that focus on the teaching of English to speakers of other languages in varied contexts.
Effective: Spring 2006

APLNG 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2001

APLNG 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2002

APLNG 497B **Multilingual Identities** (3) Students will explore the personal meanings of language learning as a historically and culturally grounded experience.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

APLNG 500 **Practice Teaching in ESL** (3) Provides instructional support and professional mentoring for second language teachers during the practice teaching experience.
Effective: Fall 2009

APLNG 510 **Health and Aging in Multilingual Contexts** (3) This course focuses on anthropological approaches to health and aging in multilingual contexts.
Effective: Spring 2007

APLNG 511 **Applied Linguistics and Health Sciences** (3) A theoretical and practical introduction to concepts and methods associated with multilingualism and health care services and research.
Effective: Summer 2006

APLNG 512 **Language and Adult Lifespan Development** (3) The effects of adult cognitive development and decline on the production and comprehension of language in mono- and multilinguals.
Effective: Summer 2006

APLNG 570 **Second Language Reading** (3) Theoretical and practical introduction to concepts, methods and practices of research and instruction of second language reading development.
Effective: Summer 2006

APLNG 571 **'Foreign' Language Materials Development** (3) This course focuses on the development and critical analysis of 'foreign' language teaching materials in applied linguistics and language learning.
Effective: Summer 2005

APLNG 572 **Communication in Second Language Classrooms** (3) The study of communication in second language classrooms.
Effective: Spring 2002

APLNG 573 **Communicative Language Teaching** (3) Cognitive, linguistic, and sociocultural foundations of communicative language teaching (CLT) as reflected in current international language teaching policies/practices.
Effective: Fall 2001

APLNG 575 **Language Ideology** (3) This course is designed to offer a range of perspectives on language ideology as an analytical construct.
Effective: Summer 2006

APLNG 576 **Language Socialization across Home, School, and Community Contexts** (3) A survey of research on language socialization from a variety of sociocultural groups across a range of sociolinguistic contexts.
Effective: Summer 2006

APLNG 580 **Proseminar in Applied Linguistics** (1) This team-taught seminar introduces PhD students to the scholarly areas and research perspectives in Applied Linguistics represented by department faculty.
Effective: Summer 2008

APLNG 581 (CAS 581) **Discourse Analysis** (3) Overview of theories and approaches to the analysis of spoken and/or written discourse.
Effective: Fall 2005

APLNG 583 **Methods of Language Assessment** (3) Introduces methodology for selecting, developing, applying, and analyzing tests and questionnaires for research and evaluation in communication and language education.
Effective: Spring 2002

APLNG 584 **Sociocultural Theory and Second Language Learning** (3) The course is an introduction to research on second language learning from a sociocultural theoretic perspective.
Effective: Spring 2004

APLNG 586 **Analyzing Classroom Discourse** (3) A theoretical and practical introduction to concepts and methods associated with the analysis of classroom discourse.
Effective: Summer 2006

APLNG 587 **Theory & Research in L2 Teacher Education** (3) Examines the historical and contemporary landscape of theory and research in second language teacher education.
Effective: Fall 2009

APLNG 588 **Design and Research of Technology-Mediated Language Learning** (3) Using computer and multimedia technologies to support materials development and second language acquisition research.
Effective: Spring 2010

APLNG 589 (CMLIT 589, FR 589, GER 589) **Technology in Foreign Language Education: An Overview** (3) Approaches to the uses and research applications of multimedia and other educational technologies applied to the teaching of foreign languages. (also crosslisted with SPAN 589)
Effective: Fall 2003

APLNG 591 **Seminar in Second Language Acquisition** (3) Seminar in second language acquisition by second/foreign language learners and implications for language pedagogy and assessment.
Effective: Spring 2002

APLNG 592 **Qualitative Research in Applied Linguistics** (3:2) This course offers an introduction to qualitative research methods in applied linguistics.
Effective: Spring 2009

APLNG 593 **Experimental Research on Language** (3) Standard methodologies for planning, conducting, interpreting, and reporting research in Applied Linguistics.
Effective: Spring 2009

APLNG 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Fall 2001
Prerequisite: prior approval of proposed assignment by instructor

APLNG 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2001

APLNG 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2001

APLNG 597A **World Englishes** (3) In this course, differences in dominant and localized varieties of English will be discussed as well as challenges posed in researching and describing new Englishes.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

APLNG 597B (ANTH 597B) **Cross-Cultural Research** (3) This course focuses on theory and methods in cross-cultural research at a global level and multiethnic research within particular societies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

APLNG 597C **Seminar in Language Use** (3) This course aims to prepare students for future in-depth study and research in a variety of language-related areas.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

APLNG 597D **Language Analysis** (3) This course is a meaning-based approach to language. The goal of the course is for students to gain a working knowledge of language and its structure.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

APLNG 600 **Thesis Research** (1-15) No description.
Effective: Fall 2001

APLNG 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 2001

APLNG 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Students experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Fall 2001

APLNG 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 2003

APLNG 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 2001

APLNG 802 **Focus on English: Teaching Form, Meaning and Use** (3) Develops an understanding of the various domains of the English language as relevant for adult English language learning and teaching.
Effective: Summer 2010

APLNG 804 **Focus on Learners: Identity, Community and Language Learning** (3) Explores how individual identities shaped by cultural differences, social positioning, institutional roles and structures influence English language learning and teaching.
Effective: Summer 2010

APLNG 806 **Focus on Classrooms: Planning and Supporting Language Learning** (3) Develops a critical awareness of one's teaching practice and highlights instructional planning and classroom interactions with adult English language learners.
Effective: Summer 2010

APLNG 808 **Focus on Instruction: Teaching and Assessing Language Learning** (3) Develops an understanding of and ability to use effective teaching and assessment practices that support adult English language learning.
Effective: Summer 2010

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Arabic (ARAB)

ARAB 401 (IL) **Advanced Language & Cultures I** (3) Fifth-semester Modern Standard Arabic: reading more complex texts, films, further development of conversation, composition skills, Arab cultures, current issues.
Effective: Spring 2008
Prerequisite: ARAB 110 or approval of program

ARAB 402 (IL) **Advanced Language & Cultures II** (3) Sixth-semester Modern Standard Arabic: reading more complex texts, films, further development of conversation, composition skills, Arab cultures, current issues.
Effective: Spring 2008
Prerequisite: ARAB 401 or approval of program

ARAB 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

ARAB 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

ARAB 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1986

ARAB 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1986

ARAB 497A (CAMS 497A) **Introduction to Classical Arabic** (3) Introduction to the grammar of classical Arabic.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ARAB 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

ARAB 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Architectural Engineering (A E)

A E 401 **Design of Steel and Wood Structures for Buildings** (3) Application of principles of engineering mechanics to layout, analysis, design, and detailing of structural elements in steel and wood of simple buildings.
Effective: Fall 2005
Prerequisite: A E 221, A E 222, A E 308

A E 402 **Design of Concrete Structures for Buildings** (3) Application of principles of engineering mechanics to layout, analysis, design, and detailing of structural elements in concrete of simple buildings.
Effective: Fall 2005
Prerequisite: A E 221, A E 222, A E 308

A E 403 **Advanced Steel Design for Buildings** (3) Continuation of A.E. 401. Advanced analysis, design, and detail of the structural elements in wood and steel.
Effective: Fall 2005
Prerequisite: A E 401, A E 430

A E 404 **Building Structural Systems in Steel and Concrete** (3) Basic analysis, design, and detailing of steel and concrete structural elements for buildings, emphasizing systems design and comparisons. A E 404 is not permitted for AE Structural Option students or for Architecture students.
Effective: Summer 2006
Prerequisite: A E 221, A E 222, A E 308

A E 421 **Architectural Structural Systems I** (3) Qualitative and quantitative analysis and design of architectural structures, force flow; structure configurations; measurement and experiments; design studio critique.
Effective: Spring 1990
Prerequisite: A E 210 3 credits in mathematics

A E 422 **Architectural Structural Systems II** (3) Continuation of A E 421, with emphasis on structural configuration and construction assemblies.
Effective: Spring 1990
Prerequisite: A E 421

A E 424 **Environmental Control Systems I** (3) Fundamental principles and applications of environmental systems in buildings. This course is intended for Architecture students.
Effective: Fall 2005
Prerequisite: A E 211

A E 430 **Indeterminate Structures** (3) Classical methods of analysis for beams, frames, arches, and secondary stresses as applied to buildings; introduction to modern methods.
Effective: Summer 1984
Prerequisite: A E 308

A E 431 **Advanced Concrete Design for Buildings** (3) Continuation of A.E. 402. Advanced analysis, design, and detail of concrete masonry, prestressed and reinforced concrete.
Effective: Fall 2005
Prerequisite: A E 402, A E 430

A E 432 **Design of Masonry Structures** (3) Analysis and design of unreinforced and reinforced masonry: non-bearing walls, bearing walls, shear walls, masonry building systems.
Effective: Spring 2005
Prerequisite: A E 402 orC E 341

A E 439 **Modern Structural Systems** (3) Analysis and design of building structures of unusual types.
Effective: Summer 1981
Prerequisite: A E 401, A E 402, A E 430

A E 441W **Integration of Architectural Engineering Systems** (3) Analysis and synthesis of systems--structural, mechanical, electrical, sanitary, construction--considering interrelationship in performance, economics of total systems, computer programs.
Effective: Fall 1993
Prerequisite: A E 309, A E 310, A E 311, A E 401, A E 402

A E 444 **Micro CADD Applications for Buildings** (3) Application of microcomputer based CADD systems to architectural engineering problems including graphics, system customization, and AI programming techniques.
Effective: Spring 2008
Prerequisite: A E 222;CMPSC 201 orCMPSC 202

A E 454 **Advanced Heating, Ventilating, and Air Conditioning** (3) Engineering design and performance analysis procedures for complex commercial building systems, including energy conservation techniques; design project.
Effective: Fall 1986
Prerequisite: A E 310

A E 455 **Advanced Heating, Ventilating, and Air Conditioning System Design** (3) Design of several different systems for a course project building; control strategy; economic comparisons using life-cycle cost techniques.
Effective: Fall 1983
Prerequisite: A E 454

A E 456 **Solar Energy Building System Design** (3) Solar radiation, collectors, and thermal storage; design and analysis of a heating system using system-simulation computer program.
Effective: Summer 1984
Prerequisite: seventh-semester standing in Engineering

A E 457 **HVAC Control Systems** (3) Theory of automatic control. HVAC control applications. Control system components, control loops, development and documentation of control logic, control commissioning.
Effective: Summer 2006
Prerequisite: A E 454

A E 458 **Advanced Architectural Acoustics and Noise Control** (3) Advanced consideration of noise control in buildings; ventilating system noise and vibration; acoustic design variables.
Effective: Fall 1983
Prerequisite: A E 309

A E 461 **Architectural Illumination Systems & Design** (3) Lighting units & photometry; lighting equipment; design criteria, calculation methods; the design process; energy codes.
Effective: Fall 2005
Prerequisite: A E 311

A E 464 **Advanced Architectural Illumination Systems & Design** (3) Flux transfer theory; advanced lighting and control systems; emergency lighting; daylighting; visual performance issues; psychological aspects of lighting.
Effective: Fall 2005
Prerequisite: A E 461

A E 466 **Computer Aided Lighting Design** (3) Design and analysis for outdoor area; floodlighting; and interior applications, including design criteria; economic analysis; modeling algorithms; and visualization.
Effective: Fall 2005
Prerequisite: A E 444, A E 461

A E 467 **Advanced Building Electrical System Design** (3) Design of electrical systems for commercial and industrial facilities emphasizing design practice and integration with codes and standards.
Effective: Spring 2008
Prerequisite: A E 311, E E 211

A E 470 **Residential Building Design and Construction** (3) Managerial aspects; architectural and code considerations; cost estimating, design, and construction of structural, plumbing, HVAC, and electrical systems.
Effective: Spring 1989
Prerequisite: A E 372 orC E 331 ; seventh-semester standing in Architectural Engineering or Civil Engineering

A E 471 **Building Construction Assemblies** (3) Performance characteristics and special problems associated with assembly- erection procedures for building construction materials and components; case studies of failures.
Effective: Winter 1978
Prerequisite: A E 221, A E 222

A E 472 **Building Construction Planning and Management** (3) Construction organization and contracts; preconstruction services; estimating; scheduling; cash flow; site planning and preparation; building construction sequences; construction business presentations; value engineering.
Effective: Fall 2005
Prerequisite: seventh-semester standing in Architectural Engineering

A E 473 **Building Construction Management and Control** (3) Building construction project planning; construction cost, schedule, quality and safety control systems; project cost accounting; change management; construction company management.
Effective: Fall 2005
Prerequisite: A E 472

A E 474 **Building Construction Estimating** (3) Construction estimating and cost engineering fundamentals; quantity take off; pricing, bid preparation; estimating, cost accounting by computer.
Effective: Spring 2001
Prerequisite: A E 372

A E 475 **Building Construction Engineering I** (3) Project planning, supervision, inspection of architectural and structural operations in major buildings; mobilization, coordination of trades; offsite testing and fabrication.
Effective: Fall 2001
Prerequisite: A E 401 orA E 402

A E 476 **Building Construction Engineering II** (3) Construction of mechanical and electrical systems in major buildings; fire protection, sound control, elevatoring; trade coordination; manufacturers' developments; computer application.
Effective: Fall 1983
Prerequisite: A E 309, A E 475

A E 477 **Senior Building Construction Project** (3) Investigation of current or completed major construction project; studies of industry management problems; formal project presentation, critique.
Effective: Summer 1981
Prerequisite: A E 475, A E 476

A E 481W **Comprehensive Architectural Engineering Senior Project I** (4) Building project selection and preparation of overall plan; preliminary investigation of building design and construction issues; creation of individual Capstone Project Electronic Portfolio (CPEP) and project proposal required.

Effective: Fall 2005
Prerequisite: ARCH 441 fifth-year architectural engineering standing in major area of emphasis

A E 482 **Comprehensive Architectural Engineering Senior Project II** (4) Continuation of A E 481W. Engineering analysis of building systems; emphasis on analysis and design of building structural, mechanical, lighting/electrical, and construction related systems. Final written report, web-based project portfolio and verbal presentation are required.
Effective: Fall 2005
Prerequisite: A E 481W

A E 486 **Professional Engineering Practice** (3) A study of the influences which affect the practice of architectural engineering, particularly codes, ethics, legal considerations, and contract documents.
Effective: Fall 1983
Prerequisite: seventh-semester standing

A E 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

A E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

A E 497B **Basics of Communications Systems** (1) The basics of telecommunications systems and system infrastructures in buildings.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

A E 497F **Load/Energy Simulation** (3) Developing models of the time depenent loads on building system on the basis of fundamental conservation of energy and heat transfer relationships; energy utilization modeling skills that allow alternative building system designs to be explored.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

A E 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in-depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

A E 520 **Room and Building Acoustics** (4) Sound propagation in enclosurers. Transmission through partitions. Design of spaces for optimum listening and industrial buildings for low noise.
Effective: Fall 1989
Prerequisite: A E 458, ACS 402

A E 534 **Analysis and Design of Steel Connections** (3) Connection analysis and design for steel buildings with an emphasis on the AISC Specification.
Effective: Summer 2005
Prerequisite: A E 401 andA E 430

A E 536 **Stability of Building Structures** (3) Elastic and inelastic buckling of beams, beam-columns, frames; applications to design of multi-story buildings.
Effective: Spring 1999
Prerequisite: A E 403 orC E 545

A E 537 **Building Performance Failures and Forensic Techniques** (3) This course provides a background in identification, evaluation, and analysis of a broad set of architectural and structural performance failures.
Effective: Summer 1999
Prerequisite: A E 401, A E 402, A E 430

A E 538 **Earthquake Resistant Design of Buildings** (3) Introductory engineering seismology, basic principles of structural dynamics, application of earthquake design provisions of model building codes to design of buildings.
Effective: Spring 2005
Prerequisite: A E 403, A E 430, A E 431

A E 541 **Computer Integrated Construction** (3) Design/development of information systems to support facility management, design construction, operations; information architectures, product/process models, advanced computer tools.
Effective: Spring 1994
Prerequisite: A E 570

A E 542 (C E 542) **Building Enclosure Science and Design** (3) The building enclosure: nature, importance, loadings; building science: control of heat, moisture, air, hygrothermal analysis; design: walls, windows, roofs, joints.
Effective: Summer 2002

A E 545 **Architectural Engineering Seminar** (1-6) Current literature and special problems in architectural engineering; presentation of technical papers.
Effective: Winter 1978

A E 551 **Combined Heat and Power System Design for Buildings** (3) Thermodynamic and thermo-economic analyses methods for determination of optimal, on-site, total energy systems for commerical buildings.
Effective: Fall 2008
Prerequisite: A E 454;A E 557 orA E 558

A E 552 **Air Quality in Buildings** (3) Indoor air pollutants, their sources and health effects; transport of pollutants; modelling of pollutant concentration in buildings.
Effective: Fall 2007
Prerequisite: A E 454, A E 455, M E 410

A E 553 **Building Energy Analysis** (3) Fundamentals of building energy dynamics and the simulation of energy flows in a building; validation of programs; practical applications.
Effective: Fall 2007
Prerequisite: A E 454, A E 455 andM E 410

A E 554 **Building Thermal Systems Design and Optimization** (3) A study of building thermal comfort systems emphasizing analytical peak and off-peak design performance modeling, simulation, optimization and economics.
Effective: Fall 1989
Prerequisite: A E 454

A E 555 **Building Automation and Control Systems** (3) Advanced techniques in the theoretical analysis and practical design of the automatic comfort controls used in building thermal systems.
Effective: Fall 1989
Prerequisite: A E 554

A E 556 **Solar Engineering of Thermal Processes** (3) Advanced quantitative methods of predicting transient active and passive solar process performance with an emphasis on building solar applications.
Effective: Fall 2007
Prerequisite: M E 410

A E 557 **Centralized Cooling Production and Distribution Systems** (3) Central cooling plant and distribution components and systems; thermal, hydraulic, and economic modeling for planning and design.
Effective: Fall 2007
Prerequisite: A E 454 ; orM E 411, M E 410

A E 558 **Centralized Heating Production and Distribution Systems** (3) Description and analysis of central heating plant and distribution components and systems; thermal and economic modeling for planning and design.
Effective: Fall 2007
Prerequisite: A E 454 ; orM E 411 andM E 410

A E 559 **Computational Fluid Dynamics in Building Design** (3) Theory and applications of building environmental modeling with Computational Fluid Dynamics (CFD).
Effective: Fall 2007
Prerequisite: A E 454, M E 410

A E 561 **Science of Light Sources** (3) In-depth scientific principles of light generation in modem electric light sources, and the resultant characteristics that influence their use for buildings.
Effective: Spring 1999
Prerequisite: A E 461

A E 562 **Luminous Flux Transfer** (3) Radiative transfer applied to lighting analysis; methods for computing direct and interreflected illumination; nearfield photometry.
Effective: Spring 2008
Prerequisite: A E 461, CMPSC 201 orCMPSC 202

A E 563 **Luminaire Optics** (3) Optical design of reflectors and refractors for lighting systems; manufacturing methods.
Effective: Spring 1999
Prerequisite: A E 464

A E 564 **Lighting Design for Visual Appearance** (3) Color; the impact of light on materials, architectural spaces, and human perception.
Effective: Summer 2007
Prerequisite: A E 461

A E 565 **Daylighting** (3) Design concepts, solar position, sky luminance distribution models, integration of daylighting and electric lighting controls, physical modeling, computer analysis techniques.
Effective: Fall 1996
Prerequisite: A E 461

A E 569 **Research Topics in Illumination Engineering** (3) Seminar on prior and current research in illumination engineering which define current recommendations and design practice.
Effective: Spring 1999
Prerequisite: or concurrent:A E 461

A E 570 **Production Management in Construction** (3) Applications of production management tools to capital facility projects; theory of production systems in construction; development of production control manual.
Effective: Fall 2007
Prerequisite: A E 475, A E 476 orC E 432

A E 571 **International Construction Management and Planning** (3) Evaluation of international project environments and participants, modeling and planning international projects.

Effective: Spring 2005
Prerequisite: A E 570

A E 572 **Project Development and Delivery Planning** (3) Methods employed by owners and developers to initiate capital facility projects; defining project objectives, constraints, participants, financing, and delivery methods.
Effective: Summer 2006
Prerequisite: A E 475, A E 476 orC E 432

A E 573 **Strategic Management in Construction** (3) Analysis tools and principles for design of effective construction organizations' strategy and structure in various markets.
Effective: Spring 2002
Prerequisite: A E 372, A E 475

A E 580 **Architecture Design, Structural, and Environmental Systems Integration** (3) Structural and environmental systems consultation with appropriate faculty to review and determine proper technical responses for the undergraduate fifth- year project.
Effective: Spring 2005
Prerequisite: A E 424 Concurrent: ARCH 530

A E 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

A E 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Spring 1987

A E 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

A E 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1987

A E 597A **Computer Modeling of Building Structures** (3) Theory and application of structural analysis using the direct stiffness method with matrix formulations. Use of computer programs for analysis of two- and three-dimensional structures. Validation and interpretation of results from computer analysis. Practical analysis and design of building structures to satisfy building code requirements.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: A E 401, A E 402 andA E 430

A E 597C **Design of Wood Structures** (3) Design of prismatic and non-prismatic wood members and arches. Members under combined torsion and bending, composite cross-sections, reinforced members, moment connection. Computer modeling for wood structures.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: A B E 462 or any equivalent

A E 597F **Virtual Facility Prototyping** (3) The goal of this course is for students to learn the application of building information modeling, advanced visualization and virtual reality technology in the building design and construction industry through the development and use of virtual facility prototypes. Students will learn how to develop virtual models of building projects that communicate important design and construction information including physical design and construction sequencing information. The models will be displayed in a large, immersive projection display system to experiment and illustrate the value of visualizing facility models at full scale.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: Students will need to have CAD background to efficiently develop the virtual prototypes for this course.

A E 597G **Building Information Modeling Execution Planning** (3) This course will focus on the skills and information needed to create a Building Information Modeling execution plan for a building construction project.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

A E 597K **Research Methods in Architectural Engineering** (3) The coruse covers different research methods such as literature review, experiment design, and use of laboratory instrumentation. In addition, writing and presentation skills would be systematically built through lectures and term project.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

A E 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2006

A E 598C **Sustainable Construction Project Management** (3) Theory, methods, and practices of high performance building design and construction.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

A E 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

A E 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 1993

A E 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the professional at the Pennsylvania State University.
Effective: Summer 2006

A E 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Summer 2004

A E 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

A E 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 1993

A E 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2008

A E 897G **BAE/MAE Capstone Project** (3) Continuation of A E 487W for students in the BAE/MAE intrgrated program. Engineering analysis of building systems; emphasis on analysis and design of building structural, mechanical, lighting/electrical, and construction related systems. Final written report, web-based project portfolio and verbal presentations are required.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

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Architectural Engineering Technology (AE T)

No courses for department code **AE T** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Architecture (ARCH)

ARCH 417 **The Language of Boundaries in Architecture and the Landscape** (3) This course examines the development and significance of boundaries in the construction of human space and time. Students who have taken other courses from Architecture Visual Arts, Geography, or Philosophy that treat some aspect of spatial perception, conception, construction, or visualiation, or who have completed equivalent study independently, may enroll with the permission of the program.
Effective: Summer 2009
Prerequisite: Students should have taken at least one of the following courses:ARCH 210, ARCH 130A, ARCH 131S, LARCH 060, LARCH 065, GEOG 020 orINART 003 or permission of program

ARCH 431 **Architectural Design V** (6) Continuation of ARCH 331 and 332, with design and research in program option areas.
Effective: Spring 2007
Prerequisite: ARCH 332 fourth-year standing in Architecture curriculum

ARCH 431A (IL) **Architectural Design V--Foreign Study** (6) A studio offered in Rome, Italy, which emphasizes urban planning and architectural design in an urban context.
Effective: Summer 2008
Prerequisite: ARCH 332

ARCH 432 **Architectural Design VI** (6) A continuation of ARCH 431, this course explores in greater depth urban planning and archiectural design in an urban context.
Effective: Spring 2009
Prerequisite: ARCH 431

ARCH 432A (IL) **Architectural Design VI--Foreign Study** (6) A continuation of ARCH 431, this course explores urban planning and architectural design in an urban context in Rome, Italy.
Effective: Summer 2008
Prerequisite: ARCH 431

ARCH 441 **Architectural Design Analysis** (3) Studies in principles and elements of design; planning for human use; the relationship of space to physical and social environment. Architectural Engineering majors only.
Effective: Spring 2008
Prerequisite: ARCH 130A

ARCH 442 **Architectural Design Analysis** (3) Continuation of ARCH 441, with emphasis on functional relationship of space, form, structure, and building groups. Architectural Engineering majors only.
Effective: Spring 2008
Prerequisite: ARCH 441

ARCH 443 **Architectural Design Analysis Inspection Trip** (1) Faculty guided trip to metropolitan areas to investigate noteworthy architecture and building construction and to visit professional offices.
Effective: Spring 2001
Prerequisite: fourth-year architectural engineering majors first priority others by faculty approval

ARCH 451 **Architectural Professional Practice** (3) A study of architectural practice in today's society: education, registration, office practice, codes, standards, construction industry, contracts, and legal documents.
Effective: Spring 2001
Prerequisite: seventh-semester standing in Architecture curriculum

ARCH 480 **Technical Systems Integration** (3) Presentations of buildings' analyses from a multiplicity of viewpoints: architectural, spacial, environmental, mechanical, construction assembly.
Effective: Summer 1994
Prerequisite: fifth-year standing in the Architecture curriculum or approval by the instructor

ARCH 481 **Digital Design Media** (3) Advanced course in digital modeling, rendering, animation and non-linear video for architectural investigations.
Effective: Summer 2006
Prerequisite: approval by instructor

ARCH 482 **MicroCAD** (3) Introductory course in Computer-Aided-Drafting applications with an emphasis on architectural office practices and architectural drawings production.
Effective: Summer 2006

ARCH 491 **Architectural Design VII-Thesis** (6) Problems in architectural planning and design; programming and/or implementation methodologies and applications for various environmental design scales.
Effective: Spring 2007
Prerequisite: ARCH 431 orARCH 432, ARCH 499A faculty review fifth-year standing in the Architecture curriculum

ARCH 492 **Architectural Design VIII-Thesis** (6) Continuation of ARCH 491 with concentration and specialization options.
Effective: Spring 2007
Prerequisite: ARCH 491 fifth-year standing in the Architecture curriculum

ARCH 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 2007

Prerequisite: prior approval of proposed assignment by instructor

ARCH 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1986

ARCH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1986

ARCH 497A **Digital Fabrication** (3) This course investigates both the conceptual and practical implications of digital fabrication in the process of design construction.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ARCH 497B **Green to Post-Green Environmental Thinking in the Twenty First Century** (3) Focusing on the effects of the environmental movement in art, architecture, and landscape design since the 1960's.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ARCH 498 **Special Topics** (1-15) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2001

ARCH 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2006
Prerequisite: seventh-semester standing

ARCH 499A (IL) **Foreign Study--Architectural Design VI** (6) Individual or group instruction conducted in a foreign country.
Effective: Spring 2007
Prerequisite: ARCH 332 fourth-year standing in the architecture curriculum

ARCH 499B (IL) **Architectural Analysis** (3) Comparative study of architectural elements and building types through on-site drawing, recording, measurement, sketching and decomposition activity.
Effective: Spring 2009
Prerequisite: ARCH 210 Concurrent: ARCH 499A ARCH 499C

ARCH 499C (IL) **Urban Studies Topics** (3) A presentation of the history of Rome through the medium of its maps and walking tours of the city.
Effective: Spring 2009
Prerequisite: ARCH 210 Concurrent: ARCH 499A ARCH 499B

ARCH 511 **Theoretical Perspectives in Architecture** (3) The impact of rationalism and romanticism on contemporary developments and theoretical postures in architectural design.
Effective: Summer 1992

ARCH 512 **Critical Theory in Architecture** (6) Inquiry into paradigms of critical theory in architecture theory, practice, and teaching. Evaluation of central texts, methods, theories, and outcomes.
Effective: Summer 2010
Prerequisite: admission into Ph.D. Program in Architecture or permission of instructor

ARCH 514 **Applying Environment-Behavior Research to Architecture and Urban Design** (3) Application of environment-behavior research to the design and evaluation of architectural and urban settings.
Effective: Summer 1992
Prerequisite: 6 credits in psychology sociology or related behavioral science courses

ARCH 520 **Methods of Inquiry in Architecture and Urban Design** (3) Introduction to the methods of research and inquiry commonly used in architecture and urban design.
Effective: Summer 1992

ARCH 522 **Computation Methods in Architectural Design** (3) Inquiry into the process of integrating computers in architectural design based on science, rationality, and language paradigms in architectural computing.
Effective: Summer 1992

ARCH 536 **Design-Inquiry** (1-12) Integration of research with the designing of architectural and urban settings.
Effective: Fall 1995
Prerequisite: ARCH 520 and approval of advisor

ARCH 541 **Topics in Theory** (3) A series of presentations on the development of contemporary architectural theory.
Effective: Summer 2002
Prerequisite: ARCH 511

ARCH 542 **Topics in Community and Urban Design** (3) Community and urban design as an area of design inquiry and interdisciplinary practice.

Effective: Summer 2002
Prerequisite: graduate standing or consent of instructor

ARCH 543 **Topics in Digital Design** (3) Inquiry into digital design paradigms of architecture and related disciplines; exploration design principles and operations supported in digital/virtual design environments.
Effective: Summer 2002
Prerequisite: graduate standing or consent of instructor

ARCH 545 **Pedagogical Practices in Architectural Education** (3) Review and application of pedagogical topics in studio teaching. Comparative evaluation of accepted and experimental practices.
Effective: Summer 2010

ARCH 550 **Ethics in Architecture** (3) Ethics in Architecture focuses on the nature of human interactions with natural and artificial worlds.
Effective: Summer 2002
Prerequisite: graduate standing or consent of instructor

ARCH 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1995

ARCH 591 **Architectural Research** (2-12) Guided research project.
Effective: Winter 1978

ARCH 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

ARCH 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 1983

ARCH 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2006

ARCH 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

ARCH 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Summer 2007

ARCH 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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Army (ARMY)

GENERAL MILITARY SCIENCE COURSE (NO OBLIGATION)

ARMY 401 **Organizational Behaviors: Interrelationships of Directing Staffs and Staff Functions** (3) Leadership; command and staff functions; ethics and professionalism; military writing; leadership laboratory.
Effective: Fall 1992
Prerequisite: ARMY 302

ARMY 402 **Army Personnel Management and Logistics** (3) Leadership; army personnel management; logistics system; personnel counseling; military justice; Soviet military; personal affairs; training management; army life; leadership laboratory.
Effective: Fall 1992
Prerequisite: ARMY 302

ARMY 496 **Independent Studies** (1-9) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1988

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Art (ART)

ART 402 **Portfolio Design and Professional Practices** (3) This course emphasizes the development of presentation skills for digital artists in audience/client interactions.
Effective: Summer 2010
Prerequisite: ART 302

ART 405 **Advanced Studio Art** (3 per semester/maximum of 9) Advanced work in drawing and painting, with an emphasis on individual development.
Effective: Spring 2008
Prerequisite: 6 credits of ART or A ED or graduate level status or permission of program

ART 409 (ART H 409) **Museum Studies** (3) An introduction to the professional activities that occur in art museums.
Effective: Summer 2004
Prerequisite: 6 credits of ART H ART and/or A ED

ART 411 (US) **Seminar in Contemporary Art** (3 per semester/maximum of 6) Trends in contemporary art investigated within the framework of studio visitations, museum tours, and through other related avenues of encounter.
Effective: Fall 2006
Prerequisite: ART 122Y, ART H 111, ART H 112 and enrollment in the ART BA ART BFA Art Education or Integrative Arts degree program.

ART 413 **Performance Art** (3) The development, production, and presentation of performance art works, and the study of performance art theory and history.
Effective: Spring 2000
Prerequisite: 4 credits of 300-level art or graduate level status or permission of instructor

ART 415 **Integrating Media: Convergence in Practice** (4 per semester/maximum of 12) A studio course concentrating on the integration of new media technologies in contemporary art practice.
Effective: Fall 2006
Prerequisite: ART 315

ART 416 **Advanced Web and Net Art: Multimedia Publishing** (4 per semester/maximum of 12) A studio course concentrating on multimedia online "net art" practice and Web publishing.
Effective: Spring 2008
Prerequisite: ART 203, ART 315 and 8 credits of 300-level new media

ART 417 **Metal Art/Technology III** (4 per semester/maximum of 12) Advanced exploration of current and emerging metal art technologies and proces ses as medium for conceptual, aesthetic, and functional artworks.
Effective: Spring 2005
Prerequisite: ART 317

ART 419 **Advanced New Media: Capstone** (4 per semester/maximum of 8) A new media and digital arts capstone course concentrating on the integration of art and technology in advanced thesis projects.
Effective: Summer 2007
Prerequisite: ART 315, ART 203 orART 416 and 12 credits of 300/400-level new media senior or graduate standing

ART 421 **Drawing** (4 per semester/maximum of 12) Drawing for advanced students, with total emphasis on sustained individual approaches.
Effective: Summer 1992
Prerequisite: ART 320

ART 422 **Advanced Figure Drawing** (4 per semester/maximum of 8) Concentrated work in recording and understanding the human figure.
Effective: Fall 1998
Prerequisite: ART 220 8 credits of 300-level art courses

ART 430 **Advanced Sculpture** (4 per semester/maximum of 12) Advanced work in sculpture, with an emphasis on individual development.
Effective: Summer 1992
Prerequisite: ART 330, ART 331 12 credits of 300-level sculpture

ART 431 **Installation Art** (4) Study and production of original visual statements through installation work as an art form.
Effective: Spring 1998
Prerequisite: 4 credits of 300-level art or graduate level status

ART 440 **Advanced Printmaking** (4 per semester/maximum of 12) Individual projects in one or more of the printmaking processes. Emphasis is on developing a portfolio of prints.
Effective: Fall 1998
Prerequisite: 4 credits of 300-level printmaking courses 8 credits total of 300-level art courses

ART 445 **Handmade Papermaking** (4 per semester/maximum of 12) Papermaking will involve experimentation with methods of forming works of art with handmade paper and three-dimensional paper pulp pieces.
Effective: Spring 2009
Prerequisite: ART 110S, ART 111, ART H 111, ART H 112 and enrollment in the ART BA ART BFA Art Education or Integrative Arts degree program

ART 446 **Artists Books** (4) Study and production of original visual statements through the book as an art form.
Effective: Spring 2009
Prerequisite: ART 110S, ART 111, ART H 111, ART H 112 and enrollment in the ART BA ART BFA Art Education or Integrative Arts degree program

ART 447 **Photo Based Printmaking** (4) Study and production of original visual statements through photographic based printmaking as an art form.
Effective: Spring 2000
Prerequisite: ART 240 4 credits of 300-level Art courses or graduate level status

ART 450 **Advanced Painting** (4 per semester/maximum of 12) Development of the artist through a series of commitments; each semester serves as a contractual agreement along professional lines.
Effective: Summer 1992
Prerequisite: ART 350

ART 455 **Advanced Painting Critique** (4 per semester/maximum of 8) The painter in relation to his peers and his profession.
Effective: Fall 1983
Prerequisite: senior or graduate standing

ART 460 **Advanced Water-Based Media** (4 per semester/maximum of 8) Further practice in the use of watercolor and related media.
Effective: Fall 1983
Prerequisite: ART 360

ART 465 **Individual Approaches I** (3) An advance studio where students are expected to explore personal themes and individual concepts in their art work.
Effective: Spring 2007
Prerequisite: ART 165, ART 166, ART 265, ART 266, ART 365, ART 366

ART 466W **Individual Approaches II** (6) An advance studio/lecture addressing the preparation for potential employment and/or entrance into graduate studies.
Effective: Summer 2007
Prerequisite: ART 165, ART 166, ART 265, ART 266, ART 365, ART 366, ART 465

ART 468 **The Intermediate Digital Medium** (3) An advanced studio course using the computer as an artistic media.
Effective: Spring 2007
Prerequisite: ART 165, ART 166, ART 168

ART 469 **Methods and Materials II** (3 per semester/maximum of 9) A studio course that focuses on specific media or techniques reflecting varied faculty expertise.
Effective: Spring 2007
Prerequisite: ART 165, ART 166, ART 265, ART 269

ART 475 (US) (ART H 475) **Contemporary Women Artists** (3) An interdisciplinary course that investigates women artists who were integral to the production of contemporary art primarily in the Americas, Europe, and Asia.
Effective: Spring 2009
Prerequisite: fifth-semester standingART H 111, ART H 112 and enrollment in the ART BA ART BFA Art Education or Integrative Arts degree program.

ART 476 (ART H 476) **History and Theory of Digital Art** (3) History and theories of contemporary digital art emphasizing humanistic approaches to technology.
Effective: Spring 2007
Prerequisite: ART H 100 orART H 112 orART H 307 orART H 325 orART H 326 orART 211

ART 480 **Advanced Ceramic Arts** (4 per semester/maximum of 12) Individual exploration of ceramic materials and construction leading to graduate study or career development as a professional potter.
Effective: Summer 1992
Prerequisite: ART 380

ART 481 **Ceramic Materials and Glaze Calculation** (3) The study of raw materials and their use in formulating clays and glazes.
Effective: Fall 2006
Prerequisite: ART 280, ART H 111, ART H 112 and enrollment in the ART BA ART BFA Art Education or Integrative Arts degree program.

ART 490 **View Camera Photography** (4) Experience with diverse camera formats and applications; particular emphasis on view camera.
Effective: Summer 2002
Prerequisite: ART 390

ART 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1995
Prerequisite: prior approval of proposed assignment by instructor

ART 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

ART 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

ART 497A **Digital Moldmaking** (4) Moldmaking for ceramics using computer aided design and digital fabrication.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ART 497A **Painting, Living and Healing in the Quantum Field** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ART 497B **Pattern and Decoration** (4) Exploration of Pattern and Decoration as it relates to Abstraction and Function. Ceramic Materials and techniques will be used.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ART 497C **Art and Life: Where They Intersect** (4) The connection between life and art will be explored with mixed media and seminar and studio practices.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ART 497D **Painting, Emotional Intelligence and Health** (3) Course addresses the question "Why Make Art?" And the reason why art outlives empire.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ART 499 (IL) **Foreign Studies--Art** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

ART 501 **Art Research** (2-6) Original study and practice in art relating to material, concept, or technique.
Effective: Winter 1978

ART 505 **Graduate Seminar** (2 per semester, maximum of 8) Seminar covering special topics at the graduate level, emphasizing interdisciplinary discourse including criticism and review of graduate work.
Effective: Summer 1999

ART 511 **Issues in Contemporary Art** (1-3 per semester, maximum of 6) A critical survey of issues in contemporary art.
Effective: Summer 1999

ART 515 **New Media Art I** (1-7 per semester/maximum of 14) Individual problems in new media arts practice leading to development of a body of work representative of the artist.
Effective: Spring 2008

ART 516 **New Media Art II** (1-7 per semester/maximum of 14) Individual problems in new media arts practice leading to development of a body of work representative of the artist.
Effective: Spring 2008
Prerequisite: ART 515

ART 517 **Metal Art I** (1-7 per semester/maximum of 14) Individual problems in metal arts leading to the development of a collection or body of work representative of the artist.
Effective: Spring 2000

ART 518 **Metal Art II** (1-7 per semester, maximum of 14) Individual problems in metal arts leading to the resolution of a collection or body of work representative of the artist.
Effective: Summer 1999
Prerequisite: ART 517

ART 530 **Sculpture I** (1-7 per semester/maximum of 14) Individual problems in sculpture leading to the development of a collection or body of work representative of the artist.
Effective: Spring 2000

ART 531 **Sculpture II** (1-7 per semester, maximum of 14) Individual problems in sculpture leading to the resolution of a collection or body of work representative of the artist.
Effective: Summer 1999
Prerequisite: ART 530

ART 545 **Printmaking I** (1-7 per semester/maximum of 14) Individual problems in printmaking leading to the development of a collection or body of work representative of the artist.
Effective: Spring 2000

ART 546 **Printmaking II** (1-7 per semester, maximum of 14) Individual problems in printmaking leading to the resolution of a collection or body of work representative of the artist.
Effective: Summer 1999
Prerequisite: ART 545

ART 550 **Painting I** (1-7 per semester/maximum of 14) Individual problems in painting leading to the development of a collection or body of work representative of the artist.
Effective: Spring 2000

ART 551 **Painting II** (1-7 per semester, maximum of 14) Individual problems in painting leading to the resolution of a collection or body of work representative of the artist.
Effective: Summer 1999
Prerequisite: ART 550

ART 570 **Graphic Design I** (1-7 per semester/maximum of 14) Individual projects in design with special emphasis on specialized topics of graphic design.
Effective: Spring 2000

ART 571 **Graphic Design II** (1-7 per semester, maximum of 14) Individual problems in design, with special emphasis on professional practice in the area of graphic design.
Effective: Summer 1999
Prerequisite: ART 570

ART 580 **Ceramics I** (1-7 per semester/maximum of 14) Individual problems in ceramics leading to the development of a collection or body of work representative of the artist.
Effective: Spring 2000

ART 581 **Ceramics II** (1-7 per semester, maximum of 14) Individual problems in ceramics leading to the resolution of a collection or body of work representative of the artist.
Effective: Summer 1999
Prerequisite: ART 580

ART 592 **Photography I** (1-7 per semester/maximum of 14) Individual problems in photography leading to the development of a body of specialized work representative of the artist.
Effective: Spring 2000
Prerequisite: 12 credits ofART 492

ART 593 **Photography II** (1-7 per semester, maximum of 14) Individual problems in photography leading to the resolution of a collection or body of work representative of the artist.
Effective: Summer 1999
Prerequisite: ART 592

ART 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1988

ART 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1999

ART 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

ART 602 **Supervised Experience and College Teaching** (1-3 per semester/maximum of 6) Supervised and graded teaching experience.
Effective: Spring 1990

ART 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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Art Education (A ED)

A ED 401 **Curricula, Pedagogy, and Assessment in Art Education** (3) Preparation of curricula, pedagogical, and assessment strategies for elementary/secondary school and museum art education programs.
Effective: Summer 2002
Prerequisite: A ED 101S, A ED 201W, A ED 211, A ED 212, A ED 225, A ED 322, A ED 323

A ED 440 **Cultural Institutions** (3) Role of the educator and educational programming in museums and other cultural institutions.
Effective: Spring 2003
Prerequisite: ANTH 100 or 3 credits of Art History courses from department list;A ED 401

A ED 488 **Cultural Institutions Practicum** (1-3) Supervised field experience in a museum or other cultural institution, including planning, implementation, and evaluation of an educational project.
Effective: Summer 2002
Prerequisite: ANTH 100 or 3 credits of art history courses from department list;A ED 401 Concurrent: A ED 490

A ED 489 **Advanced Practicum** (3) Supervised observation, unit planning, and teaching in Saturday Morning Arts School: analysis of creative expressions and art programs for learners.
Effective: Spring 2003
Prerequisite: A ED 401 Concurrent: A ED 490

A ED 490 **Capstone Course in Art Education** (3) Synthesis of preservice art education coursework; introduction to professional practices and standards; completion of teaching and learning portfolio.
Effective: Spring 2009
Prerequisite: admission to Teacher Preparation Program and successful completion of all required courses in the major except Student Teaching or final internship. Prerequisite or concurrent:A ED 488 for majors in the Museums and Cultural Institutions option Concurrent: A ED 489 majors in the Schools option

A ED 494 **Schools and Museums** (3) Museum education: issues, theories of aesthetic education and practices in schools, museums, and community art centers.
Effective: Winter 1978
Prerequisite: 12 credits in art education art art history or education

A ED 494H **Schools and Museums** (3) Museum education: issues, theories of aesthetic education and practices in schools, museums, and community art centers.
Effective: Fall 2007
Prerequisite: 12 credits in art education art art history or education

A ED 495 **Internship in Art Experiences** (15) Comprehensive instruction in craft, health, cultural, museum, studio, gallery or social agency. Students supervised by University personnel and arts personnel.
Effective: Spring 1989
Prerequisite: A ED 440 ; seventh- or eighth-semester standing

A ED 495A **Art Education Student Teaching Practicum** (7) The elementary student teaching practicum fulfills requirements for Pennsylvania certification to teach Art in both elementary and secondary schools.
Effective: Summer 2006
Prerequisite: A ED 489 ; eighth- or ninth-semester standing Concurrent: A ED 495B

A ED 495B **Art Education Student Teaching Practicum** (8) The secondary student teaching practicum fulfills requirements for Pennsylvania certification to teach Art in both elementary and secondary schools.
Effective: Summer 2006
Prerequisite: A ED 489 ; eighth- or ninth-semester standing Concurrent: A ED 495A

A ED 495C **Art Education Student Teaching Practicum** (7) The elementary student teaching practicum fulfills requirements for Pennsylvania certification to teach Art in both elementary and secondary schools.
Effective: Summer 2006
Prerequisite: A ED 489 ; eighth- or ninth-semester standing; Concurrent: A ED 495D

A ED 495D **Art Education Student Teaching Practicum** (8) The secondary student teaching practicum fulfills requirements for Pennsylvania certification to teach Art in both elementary and secondary schools.
Effective: Summer 2006
Prerequisite: A ED 489 ; eighth- or ninth-semester standing Concurrent: A ED 495A

A ED 495E **Internship in Museums and Cultural Institutions** (15) Twelve week, full time supervised internship in education in museums or other cultural institutions.
Effective: Summer 2006
Prerequisite: A ED 440 seventh- or eighth-semester standing.

A ED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

A ED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

A ED 497E (C I 497E, HIST 497E) **Consuming Child** (3) Explores linkage between new ideas about childhood and commercial/media culture since the Enlightenment through sponsored guest presentations and readings.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

A ED 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2006

A ED 502 **Research in Art Education** (3) Examination of past and present research in art education, an introduction to general methods of research, and critical evaluation of research in art education.
Effective: Summer 1995

A ED 505 **Foundations of Art Education** (3) An examination of classic theories in art education and their relevance to current developments.
Effective: Summer 1987

A ED 535 **Arts Administration for Schools and Colleges** (3) Responsibilities of arts administrators in schools and colleges; program, staff development, supervision, facilities, financing, community relations, governance, and reporting writing.
Effective: Winter 1981

A ED 536 **Curriculum Development in Art Education** (3) Factors affecting art curriculum decisions, analysis, selection, organization, preparation of curriculum. Evaluation and sources of art curriculum improvement and innovation.
Effective: Winter 1978
Prerequisite: 6 credits of methods

A ED 541 **Theories of Child Art** (3) Study of current theories of child art; application of recent psychological and anthropological theories to understanding child art.
Effective: Winter 1978
Prerequisite: A ED 486

A ED 545 **Evaluation and Assessment in Art Education** (3) Study of theories of evaluation; application of judgmental criteria; analysis and construction of assessment instruments and scoring procedures.
Effective: Winter 1978
Prerequisite: A ED 490

A ED 560 **Interpretation Theory in Art Education** (3) Study of theories of interpretation as they apply to works of art; the relationship of interpretation theory to the teaching of art.
Effective: Spring 1995

A ED 570 **Artistic Creation and Theories of Knowing** (3) A thematically organized course that makes connections between art-making and art as a way of knowing and inquiry.
Effective: Spring 1995

A ED 580 **Aesthetics and the Teaching of Art** (3) Study of the nature and value of aesthetics as part of art curricula in public schools and the relationship between aesthetics and culture.
Effective: Spring 1995

A ED 588 **History of Art Education** (3) Historical development of philosophies in art education in the United States and abroad.
Effective: Winter 1978

A ED 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

A ED 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1995

A ED 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Fall 1995

A ED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1995

A ED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1995

A ED 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

A ED 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

A ED 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching of undergraduate art education classes under the supervision of two members of the graduate faculty.
Effective: Fall 1983
Prerequisite: doctoral candidate status in Art Education and program head permission

A ED 603 **Foreign Academic Experience** (1-12) Foreign study and/or research approved by the graduate program for students enrolled in a foreign university constituting progress toward the degree.
Effective: Fall 2003

A ED 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

A ED 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

A ED 811 **New Media and Pedagogy** (3) Exploration of relationships between communication technologies and beliefs about the nature of knowledge and the nature of art.
Effective: Summer 2010

A ED 812 **Diversity, Visual Culture, and Pedagogy** (3) Diversity issues in museum and K-12 art education contexts.
Effective: Summer 2010

A ED 813 **Public Pedagogy** (3) Inquiry into the public pedagogy of contemporary visual culture for relevancy to museum and K-12 art education contexts.
Effective: Summer 2010

A ED 814 **Informal Learning** (3) Pedagogy and contexts for learning in museums and other cultural institutions.
Effective: Summer 2010

A ED 815 **Action Research in Art Education** (3) Develop a reflective process to improve strategies, practices, and knowledge of the environments within which art education is practiced.
Effective: Summer 2010

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Art History (ART H)

ART H 401 (IL) **Greek Art and Architecture** (3-9) Developments in Greek art and architecture, tenth century B.C. to first century B.C.; emphasis on the importance of Greek sanctuaries.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 111, ART H 201 orART H 311

ART H 402 (IL) **The Illuminated Manuscript** (3) Specific stylistic periods in manuscript painting from A.D. 500-1500 in Western Europe and Byzantium.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 111, ART H 302 orART H 312

ART H 404 (US) **The Art of Colonial America** (3) A survey of the visual arts in the North American colonies from the explorer artists to the American Revolution.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112, ART H 202 orART H 307

ART H 405 (US;IL) **Pioneers of Modern Architecture** (3 per semester/maximum of 6) Selected period or theme in the development of modern architecture during the nineteenth and/or early twentieth centuries.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112, ART H 202 orART H 307

ART H 409 (ART 409) **Museum Studies** (3) An introduction to the professional activities that occur in art museums.
Effective: Summer 2004
Prerequisite: 6 credits of ART H ART and/or A ED

ART H 410 **Taste and Criticism in Art** (3) History and literature of art criticism demonstrating the varied philosophic, cultural, iconographic, technical, and visual approaches.
Effective: Summer 1999
Prerequisite: 6 credits of art history

ART H 411 (IL) **Roman Art** (3-9) Roman sculpture and painting from Augustus to Constantine.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 111, ART H 201 orART H 311

ART H 412 (IL) **The Gothic Cathedral** (3) Specific aspects of Romanesque and Gothic church architecture of western Europe, especially France and England, between 1000-1500.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 111, ART H 201, ART H 302 orART H 312

ART H 414 (IL) **Italian Baroque Painting** (3) Survey of Italian Baroque painting from sixteenth-century proto-Baroque masters to painters of the late Baroque and Rococo periods.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112 orART H 304

ART H 415 (US) **The Skyscraper** (3) Origin and evolution of the skyscraper as seen against the background of cultural conditions and technological factors.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112, ART H 202 orART H 307

ART H 416 (US) **American Painting: 1876-1913** (3) Art in the United States between 1876 and 1913; emergence of an American art and transition to the modern styles.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112 orART H 307

ART H 420 (IL) **Russian Architecture** (3) Russian architecture from the first Orthodox churches of the late tenth century to the end of the Soviet Union.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 111, ART H 112, ART H 201 orART H 202

ART H 422 (IL) **Studies in Medieval Sculpture** (3-9) Specific studies of western European sculpture, 300-1500, with attention to sources, styles, type, and iconography.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 111, ART H 201, ART H 302 orART H 312

ART H 423 (IL) **Studies in Italian Renaissance Art** (3-9) Specific studies of Italian Renaissance art, including the work of artists such as Leonardo da Vinci, Michaelangelo, and Raphael.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112, ART H 202 orART H 303

ART H 424 (IL) **Masters of Northern Baroque Art** (3) Seventeenth-century painters in Flanders and Holland, including the works of artists such as Rubens, Rembrandt, and Vermeer.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112 orART H 314

ART H 426 (US;IL) **Iconoclasm: Powerful Images and their Destruction** (3) Iconoclasm: exploring the political, religious, and social motivations behind the destruction of powerful imagery throughout history.

Effective: Summer 2009
Prerequisite: 3 credits of Art History in any area

ART H 429 (IL) **Studies in Baroque Art** (3) Selected topics in the painting, sculpture, and architecture of seventeenth-century Italy, France, Flanders, Holland, and Spain.
Effective: Spring 2009
Prerequisite: 6 credits in art history (ART H)

ART H 430 **Goya and His Times** (3) The art of Francisco de Goya from the Rococo eighteenth century to the beginnings of Romanticism.
Effective: Summer 1999
Prerequisite: ART H 100, ART H 112, ART H 305 orART H 324

ART H 432 **Problems in Iconology** (3-9) The investigation of content and meaning in major monuments of the history of art.
Effective: Summer 1999
Prerequisite: 6 credits of art history

ART H 435 (IL) **Studies in Modern Art** (3-6) Lectures focusing on a selected movement of nineteenth- or twentieth-century art.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112, ART H 305, ART H 307 orART H 325

ART H 440 (IL) (ASIA 440) **Monuments of Asia** (3-9 per semester/maximum of 9) An exploration of major Asian sites and monuments through a focus on their historical and cultural significance.
Effective: Summer 2010
Prerequisite: ART H 100 orART H 120 orART H 315 orART H 320 orART H 330 orART H 340

ART H 442 (IL) **Late Antique and Early Christian Art** (3) Survey of the architecture, painting, and minor arts of Christian society from the beginning to the mid-sixth century.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 111, ART H 201 orART H 302

ART H 450 (US;IL) **The History of Photography** (3) The history of photography from 1839, with particular emphasis on the relationship with the plastic arts.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112, ART H 305, ART H 307 orART H 325

ART H 452 (IL) **Byzantine Art** (3) Monumental and minor arts of Byzantium and related areas from the reign of Justinian to the Turkish conquest of Constantinople.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 111, ART H 201 orART H 302

ART H 454 (IL) **Spanish Baroque Art** (3) Survey of seventeenth-century Spanish painting and sculpture, with an emphasis on Velasquez, Murillo, Ribera, and Zurbaran.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112 orART H 304

ART H 456 **Gian Lorenzo Bernini and the Architecture of the Full Baroque in Rome** (3) In-depth investigation into the architectural works and conceptual practices of Bernini and his contemporaries, with accentuation of specific monuments.
Effective: Summer 1999 Ending: Fall 2010
Prerequisite: ART H 100, ART H 112 orART H 202

ART H 456 (IL) **Renaissance and Baroque Palaces** (3) This course examines palace architecture and decoration in Italy, France, England, and Germany from 1450-1700.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: ART H 100 orART H 112 orART H 202 orART H 303 orART H 304

ART H 458 (IL) **Baroque Capitals of Europe** (3) This course examines the architecture and urbanism of European capital cities from 1600-1800.
Effective: Spring 2010
Prerequisite: ART H 100 orART H 112 orART H 202 orART H 304 orART H 314

ART H 464 (IL) **French Baroque Painting** (3) Examination of seventeenth-century French painting, including Italian influences; the provincial, Classical, and official styles in France.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112 orART H 304

ART H 470 (US) **American Painting and Sculpture Since 1940** (3) Painting and sculpture in the United States from the origins of Abstract Expressionism through the present.
Effective: Spring 2006
Prerequisite: ART H 100, ART H 112, ART H 307 orART H 325

ART H 475 (US) (ART 475) **Contemporary Women Artists** (3) An interdisciplinary course that investigates women artists who are integral to the production of contemporary art primarily in the Americas, Europe, and Asia.
Effective: Spring 2009
Prerequisite: Fifth semester standingART H 111, ART H 112 and enrollment in the ART BA ART BFA Art Education or Integrative Arts degree program

ART H 476 (ART 476) **History and Theory of Digital Art** (3) History and theories of contemporary digital art emphasizing humanistic approaches to technology.

Effective: Spring 2007
Prerequisite: ART H 100 orART H 112 orART H 307 orART H 325 orART H 326 orART 211

ART H 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

ART H 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

ART H 497A (IL) **Ancient Egyptian Art and Architecture** (3) An examination of selected monuments of Ancient Egyptian art and architecture.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ART H 100 orART H 111 orART H 201 orART H 301

ART H 497A **Oceanic Art** (3) Survey of the sculpture, textile, architecture and other traditional artforms of Oceania, covering the areas of Melanesia, Micronesia and Polynesia.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ART H 497B (US;IL) **The Shock of the New: Provocation and Challenge in European Art 1400-1650** (3) A team-taught, interdisciplinary exploration of provocative challenges to tradition in the visual arts, music and literature, 1400-1650.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ART H 100 orART H 112 orART H 202 orART H 303 orART H 304 orART H 313 orART H 314

ART H 497B **Rome: A City on Film-History, Fantasy, and Realism from 1896-2010** (3) Viewing and critical analysis of films from the silent era to the present; examines the representation of Rome.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ART H 497C **Art and Empire: Aztec, Inca, Spanish** (3) An analysis of the Aztec, Inca and Spanish empires' use of visual culture as an imperial strategy, 1400-1600.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ART H 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

ART H 499 (IL) **Foreign Study--Art History** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

ART H 511 **Seminar in Ancient Art** (3-12) Selected topics from the history of Greek and Roman art.
Effective: Fall 1983

ART H 512 **Seminar in Medieval Art** (3-12) Original research into problems dealing with the art of the Middle Ages.
Effective: Fall 1983

ART H 513 **Seminar in Renaissance Art** (3-12) Investigations in the area of Renaissance art, centering around major masters and monuments.
Effective: Winter 1978

ART H 514 **Seminar in Baroque Art** (3-12) Investigations in the area of baroque art, centering around major masters and monuments.
Effective: Winter 1978

ART H 515 **Seminar in Modern Art** (3-12) Lectures, readings, reports, and discussions in the field of modern art.
Effective: Winter 1978

ART H 517 **Seminar in Eighteenth-Century Art** (3-12) Investigation into themes and problems dealing with eighteenth-century art.
Effective: Winter 1978

ART H 520 **Seminar in Spanish Baroque Painting** (3-6) Specific problems in the history of seventeenth-century Spanish painting.
Effective: Winter 1978

ART H 522 **Seminar in Byzantine Art** (3-12) Specific iconographical and stylistic problems in Byzantine art and its relation to classical antiquity, the medieval West, and Islam.

Effective: Winter 1978

ART H 525 **Seminar in Modern Architecture** (3-12) Investigation into the works and problems of modern architecture as they relate to the culture of our times.
Effective: Winter 1978

ART H 542 **The Illustration of the Apocalypse** (3-6) Studies in the illustration of the Apocalypse, iconographical and stylistic, from the early Christian period through Durer.
Effective: Winter 1978

ART H 551 **Historiography of Art History** (1-6) The relationship between the definition of, and approach to, art-historical problems from Vasari to the present.
Effective: Winter 1978

ART H 552 **Problems in Connoisseurship** (3) A study of the problems of authenticating, attributing, and dating paintings and sculpture through internal evidence.
Effective: Winter 1978

ART H 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

ART H 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

ART H 597A (IL) **Seminar: Religion and Art in South Asia** (3) An exploration of the relationship between religious identity and artistic patronage in South Asia.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ART H 597A **Religion and Art in South Asia** (3) A study of the contexts within which religious architecture and art was created in medieval and early modern South Asia.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ART H 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

ART H 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

ART H 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience for teaching assistants in art history.
Effective: Fall 1983

ART H 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

ART H 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Arts and Architecture (A&A)

A&A 401 **International Arts Minor Final Project** (1-3) The final project required for the International Arts Minor.
Effective: Summer 2004
Prerequisite: A&A 100 and completion of at least 12 credits toward the International Arts Minor

A&A 410 **Interdisciplinary Digital Studio Capstone I** (4) Provides arts and design students an opportunity to conceptualize a digital arts and design undergraduate thesis.
Effective: Summer 2006
Prerequisite: A&A 310 Prerequisite or concurrent:ART H 476

A&A 411 **Interdisciplinary Digital Studio Capstone II** (4) Provides arts and design students an opportunity to implement a digital art and design undergraduate thesis.
Effective: Summer 2006
Prerequisite: A&A 410

A&A 494 **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1994

A&A 494H **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

A&A 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2004

A&A 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2004

A&A 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Asian American Studi (AAS)

AAS 428 (US) (ENGL 428) **Asian American Literatures** (3 per semester/maximum of 6) A seminar on the literatures and cultures of Asian America, with attention to forms of geographic, historical, and ethnic diversity.
Effective: Summer 2010

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Asian Studies (ASIA)

ASIA 401 **East Asian Studies** (3-6) An interdisciplinary, variable content, lecture-discussion course on the history, culture, politics, and international relations of China, Japan, and Korea.
Effective: Spring 2010
Prerequisite: 6 credits from courses in the East Asian Studies program

ASIA 404 (IL) (CMLIT 404) **Topics in Asian Literature** (3) Selected works from the major poetry, fiction, and drama of such countries as India, China, Japan.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: 3 credits in literature or related field appropriate to this course

ASIA 405Y (IL) **Seminar in Asian Studies** (3-6 per semester/maximum of 6) An advanced, writing-focused seminar in Asian Studies.
Effective: Fall 2009
Prerequisite: ASIA 100

ASIA 440 (IL) (ART H 440) **Monuments of Asia** (3-9 per semester/maximum of 9) An exploration of major Asian sites and monuments through a focus on their historical and cultural significance.
Effective: Summer 2010
Prerequisite: ART H 100 orART H 120 orART H 315 orART H 320 orART H 330 orART H 340

ASIA 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2010

ASIA 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2010

ASIA 497A **Introduction to Linguistic Anthropology** (3) This course explores how members of speech, discourse, and socio-cultural communities construct and embody through langauge and interaction.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ASIA 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2010

ASIA 501 **Proseminar in Asian Studies I** (1-3) A seminar for graduate students in the Asian Studies dual-degree PhD programs.
Effective: Summer 2009

ASIA 502 **Proseminar in Asian Studies II** (1-3) Introduction to theories, methods, and disciplines of Asian Studies.
Effective: Fall 2009

ASIA 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2009

ASIA 595 **Internship** (1-12) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 2009

ASIA 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2009

ASIA 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2009

ASIA 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2009

ASIA 600 **Thesis Research** (1-15 per semester/maximum of 99) No description.
Effective: Summer 2009

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Astronomy and Astrophysics (ASTRO)

ASTRO 400H **Honors Seminar** (1 per semester, maximum of 2) Presentations of various branches and modes of modern astrophysical research, based on lectures, visits to telescopes and facilities, and discussions.
Effective: Spring 2003
Prerequisite: ASTRO 292

ASTRO 410 **Computational Astrophysics** (3) Applications of numerical methods and computer programming to astrophysics, including stellar physics and cosmology.
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 121;PHYS 212, PHYS 213 andPHYS 214

ASTRO 414 **Stellar Structure and Evolution** (3) Theory of Stellar structure and evolution including energy generation and transport and an examination of stellar models.
Effective: Summer 2010
Prerequisite: ASTRO 292, MATH 230, PHYS 212, PHYS 213, PHYS 214, PHYS 237

ASTRO 420W **Planets and Planetary System Formation** (3) Solar system properties, star formation, protoplanetary disks and planet formation, solar system model, extrasolar planets, and astrobiology.
Effective: Summer 2004
Prerequisite: ASTRO 292

ASTRO 440 **Introduction to Astrophysics** (3) Theoretical investigation of physical processes in astronomical objects and systems; modern physical interpretation of astronomical phenomena.
Effective: Spring 1994
Prerequisite: MATH 230, PHYS 237

ASTRO 451 **Astronomical Techniques** (3) Practical methods of modern observational astronomy, detectors, filters, instrumentation for both ground-based and space observations, and data analysis.
Effective: Fall 2008
Prerequisite: PHYS 212, PHYS 213, PHYS 214

ASTRO 475W **Stars and Galaxies** (3) Astronomical studies concerning the distribution and evolution of stars and gas in our and other galaxies.
Effective: Fall 1993
Prerequisite: ASTRO 292

ASTRO 480 **Nebulae, Galaxies, and Cosmology** (3) Emission-line spectroscopy, structure and evolution of galaxies, physics of galactic nuclei and quasars, observational cosmology.
Effective: Spring 2002
Prerequisite: ASTRO 292, PHYS 212, PHYS 213, PHYS 214

ASTRO 485 **Introduction to High-Energy Astronomy** (3) The study of black holes, neutron stars, white dwarfs, supernova remnants, and extragalactic objects through x-ray and gamma ray observations.
Effective: Spring 1994
Prerequisite: PHYS 237

ASTRO 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1991

ASTRO 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1991

ASTRO 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

ASTRO 501 **Fundamental Astronomy** (3) Concepts, tools and techniques, and essential background in stellar, Galactic, extragalactic astronomy and cosmology.
Effective: Fall 2008

ASTRO 502 **Fundamental Astrophysics** (3) Fundamental tools and results of modern astrophysical theory. Gravitation; gas dynamics; radiation processes; radiative transfer; atomic structure and transitions.
Effective: Fall 2008

ASTRO 504 **Extragalactic Astronomy** (3) Properties and evolution of galaxies including their stellar, interstellar, black hole and Dark Matter components.
Effective: Fall 2008
Prerequisite: ASTRO 501, ASTRO 502

ASTRO 513 **Observational Techniques in Astronomy** (3) Theoretical and practical aspects of modern multiwavelength

observational astrophysics including detector physics, imaging techniques, spectroscopic techniques, and data analysis principles.
Effective: Spring 2008
Prerequisite: ASTRO 501, ASTRO 502

ASTRO 527 (PHYS 527) **Computational Physics and Astrophysics** (3) Introduction to numerical methods for modeling physical phenomena in condensed matter, atomic and high energy physics, gravitation, cosmology and astrophy.
Effective: Fall 2008

ASTRO 530 **Stellar Atmospheres** (3) The structure, physics and observational manifestations of atmospheres of stars.
Effective: Fall 2008
Prerequisite: ASTRO 501, ASTRO 502

ASTRO 534 **Stellar Structure and Evolution** (3) Physics of stellar interiors, stellar structure, and evolutionary changes of stars from pre-main sequence through final states.
Effective: Fall 2008
Prerequisite: ASTRO 501, ASTRO 502

ASTRO 542 **Interstellar Medium and Star Formation** (3) Theory and observation of the interstellar medium of our Galaxy and the process of star and planet formation.
Effective: Fall 2008
Prerequisite: ASTRO 501, ASTRO 502

ASTRO 545 (PHYS 545) **Cosmology** (3) Modern cosmology of the early universe, including inflation, the cosmic microwave background, nucleosynthesis, dark matter and energy.
Effective: Spring 2009

ASTRO 550 **High Energy Astrophysics** (3) Theory and observations of X-rays, gamma-rays and other high energy radiation from Galactic and extragalactic sources.
Effective: Fall 2008
Prerequisite: ASTRO 501, ASTRO 502

ASTRO 585 **Topics in Astronomy and Astrophysics** (3) Advanced study of issues in planetary, stellar, galactic, extragalactic and theoretical astronomy and astrophysics.
Effective: Summer 2008
Prerequisite: ASTRO 501, ASTRO 502

ASTRO 589 **Seminar in Current Astronomical Research** (1) Contemporary issues in instrumental, observational and theoretical astronomy and astrophysics.
Effective: Summer 2008
Prerequisite: ASTRO 501, ASTRO 502

ASTRO 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1991

ASTRO 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1991

ASTRO 597 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1991

ASTRO 600 **Thesis Research** (1-15) No description.
Effective: Summer 1991

ASTRO 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1991

ASTRO 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) No description.
Effective: Summer 1991

ASTRO 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1991

ASTRO 611 **Ph.D. DIssertation Part-Time** (0) No description.
Effective: Summer 1991

ASTRO 801 **Planets, Stars, Galaxies, and the Universe** (3) Overview of the structure, formation, and evolution of planets, stars, galaxies, and the universe.

Effective: Summer 2008

ASTRO 897 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2007

ASTRO 897A **Black Holes: Gravity's Fatal Attraction** (2) Workshop for In-Service teachers with a content area focus on the study of black holes.
Effective: Summer 2010 Ending: Summer 2010

ASTRO 897B **Lunar Exploration: Taking Earth Science to the Moon** (2) Workshop for In-Service teachers with a content area focus on the study of the Earth's Moon.
Effective: Summer 2010 Ending: Summer 2010

ASTRO 897C **Robots, Math, and Solar System Exploration** (2) Workshop for In-Service teachers using a NASA produced robotics curriculum.
Effective: Summer 2010 Ending: Summer 2010

ASTRO 897D **Telescopes: Tools for Astronomical Discovery and the Search for Life on Other Planets** (2) Workshop for In-Service teachers with a content area focus on telescopes.
Effective: Summer 2010 Ending: Summer 2010

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Behavioral Sciences (BE SC)

BE SC 407 **Small Groups Counseling** (3) Intensive survey of research and theory on behavior in small groups, with emphasis on interdependence, cooperation, and attitude change.
Effective: Spring 2001
Prerequisite: general psychology general sociology or general behavioral science

BE SC 408 **Group Facilitation and Leadership Skills** (3) Skill training in group facilitation and leadership based on analyses of roles and interpersonal dynamics plus differences among impact population.
Effective: Spring 2001
Prerequisite: general psychology general sociology or general behavioral science

BE SC 410 **Human Relations** (3) Analysis and theoretical principles of semantics and complex human relations in the family, industry, and informal organizations.
Effective: Spring 2001
Prerequisite: general psychology general sociology or general behavioral science

BE SC 459 **BASIC COUNSELING SKILLS** (3) Behavioral, cognitive, and expressive methods of assessing and enhancing life-coping skills.
Effective: Spring 2001
Prerequisite: general psychology general sociology or general behavioral science

BE SC 461 **Theories and Models of Counseling** (3) A survey of the various methods of counseling as well as the theories behind them.
Effective: Spring 2001
Prerequisite: general psychology general sociology or general behavioral science

BE SC 464 (US) (WMNST 464) **Feminine/Masculine** (3) Study of sex role learning; investigating feminine/masculine labeling; implications for contemporary society.
Effective: Spring 2008
Prerequisite: general psychology or general sociology

BE SC 468 **Industrial Psychology: Significant Issues** (3) A survey of major sociopsychological issues involved in the study of worker behavior and the industrial organization.
Effective: Spring 2001
Prerequisite: general psychology general sociology or general behavioral science

BE SC 494 **Senior Thesis** (3-9) Problem formulation, literature search, research design, data collection, analysis of results, and final write-up of a substantial research project.
Effective: Spring 2001
Prerequisite: permission of program

BE SC 494H **Senior Thesis** (3-9) Problem formulation, literature search, research design, data collection, analysis of results, and final write-up of a substantial research project.
Effective: Fall 2007
Prerequisite: permission of program

BE SC 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 1983

BE SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1983

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Berks-Lehigh Valley (BKLV)

BKLV 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2001

BKLV 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

BKLV 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Fall 2001
Prerequisite: prior approval of proposed assignment by instructor

BKLV 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2001

BKLV 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2001

BKLV 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2001

BKLV 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Biobehavioral Health (BB H)

BB H 402 (IL) **African Health & Development** (3) Course will address African health and development strategies in the context of health promotion programs.
Effective: Summer 2010
Prerequisite: BB H 305

BB H 407 (IL) **Global Health Equity** (3) Health, social disparities, and equity in the global environment.
Effective: Summer 2010

BB H 410 **Developmental and Health Genetics** (3) Discussion of genetic influences on development and the interrelationships between genetics and health.
Effective: Spring 2008
Prerequisite: BIOL 133 orBIOL 222;STAT 200, STAT 220 orSTAT 250

BB H 411 **Research and Applications in Biobehavioral Health** (3) Research methods, multi-level analyses, and applications in biobehavioral health.
Effective: Spring 2001 Ending: Fall 2010
Prerequisite: BB H 101, BB H 310W, STAT 200

BB H 411W **Research and Applications in Biobehavioral Health** (3) Research methods, multi-level analyses, and applications in biobehavioral health.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: BB H 101, BB H 310, STAT 200

BB H 416 **Health Promotion II: Planning, Implementation, and Evaluation** (3) Planning, implementation, and evaluation of health promotion, prevention, and intervention programs; emphasizing evaluation.
Effective: Spring 2000 Ending: Summer 2010
Prerequisite: BB H 310W, BB H 316

BB H 416 **Health Promotion II: Planning, Implementation, and Evaluation** (3) Planning, implementation, and evaluation of health promotion, prevention, and intervention programs; emphasizing evaluation.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: BB H 310, BB H 316

BB H 417 **Advanced Applications in Health Promotion** (3) Advanced learning experience in health promotion applications in which students will actively participate in planning, implementing, evaluating health programs.
Effective: Spring 2000
Prerequisite: BB H 416

BB H 420 **Developing Stress Management Programs** (3) Planning, developing, and implementing strategies for stress management programs for health education professionals in school, community, and corporate settings.
Effective: Spring 1998

BB H 422 **Safety Education** (3) Principles and practices of accident prevention; home, school, highway, work, and public places.
Effective: Spring 1997
Prerequisite: HL ED 060 3 credits in psychology

BB H 432 **Biobehavioral Aspects of Stress** (3) Comprehensive discussion on the mechanisms of stress-induced diseases.
Effective: Spring 2007 Ending: Summer 2010
Prerequisite: BB H 101, BIOL 141, BB H 310W or equivalent

BB H 432 **Biobehavioral Aspects of Stress** (3) Comprehensive discussion on the mechanisms of stress-induced diseases.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: BB H 101, BIOL 141, BB H 310 or equivalent

BB H 440 (US;IL) (H P A 440) **Principles of Epidemiology** (3) Theory of epidemiology and significant case studies; potential applications to health care.
Effective: Fall 2008
Prerequisite: BB H 101 orBIOL 110 orH P A 310;STAT 200 orSTAT 250

BB H 444 **Health Issues in Employee Assistance Programs** (3) An introduction to health promotion strategies in employee assistance programs.
Effective: Spring 1998
Prerequisite: KINES 060, KINES 443

BB H 446 **Human Sexuality as a Health Concern** (3) Examination of human sexuality as a integral part of basic health education and health care for persons of all ages.
Effective: Fall 2001
Prerequisite: BB H 101

BB H 451 **Pharmacological Influences on Health** (3) Biological and behavioral aspects of therapeutic and recreational drug use and misuse, and their relationships to health.
Effective: Fall 2001

Prerequisite: BB H 101

BB H 452 (NURS 452, WMNST 452) **Women's Health Issues** (3) Exploration of major health issues concerning women today, with an emphasis on social, cultural, and medical influences.
Effective: Spring 2001
Prerequisite: BB H 101, BIOL 141

BB H 453 **Orientation to the Health Education Practicum** (1) Orientation to and preparation for the health field experience.
Effective: Spring 1998
Prerequisite: sixth-semester standing

BB H 458 (WMNST 458) **Critical Issues in Reproduction** (3) Examination and analysis of the new reproductive technologies from the standpoint of medical ethics, feminism, and sociocultural influences.
Effective: Spring 2007
Prerequisite: BIOL 141 orPSYCH 100

BB H 468 **Neuroanatomical Bases for Disorders of Behavior and Health** (3) An examination of the anatomical/cellular/molecular bases for human central nervous system disorders and their impacts on victims/families/caregivers.
Effective: Spring 2007
Prerequisite: BB H 368, BB H 469 orPSYCH 260

BB H 469 (BIOL 469) **Neurobiology** (3) Comprehensive examination of neuroanatomy and physiology designed to integrate the principles of neurochemistry, neuroendocrinology and molecular biology.
Effective: Fall 1994
Prerequisite: BIOL 240W

BB H 470 (BIOL 470) **Functional and Integrative Neuroscience** (3) Neurobiological function in motivated behaviors, motor and sensory function, learning and memory, development, sexual differentiation, and pathology.
Effective: Summer 1995
Prerequisite: BIOL 469

BB H 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1995

BB H 494H **Senior Honors Thesis** (1-6) Independent study related to a student's interests directed by a faculty supervisor and culminating in the production of a thesis.
Effective: Summer 2005
Prerequisite: approval of honors thesis advisor

BB H 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 1995

BB H 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1995

BB H 497A **Clinic Volunteer Training** (2-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BB H 497B **Health Works** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BB H 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2009

BB H 501 **Biobehavioral Systems in Health and Development: Theory and Processes** (3) Examination of theories and basic processes for understanding individuals as dynamic biobehavioral complex systems functioning through continual inter- actions.
Effective: Spring 2001
Prerequisite: graduate status

BB H 502 (PSY 502) **Health: Biobehavioral Perspectives** (3) Introduction to the role of psychology in maintaining health and in treating nonpsychiatric disorders.
Effective: Spring 1992

BB H 503 **Biobehavioral Systems in Health and Development: Processes and Integration** (3) Examination and integration of basic processes for understanding individuals as dynamic biobehavioral complex systems functioning through continual interactions.

Effective: Spring 2001
Prerequisite: or concurrent:BB H 501

BB H 504 **Behavioral Health Intervention Strategies** (3) Evaluation of intervention strategies from a biobehavioral health context. Theories of change processes as they pertain to health are analyzed.
Effective: Spring 1991
Prerequisite: BB H 502, BB H 503

BB H 505 **Behavioral Health Research Strategies** (3) Research strategies in behavioral health investigations are examined. Designs and data analytic models relevant to biobehavioral research are included.
Effective: Spring 1991
Prerequisite: coursework in research design and/or introductory statistics

BB H 521 **Structural Equatino Modeling** (3) Structural Equation Modeling with LISREL and Amos. Confirmatory factor analysis; regression and path analysis with manifest/latent variables; special applications.
Effective: Summer 2002
Prerequisite: HD FS 519, HD FS 526

BB H 551 **World Health Promotion** (3) Analysis of the various health problems that affect humans throughout the world; emphasis will be placed on personal health issues.
Effective: Spring 1998

BB H 552 **Current Health Education Issues** (3) Analysis of scientific and political foundations of current issues within health education tasks, with emphasis on research and action implications.
Effective: Spring 1998

BB H 555 **Women's Health Studies in Health Education** (3) Analysis of the status of women as consumers and providers of health education, with emphasis on theories and influencing factors.
Effective: Spring 1998

BB H 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1991

BB H 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Spring 1991

BB H 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 1991

BB H 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1991

BB H 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1991

BB H 597A **Missing Data: Analysis and Design** (1) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BB H 597B (IBIOS 597B) **Neurobiology of Addiction** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BB H 600 **THESIS RESEARCH** (1-15) NO DESCRIPTION.
Effective: Spring 1991

BB H 601 **PH.D. DISSERTATION FULL-TIME** (0) NO DESCRIPTION.
Effective: Spring 1991

BB H 602 **SUPERVISED EXPERIENCE IN COLLEGE TEACHING** (1-3 PER SEMESTER, MAXIMUM OF 6) NO DESCRIPTION.
Effective: Spring 1991

BB H 610 **Thesis Research Off-Campus** (1-15) No description.

Effective: Spring 1991

BB H 611 **PH.D. DISSERTATION PART-TIME** (0) NO DESCRIPTION.
Effective: Spring 1991

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Biochemistry and Molecular Biology (B M B)

B M B 400 **Molecular Biology of the Gene** (2-3) Biochemistry of genetic phenomena, including the structure, replication and dynamics of genes and chromosomes, their expression and regulation.
Effective: Fall 2008
Prerequisite: BIOL 222 orBIOL 322;BIOL 230W orB M B 251;CHEM 212

B M B 401 **General Biochemistry** (3) Principles of the structure and function of biological molecules, including carbohydrates, lipids, membranes, proteins, and enzymes. Students may not receive credit for both CHEM 476 and B M B 401.
Effective: Fall 2009
Prerequisite: CHEM 212;B M B 251 orBIOL 230

B M B 401H **General Biochemistry** (3) Principles of the structure and function of biological molecules, including carbohydrates, lipids, membranes, proteins, and enzymes. Students may not receive credit for both CHEM 476 and B M B 401H.
Effective: Fall 2009
Prerequisite: CHEM 212;B M B 251 orBIOL 230W

B M B 402 **General Biochemistry** (3) Comprehensive survey of the pathways and regulation of intermediary metabolism.
Effective: Fall 2007
Prerequisite: B M B 401 orCHEM 476

B M B 402H **General Biochemistry** (3) Comprehensive survey of the pathways and regulation of intermediary metabolism.
Effective: Summer 2005
Prerequisite: B M B 401H

B M B 403 **Biochemistry Laboratory** (1) An introduction to techniques of experimental biochemistry, illustrating principles covered in B M B 402.
Effective: Spring 2010
Prerequisite: or concurrent:B M B 402

B M B 406 **Molecular Biology** (3) A discussion of current aspects of cell molecular biology with a laboratory emphasizing current biotechnology techniques.
Effective: Fall 2007
Prerequisite: BIOL 222 orBIOL 322;BIOL 230W orB M B 251;CHEM 039

B M B 408 **Laboratory Instructional Practice** (1-2) Participation in the instruction of undergraduate laboratory courses, including classroom preparation; discussion of principles and objectives of each exercise.
Effective: Spring 1995
Prerequisite: 10 credits in biochemistry and molecular biology and permission of the department

B M B 411 **Survey of Biochemistry and Molecular Biology Literature** (1) An introduction to readings and oral presentations in biochemistry and molecular biology.
Effective: Spring 1995
Prerequisite: B M B 401;B M B 400 orB M B 402

B M B 428 **Physical Chemistry with Biological Applications** (3) Chemical thermodynamics and kinetics with applications to biological problems.
Effective: Summer 2007
Prerequisite: CHEM 203 orCHEM 212;PHYS 203 orPHYS 251 ; 3 credits in cell biology

B M B 430 (BIOL 430, ENT 430) **Developmental Biology** (3) Molecular and genetic analyses of mechanisms involved in differentiation and determination in biological systems.
Effective: Summer 1994
Prerequisite: BIOL 222;B M B 252 orBIOL 230

B M B 432 (MICRB 432, VB SC 432) **Advanced Immunology: Signaling in the Immune System** (3) The study of signaling pathways that regulate the immune response.
Effective: Fall 2007
Prerequisite: B M B 400, MICRB 410

B M B 433 (VB SC 433) **Molecular and Cellular Toxicology** (3) In-depth coverage of processes by which drugs/chemicals interact with biological systems and the experimental approaches used to study these interactions.
Effective: Fall 2007
Prerequisite: B M B 401

B M B 435 (MICRB 435, VB SC 435) **Viral Pathogensis** (2) A study of the molecular, immunological and pathological aspects of viral diseases as well as laboratory methods of diagnosis.
Effective: Fall 2007
Prerequisite: MICRB 201;B M B 251 andB M B 252 orBIOL 110 andBIOL 230W

B M B 437 **Physiological Biochemistry** (2) Physiological aspects of biochemistry, with emphasis on mammalian metabolism, specialized tissue and fluid functions, detoxification mechanisms, energetics, and physiological interrelationships.
Effective: Spring 1995
Prerequisite: B M B 402

B M B 442 (MICRB 442) **Laboratory in Proteins, Nucleic Acids, and Molecular Cloning** (3) Laboratory in enzyme purifications and assay techniques; nucleic acid isolation and characterization, including plasmid preparation.
Effective: Spring 2009
Prerequisite: B M B 251, BIOL 230W orMICRB 201;CHEM 202 orCHEM 210 . Prerequisite or concurrent:B M B 211 orB M B 401

B M B 443W **Laboratory in Protein Purification and Enzymology** (3) Laboratory in protein isolation methodology, enzyme kinetics, and physico- chemical properties of proteins.
Effective: Spring 2009
Prerequisite: B M B 442, B M B 401

B M B 444 **Laboratory in Carbohydrates and Lipids** (1) Laboratory in the isolation, quantification, and characterization of carbohydrates and lipids.
Effective: Spring 2009
Prerequisite: B M B 442, B M B 401

B M B 445W **Laboratory in Molecular Genetics I** (2) Laboratory in molecular techniques in gene analysis and microbial genetics, emphasizing in vitro methodologies.
Effective: Spring 2009
Prerequisite: B M B 442, B M B 400, MICRB 202

B M B 446 **Laboratory in Molecular Genetics II** (1) Laboratory in gene analysis and microbial genetics, emphasizing in vivo methodologies.
Effective: Spring 2009
Prerequisite: B M B 442, B M B 400, MICRB 202

B M B 450 (MICRB 450) **Microbial/Molecular Genetics** (2) Genetic phenomena, with emphasis on molecular mechanisms: gene transfer, recombination, gene conversion, gene fusion, suppression, transposons.
Effective: Spring 2001 Ending: Summer 2010
Prerequisite: BIOL 222, MICRB 201

B M B 450 (MICRB 450) **Microbial/Molecular Genetics** (2) Genetic phenomena, with emphasis on molecular mechanisms: gene transfer, recombination, gene conversion, gene fusion, suppression, transposons.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: BIOL 222 orBIOL 322, MICRB 201

B M B 460 (MICRB 460) **Cell Growth and Differentiation** (3) Mechanisms and regulation of protein trafficking, organelle biosynthesis, cell development, signaling and cell cycle control. Emphasizes experimental design and analysis.
Effective: Spring 2006
Prerequisite: B M B 252

B M B 464 **Molecular Medicine** (3) An exploration of the impact of advances in molecular biology on understanding disease mechanisms, medical diagnosis, and therapeutics.
Effective: Spring 1999
Prerequisite: B M B 251

B M B 465 **Protein Structure and Function** (3) A study of the relationship between structure and function of proteins; internet analysis to predict structure and function is included.
Effective: Fall 2007
Prerequisite: BIOL 230W

B M B 474 **Analytical Biochemistry** (3) Physical/chemical theory and techniques that emphasize purification and characterization of biological macromolecules, including proteins, lipids and nucleic acids.
Effective: Fall 2008
Prerequisite: Prerequisite or concurrent:B M B 428 orCHEM 450

B M B 480 (MICRB 480) **Tumor Viruses and Oncogenes** (3) Oncogenes, DNA and RNA tumor viruses, and relevant experimental techniques with emphasis on molecular basis of carcinogenesis and gene regulation.
Effective: Spring 2001
Prerequisite: or concurrent:MICRB 415, MICRB 435 orMICRB 460

B M B 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1995

B M B 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1995

B M B 497A **Practical Applications of Enzymology** (1) Focus on understanding enzymes and enzyme activity well enough to deal with their use in real-world situations.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

B M B 497B **Comparative Genomics: Illuminating the Dark Matter of Genomes** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

B M B 497C **Metals in Biology** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

B M B 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1995

B M B 498A (MICRB 498A) **Antibiotics: Development and Resistance** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

B M B 498A (MICRB 498A) **Antibiotics: Development and Resistance** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

B M B 498B **Cell Biology Methods** (1) Advanced laboratory in the visualization and analysis of organelles, genetic mechanisms, and metabolic processes in eukaryotes.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: MICRB 202, MICRB 252, MICRB 442

B M B 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Bioengineering (BIOE)

BIOE 401 **Introduction to Bioengineering Research and Design** (3) Challenges and constraints of bioengineering research and design. Emphasis on immunoresponse, tissue mechanics, biological transport phenomena, and biomaterials.
Effective: Spring 2007
Prerequisite: BIOE 201, BIOE 303 Concurrent: BIOE 404

BIOE 402 **Biomedical Instrumentation and Measurements** (3) Biomedical measurements, including consideration of techniques, equipment, and safety.
Effective: Spring 2008
Prerequisite: MATH 250 orMATH 251;BIOE 301 orE E 210 orE E 212 orPHYS 402

BIOE 403 **Biomedical Instrumentation Laboratory** (1) Biomedical measurements laboratory including measurement of bioptentials, experiments in medical imaging techniques, and use of cardiovascular and pulmonary system instrumentation.
Effective: Spring 2007
Prerequisite: Prerequisite or concurrent:BIOE 402

BIOE 404 **Data Analysis and Experiment Design** (1) Statistical measures of data, and selection of experiment sample size to meet criteria.
Effective: Summer 2006
Prerequisite: BIOE 302 Concurrent: BIOE 401

BIOE 406 **Medical Imaging** (3) Physical principles and clinical applications of medical imaging methods.
Effective: Summer 2000
Prerequisite: PHYS 212

BIOE 409 **Biofluid Mechanics** (3) The fundamental relations in fluid mechanics and their application to biofluids including steady/unsteady flows, diseased states, devices and biorheology.
Effective: Summer 2006
Prerequisite: MATH 230, MATH 251, BIOE 303

BIOE 410 **Biomedical Applications of Microfluidics** (3) Study of fluid mechanics at small length scales. Low Reynolds number flow, electrokinetic flows, bioseparations in microfluidic devices.
Effective: Fall 2007
Prerequisite: BIOE 303 orM E 320

BIOE 413 **Bioengineering Transport Phenomena** (3) An integrated study of the fundamentals of mass transport processes with emphasis on the analysis of physiological systems.
Effective: Summer 2007
Prerequisite: BIOE 303, BIOE 313 orCHEM 450

BIOE 419 **Artificial Organs and Prosthetic Devices** (3) Analysis of function and consideration of design concerns for biomedical implants, including prosthetic joints, electrical stimulators, and cardiovascular pumps.
Effective: Fall 2007
Prerequisite: MATH 250 orMATH 251 . Prerequisite or concurrent:BIOL 141 orBIOL 472

BIOE 423 **Reaction Kinetics of Biological Systems** (3) Chemical kinetics and reaction equilibria with applications to the analysis of physiological function and the design of synthetic organs.
Effective: Spring 2007
Prerequisite: BIOL 141, BIOE 313 orCH E 210 . Prerequisite or concurrent:BIOE 413 orCH E 302 andCH E 413

BIOE 440 **Clinical Corelations** (1) Engineering analysis applied to common disease states and therapies.
Effective: Summer 2000
Prerequisite: BIOE 402

BIOE 443 (MATSE 403) **Biomedical Materials** (3) Describe properties of materials and composites and their in vivo interactions.
Effective: Spring 2007
Prerequisite: MATSE 201

BIOE 444 (IL) (MATSE 404) **Surfaces and the Biological Response to Materials** (3) Focus is on special properties of surface as an important causative and mediating agent in the biological response to materials.
Effective: Summer 2007
Prerequisite: CHEM 111, CHEM 113

BIOE 450W **Bioengineering Senior Design** (3) Application of engineering and physiological principles to design of artificial organs and life supportive devices.
Effective: Spring 2009
Prerequisite: BIOE 403, BIOE 440, ENGL 202C senior standing

BIOE 490 **Colloquium** (1) Technical presentations related to research and industry concerns, and by students doing senior projects.
Effective: Summer 2000
Prerequisite: or concurrent:BIOE 450W

BIOE 494H **Honors Thesis** (1-3) Independent study research and design, leading towards honors thesis.

Effective: Summer 2006
Prerequisite: Permission of program.

BIOE 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

BIOE 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

BIOE 497G **Tissue Engineering: Concepts, Calculations, and Applications** (3) Introduction to interdisciplinary tissue engineering concepts, associated biochemical and biomechanical engineering calculations, and cardiovascular, musculoskeletal, and other tissue application examples.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BIOE 497K **Bioengineering Mechanics and Techniques Laboratory** (3) Experimental laboratory that includes measurements related to biomechanical phenomena (e.g. tissue viscoelasticity and blood flow) and cellular growth.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: BIOE 201 andBIOE 303

BIOE 499 **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2008

BIOE 501 (CH E 501) **Bioengineering Transport Phenomena** (3) Application of the equations of mass, energy, and momentum conservation to physiological phenomena and to the design of artificial organs.
Effective: Summer 1990

BIOE 502 **Introduction to Bioelectric Phenomena** (3) Electric phenomena in nerve and muscle, membrane potentials, Hodgkin-Huxley equations, volume conductor problem, applications to electrocardiography, electroencephalography, plethysmography.
Effective: Winter 1978

BIOE 503 (CH E 503) **Fluid Mechanics of Bioengineering Systems** (3) Cardiovascular system and blood flow, non-Newtonian fluid description, vessel flows, unsteady flows and wave motion, windkessel theory, transmission line theory.
Effective: Summer 1990

BIOE 504 **Physiological Systems Analysis** (3) Application of systems theory, control theory, and analytic modeling strategies to the study of physiological systems.
Effective: Summer 1985
Prerequisite: BIOL 472, MATH 250

BIOE 505 **Bioengineering Mechanics** (3) Passive and active mechanical properties of tissues, rheological materials, models of muscle contraction, pulmonary mechanics, forces in muscular- skeletal system.
Effective: Winter 1978

BIOE 506 **Medical Imaging** (3) Medical diagnostic imaging techniques, including generation and detection of ultrasound, x-ray, and nuclear radiation; instrumentation and biological effects.
Effective: Fall 1983
Prerequisite: PHYS 202

BIOE 507 **Biomedical Signal Processing** (3) Data acquisition and digital signal processing, focusing on biomedical signal processing issues, including linear-phase filters, spectral analysis, and wavelets.
Effective: Spring 1999
Prerequisite: BIOE 401, BIOE 402, BIOL 041 orBIOL 472;MATH 250

BIOE 508 (MATSE 508) **Biomedical Materials** (3) Properties and methods of producing metallic, ceramic, and polymeric materials used for biomedical applications.
Effective: Spring 2003

BIOE 510 **Biomedical Applications of Microelectromechanical Systems (BioMEMS) and Bionanotechnology** (3) Introduction to BioMEMS and Bionanotechnology. Topics include: electromechanical and chemical biosensors, microfluidics microscale separations, and surface patterning for cellular engineering.
Effective: Spring 2008
Prerequisite: E E 441, BIOE 201

BIOE 512 **Cell and Molecular Bioengineering** (3) Graduate level cell and molecular biology course for engineers emphasizing molecular mechanisms.
Effective: Summer 2004

BIOE 513 **Bioengineering Laboratory Techniques** (3) Laboratory techniques in cell molecular biology, protein biochemistry and cell culture with an emphasis on engineering analysis and quantification.
Effective: Summer 2008
Prerequisite: BIOE 512

BIOE 515 **Cell Mechanics and Biophysics** (3) Advanced topics and recent developments in cellular engineering; applications of engineering science to cell biology.
Effective: Spring 1997
Prerequisite: BIOE 505

BIOE 516 **Ultrasonic Imaging** (3) Advanced topics and recent developments in ultrasonic imaging.
Effective: Spring 1991
Prerequisite: BIOE 506

BIOE 517 (MATSE 507) **Biomaterials Surface Science** (3) Special properties of surfaces as an important causative and mediating agent in the biological response to materials.
Effective: Spring 2003

BIOE 519 **Artificial Organs Design** (3) Basic techniques and principles of a multidiscipline approach to artificial organs design.
Effective: Spring 1991

BIOE 520 **Biophotonics** (3) Physical and engineering underpinnning of different modalities of laser microscopy and spectroscopy in biophysics, biomedical engineering, and life science applications.
Effective: Fall 2007
Prerequisite: BIOE 512

BIOE 536 **Ultrasonic Transducer Arrays** (3) Theory, design, fabrication and testing of ultrasonic transducer arrays.
Effective: Spring 2001
Prerequisite: BIOE 506 orBIOE 516

BIOE 552 (I E 552) **Mechanics of the Musculoskeletal System** (3) Structure and biomechanics of bone, cartilage, and skeletal muscle; dynamics and control of musculoskeletal system models.
Effective: Summer 1998
Prerequisite: Consent of program. Prerequisite or concurrent:BIOL 472

BIOE 553 (I E 553) **Engineering of Human Work** (3) Physics and physiology of humans at work; models of muscle strength, dynamic movements; neural control; physical work capacity; rest allocation.
Effective: Summer 1985
Prerequisite: BIOL 141 orBIOL 472

BIOE 576 **Bioengineering of the Cardiovascular System** (3) Experimental and analytical studies of network branching patterns, regional blood flow, rheology and mechanics of blood cells and vessels.
Effective: Summer 1991
Prerequisite: BIOL 472

BIOE 580 **Bioengineering Internship** (3-6) Supervised experience at The Milton S. Hershey Medical Center, including rotation through services and work on a minor project.
Effective: Fall 1983
Prerequisite: BIOE 402 ; 3 credits in bioengineering at the 500 level

BIOE 590 **Bioengineering Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1991

BIOE 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

BIOE 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

BIOE 597D **Mechanobiology of the Cell** (3) Explore the molecular bases of cell mechanics and the role of mechanics in cell biology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: BIOE 201 andBIOE 303 or equivalent

BIOE 597I **Ethics in Biomedical Engineering** (1) Discussions focused on issues related to medical device development and marketing, responsible conduct of research, and meeting oversight requirements by Institutional Review Boards for human studies and IACUC oversight of animal experiments.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

BIOE 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.

Effective: Fall 2008

BIOE 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

BIOE 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

BIOE 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

BIOE 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Bioethics & Med Huma (BMH)

BMH 490 **Bioethics and Medical Humanities Capstone Course** (3) Students will integrate knowledge from their BMH minor through discussion and writing a paper on some aspect of medical humanities.
Effective: Summer 2005
Prerequisite: PHIL 132

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Bioinformatics (BIIFM)

BIIFM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2004

BIIFM 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2003

BIIFM 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2003

BIIFM 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2003

BIIFM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2003

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Biological Engineering (B E)

B E 461 **Design of Fluid Power Systems** (3) Hydraulic systems, hydrostatic transmissions, electro-hydraulic systems in application to agricultural production and processing systems.
Effective: Fall 2008
Prerequisite: B E 306 orM E 360;C E 360 orM E 320

B E 462 **Design of Wood Structures** (3) Structural properties of wood; design of wood structural elements; design of wood structural systems; design of post-frame buildings.
Effective: Fall 2008
Prerequisite: B E 303, A E 308 orC E 340

B E 465 **Food and Biological Process Engineering** (3) Reactor design, kinetics, fluid flow, thermal processes, and other topics applied to the design of systems for the food and biological process industry.
Effective: Fall 2008
Prerequisite: B E 302

B E 466W **Biological Engineering Design** (3) This course focuses on a industry sponsored design project offered in conjunction with the College of Engineering Learning Factory.
Effective: Summer 2010
Prerequisite: B E 391 ; senior level standing in B E

B E 467 **Design of Stormwater and Erosion Control Facilities** (3) Design of best management practices for stormwater management, erosion and sediment control as applied to the agriculture-urban interface.
Effective: Fall 2008
Prerequisite: B E 307 orC E 361

B E 468 **Microbiological Engineering** (3) Application of basic engineering principles and designs in biochemical and biological processes.
Effective: Fall 2008
Prerequisite: B E 308 orB M B 211 andMICRB 201;PHYS 211 orPHYS 250

B E 469W **Optimization of Biological Production and Processing Systems** (3) Engineering and biological principles combined with economics and mathematical techniques to evaluate and optimize biological production and processing systems.
Effective: Fall 2008
Prerequisite: B E 302 and one B E 460 level course

B E 475 **Food Engineering Equipment Design** (3) Engineering analysis and operation of pilot-plant equipment, i.e., spray, freeze and deep bed dryers, evaporators, freezing tunnels, distillation columns.
Effective: Fall 2008
Prerequisite: B E 465

B E 477 **Land-Based Waste Disposal** (3) Analysis, design, and management of land-based systems for recycling and disposal of municipal, industrial, and agricultural wastes.
Effective: Fall 2008
Prerequisite: B E 307 orC E 370 orA S M 327

B E 487 **Watershed Modeling for Water Quality Design** (3) Application of common watershed models used to investigate design alternatives for flow and quality effects.
Effective: Summer 2010
Prerequisite: B E 307 orC E 361

B E 490W **Agricultural and Biological Engineering Colloquium** (1) Identification and analysis of the opportunities for professional development in the agricultural and biological engineering profession.
Effective: Fall 2008
Prerequisite: sixth-semester or higher standing in Agricultural and Biological Engineering

B E 494 **Senior Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Fall 2008

B E 494H **Senior Honors Thesis** (1-6) Senior honors thesis.
Effective: Fall 2008
Prerequisite: junior or senior status in the University Scholar's program

B E 495 **Agricultural Engineering Internship** (1-6) Independent study and supervised cooperative education experience related to the student's career objective.
Effective: Fall 2008

B E 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2008

B E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject

which may be topical or of special interest.
Effective: Fall 2008

B E 497A **Biological Engineering Design Project** (3) Engineering design groups with industry representative to conceptualize, design, build and demonstrate a solution to a posed problem.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

B E 497B **Biomass Energy Systems** (3) Discuss fundamental theories, applied technologies used in production and conservation of biomass into fuels, power, heat and other valued products.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

B E 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Fall 2010 Future: Fall 2010

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Biological Science (BI SC)

No courses for department code **BI SC** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Biology (BIOBD)

No courses for department code **BIOBD** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Biology (BIOL)

BIOL 400 **Teaching in Biology** (1-3) This course will train biology teaching assistants to teach in the laboratory/ recitation setting with emphasis on critical thinking skills. Enrollment will be limited to students of at least fifth semester standing that have been accepted as teaching assistants for biology.
Effective: Fall 2006
Prerequisite: Enrollment will be limited to students of at lease fifth semester standing who are or have been accepted as teaching assistants in a life science course.

BIOL 401 **Genetic Analysis of Model Systems** (3) Survey of tools and techniques available for genetic analysis with bacteria, Neurospora, yeast, Drosophila, C. elegans, Arabidopsis, maize, mice, and humans.
Effective: Spring 2001
Prerequisite: BIOL 230W andB M B 400 orB M B 401 ; or concurrent:B M B 401

BIOL 402W **Biological Experimental Design** (3) Discussion of experimental design, analysis and presentation, with a practicum providing for student design, analysis and presentation of biological experiments. Students may not take this course if they have taken BIOBD 350W.
Effective: Fall 2007
Prerequisite: at least two of the following three courses:BIOL 220W, BIOL 230W, BIOL 240W;STAT 250

BIOL 403 **Laboratory Methods for Genetic Analysis** (2) Survey of tools and techniques available for genetic analysis with bacteria, Neurospora, yeast, Drosophila, C. elegans, Arabidopsis, maize, mice, and humans.
Effective: Spring 1999
Prerequisite: BIOL 230W Concurrent: B M B 400 or B M B 401

BIOL 404 **Cellular Mechanisms in Vertebrate Physiology** (3) This course considers cellular mechanisms governing physiological aspects of vertebrate cell signaling and their adaptation to particular organismal functions.
Effective: Spring 2001
Prerequisite: B M B 251 orBIOL 230W

BIOL 405 **Molecular Evolution** (3) Introduction to concepts and techniques of analysis of molecular sequence data from an evolutionary point of view.
Effective: Fall 1994
Prerequisite: BIOL 222 orBIOL 230W

BIOL 406 **Symbiosis** (3) This course covers a variety of different types of symbiotic relationships between unicellular symbionts and plants, fungi, or animals.
Effective: Summer 1998
Prerequisite: BIOL 110;BIOL 220W, BIOL 230W orBIOL 240W

BIOL 407 **Plant Developmental Anatomy** (3) This course will examine the development of basic vascular plant anatomical structures including leaves, stems, roots, and flowers.
Effective: Fall 2005
Prerequisite: BIOL 240W

BIOL 408 **Contributions of Women to the Biological Sciences: Past and Present** (3) A study of the contributions that women scientists have made and continue to make in the biological sciences.
Effective: Spring 2005
Prerequisite: BIOL 220W, BIOL 230W orBIOL 240W

BIOL 409 **Biology of Aging** (3) Mechanisms of the aging process, with special reference to man. Unfavorable progressive changes in molecules, cells, systems, and organisms.
Effective: Summer 1984
Prerequisite: 6 credits in biology

BIOL 410 **Molecular Basis of Plant Development** (3) A discussion of how genetic engineering is applied to understanding and modifying plant development.
Effective: Summer 1999
Prerequisite: BIOL 222, BIOL 240W;B M B 211 orB M B 400, B M B 401

BIOL 411 **Medical Embryology** (3) Develops an understanding of human reproductive physiology, embryological processes, their time frames, and the development of major human body systems. The course emphasizes clinical correlations and the medical consequences of developmental abnormalities.
Effective: Summer 1998
Prerequisite: 6 credits of biology

BIOL 412 **Ecology of Infectious Diseases** (3) This course examines how ecological processes impact upon the epidemiology of infectious diseases.
Effective: Fall 2004
Prerequisite: BIOL 220W orH P A 440

BIOL 413 **Cell Signaling and Regulation** (3) Introduction to the themes of cellular signaling and regulation through critical review of primary literature.
Effective: Spring 1998
Prerequisite: BIOL 240W

BIOL 414 **Taxonomy of Seed Plants** (3) Basic principles and procedures in the practice of angiosperm systematics.

Effective: Fall 1994
Prerequisite: BIOL 240W

BIOL 415 **Ecotoxicology** (3) Major concepts and controversies in the interdisciplinary field of ecological toxicology; toxicity analysis, remediation, and case studies of environmental pollution.
Effective: Spring 1995
Prerequisite: BIOL 110, BIOL 220W;FOR 308 orW F S 209

BIOL 416 **Biology of Cancer** (3) This course intends to illustrate biological basis of cancer development, and discusses aspects on prevention, detection, and treatment of cancer.
Effective: Spring 1999
Prerequisite: BIOL 222 orBIOL 230W

BIOL 417 **Invertebrate Zoology** (4) Function and form of major invertebrate phyla.
Effective: Fall 1994
Prerequisite: BIOL 110

BIOL 419 **Ecological and Environmental Problem Solving** (3) Overview of processes involved in solving environmental problems. Provides students with toolkit for understanding ecological and environmental problems.
Effective: Spring 2004
Prerequisite: BIOL 220W

BIOL 420 (GEOSC 420) **Paleobotany** (3) Classification, morphology, phylogeny, and stratigraphic occurrence of fossil plants; practicum includes field trips and study of paleobotanical techniques and specimens.
Effective: Spring 2005
Prerequisite: any 3 credit introductory course in historical geology or plant biology

BIOL 421 (VB SC 421) **Comparative Anatomy of Vertebrates** (4) The comparative anatomy of representative vertebrate animals discussed from a descriptive and an evolutionary viewpoint.
Effective: Spring 2008
Prerequisite: BIOL 240W

BIOL 422 **Advanced Genetics** (3) Chromosomal mechanism of heredity; cytoplasmic and polygenic inheritance, chemical genetics, genomics, and experimental evolution.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: one genetics or genetic based course includingBIOL 133, BIOL 222, BIOL 322 orBIOL 230W

BIOL 422W **Advanced Genetics** (3) Chromosomal mechanism of heredity; cytoplasmic and polygenic inheritance, chemical genetics, and experimental evolution.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: BIOL 133 orBIOL 222 orBIOL 230W

BIOL 423 **Introductory Palynology** (4) Morphology, taxonomy, stratigraphy, and paleoecology of fossil palynomorphs; practicum--study of modern pollen and spores and analysis of sedimentary rocks.
Effective: Fall 2001
Prerequisite: any 3-credit introductory course in historical geology or plant biology

BIOL 424 **Seeds of Change: The Uses of Plants** (3) Interdisciplinary approach to the biology, chemistry, history, and culture of the interactions between plants and people.
Effective: Spring 2009
Prerequisite: BIOL 110;BIOL 220W, BIOL 230W orBIOL 240W

BIOL 425 (PPATH 425) **Biology of Fungi** (4) A survey of the biological diversity of fungi, stressing evolution, ecololgy, disease, morphology, life histories, and importance to human affairs.
Effective: Spring 2002
Prerequisite: fifth-semester or graduate standing in a biological sciences major with six credits completed in the major

BIOL 426 **Developmental Neurobiology** (3) Overview of basic developmental processes as they apply to the central nervous system.
Effective: Spring 2004
Prerequisite: BIOL 141 orBIOL 240

BIOL 427 **Evolution** (3) Selected topics on the evolution of life.
Effective: Spring 1995
Prerequisite: BIOL 220W, BIOL 230W

BIOL 428 **Population Genetics** (3) Mathematical formulation of evolution by natural selection, genetic equilibrium under selection, mutation, migration, random drift.
Effective: Spring 2001
Prerequisite: BIOL 220W, STAT 250;MATH 111 orMATH 141

BIOL 429 **Animal Behavior** (3) Physiological mechanisms, ecological relevance, and adaptive significance of animal behavior.
Effective: Spring 1999
Prerequisite: BIOL 110, BIOL 220W

BIOL 430 (B M B 430, ENT 430) **Developmental Biology** (3) Molecular and genetic analyses of mechanisms involved in differentiation and determination in biological systems.
Effective: Summer 1994
Prerequisite: B M B 252 ; orBIOL 222, BIOL 230W

BIOL 431 **Comparative Plant Morphology** (4) Origin, structure, development, reproduction, and evolutionary relationships of plants and fungi.
Effective: Fall 1994
Prerequisite: BIOL 240W

BIOL 432 **Developmental Genetics** (3) An advanced course in developmental biology, focusing on the use of genetics techniques to study fundamental questions of animal development.
Effective: Summer 1998
Prerequisite: BIOL 230W ; orB M B 251, B M B 252

BIOL 435 **Ecology of Lakes and Streams** (3) Physical, chemical, and biological characteristics of freshwater environments, with special emphasis on factors regulating productivity in freshwater ecosystems.
Effective: Fall 1994
Prerequisite: BIOL 220W

BIOL 436 **Population Ecology and Global Climate Change** (3) Ecological responses of individuals, populations, and communities to environmental variation, with emphasis on climate change.
Effective: Spring 2004
Prerequisite: BIOL 220

BIOL 437 **Histology** (4) Microscopic structure of the tissue of the animal body.
Effective: Fall 1994
Prerequisite: BIOL 230W

BIOL 438 **Theoretical Population Ecology** (3) Theoretical discussions of demographics, population and metapopulation growth models, life histories, and species interactions such as competition, predation, host-parasitoid relationships.
Effective: Fall 2007
Prerequisite: BIOL 220W, MATH 140, STAT 250

BIOL 439 **Practical Bioinformatics** (3) Practical aspects of retrieving and analyzing biological information residing in common databases.
Effective: Spring 2004
Prerequisite: BIOL 230 orB M B 251

BIOL 440 **Embryology** (4) Origin and development of the various tissues and organs of the animal body.
Effective: Fall 1994
Prerequisite: BIOL 240W

BIOL 441 **Plant Physiology** (3) Classical and current concepts in plant constituents, mineral nutrition, water relations, respiration, photosynthesis, photoperiodism, plant hormones, growth, and development.
Effective: Spring 1995
Prerequisite: BIOL 230W, BIOL 240W

BIOL 442 **Plant Physiology** (3) Techniques and fundamentals of classical and current experimental plant physiology, with emphasis in those areas studied in BIOL 441. Laboratory.
Effective: Spring 1998
Prerequisite: BIOL 240W, BIOL 407 orBIOL 441

BIOL 443 **Evo-devo: Evolution of Developmental Mechanisms** (3) How evolution of animals and plants can be traced to changes in the regulation and/or interactions of genes controlling development.
Effective: Spring 2004
Prerequisite: BIOL 240

BIOL 444 **Field Ecology** (3) This field course will explore the flora and fauna of the mid-Atlantic area.
Effective: Fall 2007
Prerequisite: BIOL 220W

BIOL 446 **Physiological Ecology** (3) The physiological abilities of plants and animals to adapt to their abiotic environment.
Effective: Fall 1994
Prerequisite: BIOL 220W, BIOL 240W

BIOL 448 **Ecology of Plant Reproduction** (3) Analysis of the ecology, evolution, and natural history of angiosperm reproduction, including pollination, fruit-set, dispersal, and relevant plant- animal interactions.
Effective: Fall 1994
Prerequisite: BIOL 220W

BIOL 450W **Experimental Field Biology** (3-5) A practical introduction to modern experimental techniques for ecological study of terrestrial, marine, and fresh water habitats.
Effective: Fall 2007
Prerequisite: BIOL 220W, BIOL 240W

BIOL 454 **Herpetology** (2) The biology of reptiles and amphibians.
Effective: Fall 1994
Prerequisite: BIOL 110

BIOL 459 (BIOTC 459, HORT 459) **Plant Tissue Culture and Biotechnology** (3) Principles and techniques for the in vitro culture, propagation, and genetic manipulations of plant cells.
Effective: Fall 1999
Prerequisite: BIOL 230W ; orB M B 251, B M B 252

BIOL 460 (ANTH 460) **Human Genetics** (3) The human genome, its variation, origins, and relation to disease and other

traits.
Effective: Fall 2007
Prerequisite: BIOL 230W or 3 credits in genetics

BIOL 460H (ANTH 460H) **Human Genetics** (4) Gene mapping in humans; molecular basis of genetic disease; gnomic structure; immunogenetics; and genetic evidence for human evolutionary history.
Effective: Fall 2001
Prerequisite: 3 credits in genetics orANTH 021 orBIOL 222 orBIOL 230W ; and 3 credits in statistics

BIOL 461 **Contemporary Issues in Science and Medicine** (3) Current/classical issues relating to health, research, agriculture, environment, and biotechnology. Active exploration of the impact of science on society.
Effective: Spring 2003
Prerequisite: A 400-level Biology course.

BIOL 463 **General Ecology** (3) Illustrates science of ecology, from individual, population, and community- level perspectives, discusses applications of this science to issues of conservation of biodiversity.
Effective: Spring 2002
Prerequisite: BIOL 220

BIOL 464 (ANTH 464) **Sociobiology** (3) The study of the adaptive function of social behavior, the comparative analysis of social organization, and the ecology of sociality.
Effective: Spring 1987
Prerequisite: 6 credits in biology or anthropology

BIOL 465 **General Cytology** (3) Structure and function of organelles of plant and animal cells, mitosis, meiosis, cytological techniques.
Effective: Fall 1988
Prerequisite: 12 credits in biology and/or molecular and cell biology

BIOL 466 **Laboratory in Cytology** (1) Laboratory exercises concerning aspects of cell structure and function and cytological equipment and techniques discussed in BIOL 465.
Effective: Fall 2000
Prerequisite: or concurrent:BIOL 465

BIOL 469 (BB H 469) **Neurobiology** (3) Comprehensive examination of neuroanatomy and physiology designed to integrate the principles of neurochemistry, neuroendocrinology, and molecular biology.
Effective: Spring 1995
Prerequisite: BIOL 240W

BIOL 470 (BB H 470) **Functional and Integrative Neurosciences** (3) Neurobiological function in motivated behaviors, motor and sensory functions, learning and memory development, sexual differentiation, and pathology.
Effective: Summer 1995
Prerequisite: BIOL 469

BIOL 471 **Molecular Neurobiology/Cell Biology Laboratory** (3) Introduction to modern molecular and cellular methodologies. The course is designed to integrate the principles of molecular cell biology with neurochemistry and neuroendocrinology.
Effective: Summer 1995
Prerequisite: BIOL 469

BIOL 472 **Mammalian Physiology** (3) Mechanisms concerned with normal animal function, with special emphasis on humans.
Effective: Summer 2007
Prerequisite: BIOL 240W, CHEM 203

BIOL 473 **Laboratory in Mammalian Physiology** (2) Laboratory experiments demonstrating fundamentals in physiology.
Effective: Summer 1985
Prerequisite: or concurrent:BIOL 472

BIOL 474 (GEOSC 474) **Astrobiology** (3) In depth treatment of principles/concepts of biochemical evolution, the origin/evolution of life; evaluation of distribution of life in the universe.
Effective: Summer 2007
Prerequisite: BIOL 110, CHEM 110

BIOL 477 **Biology of Human Sexuality** (3) Biological aspects of human sexual development, response, expression, function, and dysfunction among individuals of various ages and life experiences.
Effective: Spring 2008
Prerequisite: BIOL 177

BIOL 479 (AN SC 479) **General Endocrinology** (3) Endocrine mechanisms regulating the morphogenesis, homeostasis, and functional integration of animals.
Effective: Fall 2009
Prerequisite: BIOL 141 orBIOL 472

BIOL 482 **Coastal Biology** (3-4) Marine organisms, their interactions with each other, and their relationships with several coastal habitats.
Effective: Spring 2010
Prerequisite: BIOL 220W

BIOL 492 **Senior Seminar in Biology** (1) Discussion of selected topics from recent biological literature; reports on current research or internship experiences.

Effective: Fall 2007
Prerequisite: 18 credits in Biology; seventh-semester standing

BIOL 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2010

BIOL 495 **Internship in Biology** (3-12) Practical off-campus experience in Biology under the supervision of a professional and a faculty member.
Effective: Fall 2007

BIOL 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

BIOL 496A **Exercise Physiology** (1-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BIOL 496B **Metabolic Physiology** (1-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BIOL 496C **Junior/Senior Research in Behrend Biology** (1-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BIOL 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

BIOL 497A **Environmental Science and Conservation Biology: A Field Course in the Biodiversity of Costa Rica** (4) Using a course model of pre-trip, field-trip, and post-trip activities students gain an in-depth interdisciplinary and international understanding of environmental science and conservation biology.
Effective: Summer 2010 Ending: Summer 2010

BIOL 497A **Biology of RNA** (3) This course explores the role of RNA in the emergence of life, evolution of RNA function and relevance of RNA-based mechanisms to health.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: BIOL 230W

BIOL 497A **Evolution of Infectious Diseases** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: BIOL 220W

BIOL 497B **Human Dimensions of Health Care** (3) Health care from the point of view of patients, their families, and health care providers by on-site experience in family and community medicine settings.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BIOL 497B **Biology of Reproduction** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: BIOL 240W

BIOL 497D **Pathobiology** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: BIOL 230W, BIOL 240W and 6th semester standing

BIOL 497E **Evolution of the Vertebrates** (3) Covers the evolution of vertebrate animals, with emphasis on adaptation and convergence within and among living representatives of each group.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: BIOL 220W andBIOL 240W

BIOL 498 (ENT 498) **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1993

BIOL 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

BIOL 499A (IL) **Tropical Field Ecology** (3) An intensive introduction to tropical biodiversity to be taught in Belize, Central America.
Effective: Summer 2005
Prerequisite: BIOL 220W

BIOL 501 **Ecological Genetics** (3) This course will integrate concepts from genetics and ecology, discussing actual data interpreting them in a theoretical context.
Effective: Summer 1991
Prerequisite: BIOL 427

BIOL 505 **Statistical Methods in Evolutionary Genetics** (3) Statistical methods that are used for analyzing and interpreting genetic data in molecular evolution will be discussed.
Effective: Spring 1994
Prerequisite: BIOL 222, STAT 250

BIOL 510 **Molecular Basis of Plant Development** (2) Critical examination of topics related to plant growth and differentiation with an emphasis on plant mutants and genetic engineering.
Effective: Spring 1994
Prerequisite: BIOL 441

BIOL 511 **Advanced Plant Physiology** (3) Physiology of plants, including uptake of water and minerals, translocations, mineral nutrition, energy relations, respiration, and catabolism.
Effective: Fall 1983
Prerequisite: BIOL 442

BIOL 512 **Advanced Plant Physiology** (3) Continuation of BIOL 511. Physiology of plants, including photosynthesis, synthesis of cellular constituents, growth and development.
Effective: Fall 1983
Prerequisite: BIOL 442

BIOL 513 **Plant Cellular Signaling** (3) Introduction to themes of plant signaling through critical review of primary literature.
Effective: Spring 1996

BIOL 514 **Topics in Systematics and Evolution** (2) Discussion of pertinent current literature in systematic biology and evolution.
Effective: Spring 1995

BIOL 515 (PLPHY 515) **Modern Techniques and Concepts in Plant Cell Biology** (2) An intensive introduction to concepts of plant cell biology and modern techniques used in this field.
Effective: Summer 1998
Prerequisite: introductory course in plant physiology

BIOL 516 (PLPHY 516) **Modern Techniques and Concepts in Plant Molecular Biology** (2) An intensive introduction to contemporary molecular biology methods as applied to the study of plants.
Effective: Summer 1998
Prerequisite: general biology and plant physiology at the undergraduate level

BIOL 518 **Special Problems** (1-6) Prosecution of an assigned problem under the guidance of a staff member. Throughout the year as arranged. By appointment.
Effective: Winter 1978

BIOL 519 **Ecological and Environmental Problem Solving** (4) Overview of processes involved in solving environmental problems. Provides students with toolkit for understanding ecological and environmental problems.
Effective: Spring 2005
Prerequisite: BIOL 220 or an introductory ecology course

BIOL 524 **Seminar in Genetics** (1 per semester) No description.
Effective: Fall 1983

BIOL 526 (GEOSC 526) **Problems in Palynology** (1-6) Individual research projects in various aspects of palynology, especially palynostratigraphy and paleoecological palynology.
Effective: Summer 1989
Prerequisite: BIOL 423

BIOL 542 (ENT 542, W F S 542) **Systematics** (3) Principles and methods of classification, phylogeny, and speciation; taxonomic techniques; analysis of species; causal interpretation of animal diversity.
Effective: Summer 1990

BIOL 544 **Advanced Physiological Ecology** (4) The physiological abilities of plants and animals to adapt to their abiotic environment.
Effective: Fall 1983

BIOL 545 **Ecosystem Dynamics** (3) Survey and discussion of recent literature on ecosystem structure and function.
Effective: Spring 1988
Prerequisite: BIOL 210

BIOL 546 **Ecology of Populations** (3) Ecological responses of organisms to environmental variables (food, etc.) that determine population behavior. Demography, competition, predation, and community principles.
Effective: Summer 1991

BIOL 550 **Classic Ecology** (1) This course intends to illustrate the historical developments in the science of ecology and how these developments have shaped the current study of ecology.
Effective: Spring 2003
Prerequisite: BIOL 563

BIOL 563 **General Ecology** (3) Illustrates the science of ecology, from an individual/population/community level perspective; discusses applications of this science to issues related to conservation of biodiversity.
Effective: Summer 2002
Prerequisite: introductory Biology

BIOL 571 (PHSIO 571) **Animal Physiology** (3) Mammalian cardiovascular, respiratory, renal, and gastrointestinal systems.
Effective: Summer 1985
Prerequisite: BIOL 472

BIOL 572 (PHSIO 572) **Animal Physiology** (3) Mammalian nervous, endocrine, metabolic, and reproductive systems.
Effective: Summer 1985
Prerequisite: BIOL 473

BIOL 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2005

BIOL 591 **Molecular Evolutionary Biology Seminar** (1) Continuing seminars in Molecular Evolutionary Biology consisting of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1995

BIOL 592 **Critical Evaluation of Literature in Biology** (1) Weekly readings and critiques of recent papers from primary literature are used to teach independent thinking and effective scientific communication.
Effective: Fall 2001
Prerequisite: Departmentally controlled

BIOL 593 (ANTH 593, ENT 593) **Tropical Field Studies (Organization for Tropical Studies)** (8) An intensive field course concentrating on field problems, experimental design, and data analysis in tropical habitats.
Effective: Summer 1993
Prerequisite: approval by the Committee on Tropical Studies

BIOL 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on and individual basis and which fall outside the scope of formal courses.
Effective: Spring 1994

BIOL 596A **Dengue Fieldwork in Vietnam** (9) Creative projects, including nonthesis research, that are supervised on and individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BIOL 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1990

BIOL 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2001

BIOL 598B (CSE 598B, STAT 598B) **Bioinformatics I** (3) AR and MA processes, spectrum analysis, regression models, multivariate be models.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

BIOL 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

BIOL 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

BIOL 602 **Supervised Experience in College Teaching** (1-3) Supervised experience in teaching and orientation to other

selected aspects of the profession at The Pennsylvania State University.
Effective: Summer 1997

BIOL 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

BIOL 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

BIOL 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2007

1 BIOL 220W GN, 230W GN, and 240W GN each carry only 1 credit to "Writing"; all three courses must be taken to meet the W requirement.

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Biomedical Engineering Technology (BE T)

No courses for department code **BE T** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Biotechnology (BIOTC)

BIOTC 416 (MICRB 416) **Microbial Biotechnology** (2) Fundamentals of applied biotechnology; the use of microorganisms in the synthesis of biologically-important and industrially-useful products.
Effective: Spring 2009
Prerequisite: MICRB 201, MICRB 202;B M B 442 orMICRB 442

BIOTC 459 (BIOL 459, HORT 459) **Plant Tissue Culture and Biotechnology** (3) Principles and techniques for the in vitro culture, propagation, and genetic manipulations of plant cells.
Effective: Spring 2003
Prerequisite: BIOL 230W ; orB M B 251, B M B 252

BIOTC 460 (AGRO 460) **Advances and Applications of Plant Biotechnology** (3) This course provides a comprehensive overview and current status of plant biotech research. The course provides knowledge of plant systems that fall in the category of GMOs.
Effective: Spring 2009
Prerequisite: BIOL 230W, B M B 251 or equivalent

BIOTC 479 **Methods in Biofermentations** (3) Bioprocessing principles and development; uses and operation of biofermentors; determination of biomass; problems of scale-up.
Effective: Spring 2009
Prerequisite: MICRB 201, MICRB 202;B M B 251, B M B 252, B M B 442

BIOTC 489 (V SC 489) **Animal Cell Culture Methods** (3) An overview of animal cell culture methodology and its practical application in bioprocess technology.
Effective: Spring 1996
Prerequisite: MICRB 201, MICRB 202;BIOL 230W orB M B 251

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Business Administration (B A)

B A 411 **Analyzing Business and Industry** (3) Prepares students to read, interpret, and analyze financial statements effectively in order to evaluate business entities and their industries.
Effective: Summer 2003
Prerequisite: ACCTG 211, B A 301, B A 302, B A 303, B A 304

B A 412H **Honors Integration and Research** (2-3) The integration of the business core into a detailed financial, strategy and market analysis of actual companies selected by student teams.
Effective: Summer 2003 Ending: Fall 2010
Prerequisite: B A 301, B A 302, B A 303, B A 304 or any two of these with the other two taken concurrently.

B A 412H **Honors Integration and Research** (2-3) The integration of the business core into a detailed financial, strategy and market analysis of actual companies selected by student teams.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: ACCTG 211;FIN 301 orB A 301;SCM 301 orB A 302;MKTG 301 orB A 303;MGMT 301 orB A 304

B A 420 **Planning for Internship, Collaborative Project, and Research in Business** (1) Planning, preparation, and decision making for students enrolling in either B A 495A, 495B, or 495C courses in their final semester.
Effective: Summer 2002
Prerequisite: B A 321 and sixth-semester standing

B A 421 **Project Management and Planning for Business** (1-2) Planning and preparation for field experience internship, senior thesis, or group project supplemented with exercises in project management.
Effective: Spring 2003
Prerequisite: B A 322

B A 422W **Strategic Business Planning** (3) Presentations and discussion of contemporary business issues by students and visiting professionals; emphasis on effective business communications.
Effective: Spring 2008
Prerequisite: B A 421, MGMT 301, MKTG 301, FIN 301 . Prerequisite or concurrent:B A 495A, B A 495B orB A 495C

B A 427 **Risk and Decisions** (3) Conceptualizing decisions involving risk, analyzing choices, estimating the risk, and communicating the analysis.
Effective: Spring 2007
Prerequisite: MATH 110 orMATH 140 and eitherSCM 200 orSTAT 200

B A 454H **Business Honors Thesis/Project** (3) An opportunity to pursue an advanced research thesis or project to integrate studies within Business Administration.
Effective: Spring 2008
Prerequisite: HONOR 301 senior standing and permission of the program

B A 462 **Business Strategy** (3) Interpretation of business concept in the analysis of problems related to the successful management of a company, institution, or organization.
Effective: Spring 2008
Prerequisite: FIN 301, MGMT 301, MKTG 301

B A 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

B A 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

B A 495A **Internship in Business** (3-9) Guided professional practicum in business administration involving an internship with a business organization; practice of business skills in field setting.
Effective: Spring 2003
Prerequisite: B A 322, B A 420

B A 495B **Collaborative Project in Business** (3-9) Guided professional practicum in business administration involving a group project; application of business skills in collaborative setting.
Effective: Spring 2003
Prerequisite: B A 322, B A 420

B A 495C **Undergraduate Research in Business** (3-9) Guided student research in business administration; application of analytical or research techniques to business problems.
Effective: Spring 2003
Prerequisite: B A 322, B A 420

B A 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

B A 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

B A 497B (E R M 497B) **Introduction to Sustainable Business** (3) An introduction to sustainable business strategies and practices.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

B A 497F **Nittany Lion Fund Manager** (3) In this course students manage the Nittany Lion Fund, an investor-owned, student-managed investment fund.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

B A 497F **Nittany Lion Fund Manager** (3) In this course students manage the Nittany Lion Fund, an investor-owned, student-managed, investment fund.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

B A 499 (IL) **Foreign Study--Business Administration** (1-18) Study in selected countries of business institutions, functions, and current business problems.
Effective: Spring 2007
Prerequisite: ACCTG 211;ECON 002, ECON 004;SCM 200

B A 500 **Marketing Management** (1-3) An examination of the role of the market place in company management.
Effective: Fall 2008

B A 501 **Management** (2) Examination and application of concepts of human behavior and organization to managing people in work organizations.
Effective: Spring 2002

B A 502 **Team Process and Performance** (1-3) Development of managerial skills and techniques for diagnosing, intervening and leading effective teams.
Effective: Fall 2008

B A 503 **Seminar in Public Utilities** (3) No description.
Effective: Fall 1983

B A 504 **Ethical Leadership** (2) This course introduces students to their ethical responsibilities as business leaders.
Effective: Fall 2008
Prerequisite: B A 501, B A 502

B A 505 **Negotiation Theory and Skills** (1-3) Development of managerial skills for distributive and integrative negotiations at the two-party and team levels.
Effective: Fall 2009

B A 510 **Supply Chain and Operations Management** (1-3) Introduction to the organizational processes and methods used to create and deliver goods and services.
Effective: Fall 2008

B A 511 **Financial Accounting** (1-3) Basic concepts and principles (i.e. the jargon) underlying financial accounting practices.
Effective: Fall 2008

B A 512 **Quantitative Analysis for Managerial Decision Making** (2) Construction and use of quantitative methods in business decision-making.
Effective: Summer 1995

B A 513 (PHIL 513, PSY 513) **Philosophy of Social Science** (3) Study of major methodological, normative, and theoretical issues in the social sciences, emphasizing the development of positivism and critical alternatives.
Effective: Fall 2004

B A 515 **Business Statistics for Contemporary Decision Making** (2) Conceptual understanding of statistics through both numerical and applied approach.
Effective: Summer 2008

B A 517 **Communication Skills for Management** (1-3) Development of communication skills required for management; audience awareness, style, individual and group presentations.
Effective: Fall 1983
Prerequisite: admission to the Master of Business Administration program

B A 521 **Introduction to Managerial Accounting** (2) Cost accounting and the design of management accounting systems for planning and controlling operations, and for motivating personnel.
Effective: Fall 2001

B A 523 **IT Strategy** (2) An introduction to information technologies critical to business organizations.
Effective: Spring 2009

B A 528 **Business Simulation** (1-3) A team-based course during which students will manage a simulated firm.
Effective: Summer 2008

B A 531 **Introduction to Finance** (1-3) An examination of the techniques available to aid the financial manager in decision making.
Effective: Fall 2008

B A 532 **Global Business Environment** (1) An introduction to worldwide economic trends and economic problems with an emphasis on how businesses cope with global business problems.
Effective: Summer 2008

B A 533 **Economics for Managers** (2) An introduction to the tools of economic decision making and a consideration of firm, industry, and global economic influences on economic desicion making.
Effective: Spring 2002

B A 535 **Global Perspectives** (1) An overview of the global business environment.
Effective: Fall 2001

B A 536 **Global Immersion** (2) Exploration of the opportunities and the challenges of doing business in another economic region.
Effective: Summer 2008

B A 545 **Business, Government and International Economics** (2) Understand how macroeconomic events and policies affect the global economy and business decisions.
Effective: Summer 2008

B A 560 **Enterprise Consulting** (3) Student groups engaging in consulting relationships with enterprises through use of managerial techniques for identification, analysis, and solution of managerial problems.
Effective: Spring 1984
Prerequisite: ACCTG 511, Q B A 510 andB A 533, B A 555, MGMT 501, Q B A 511

B A 565 **Strategic Leadership** (1-3) Presents a senior executive perspective on key opportunities and challenges faced by business leaders.
Effective: Summer 2008

B A 571 **Strategic Management** (1-3) Analysis and application of concepts and techniques aimed at successfully developing and implementing competitive strategy in a complex business environment.
Effective: Fall 2008

B A 572 **Introduction to Business Research** (3) An introduction to issues involved in framing, defending, and evaluating business research programs.
Effective: Spring 2004
Prerequisite: admission to the doctoral program in Business Administration

B A 574 **Business Research** (1-3) A project paper, comparable in quality and scope of work to a graduate thesis, on problems of a company.
Effective: Winter 1978
Prerequisite: 15 credits of 400- and 500-level courses in business administration

B A 575 **Capstone Business Case** (4) A team-based project course that requires students to analyze an actual business problem from a firm or nonprofit organization.
Effective: Summer 2008

B A 578 **Entrepreneurship** (3) Study of the development or acquisition of a business appropriate to the objectives and resources of the individual entrepreneur.
Effective: Winter 1978

B A 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

B A 591 **Applied Communications** (1) Develop oral and written communication strategies to succeed in professional and academic contexts.
Effective: Spring 2010
Prerequisite: admission to the doctoral program in Business Administration

B A 595 **Internship** (1-12) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 2008

B A 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

B A 596A **Ethical Dim of Mgmt in the Biotech and Health Industry** (3) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

B A 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

B A 597D **Advanced Microeconomic Analysis** (3) This course discusses topics in advanced microeconomic analysis including competitive analysis, game theory, and mechanism design.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

B A 599 (IL) **Foreign Study--Business Administration** (1-12) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in established exchange program

B A 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

B A 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

B A 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 1999

B A 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

B A 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Business Law (B LAW)

B LAW 410 **Criminal Law in the Business Community** (3) The basic principles of criminal law as they affect society and the business community.
Effective: Spring 1996
Prerequisite: B A 243 orB LAW 243

B LAW 424 (R EST 424) **Real Estate Law** (3) Analyze contemporary law applicable to various types of ownership interests and rights, methods of transferring ownership, and use of real property.
Effective: Spring 2005
Prerequisite: B LAW 346

B LAW 425 (R EST 425) **Environmental Law, Property, and Commerce** (3) Examines the impacts of major federal environmental laws on business relations and property interests.
Effective: Summer 1995
Prerequisite: B A 243, B LAW 243 orE R M 151

B LAW 444 **Advanced UCC and Commercial Transactions** (3) All articles of the Uniform Commercial Code, banking relationships, debtor- creditor law, and bankruptcy law.
Effective: Spring 2005
Prerequisite: B A 241 orB A 243 andACCTG 211 andB A 301 orFIN 100

B LAW 445 **Intellectual Property & Competition Law** (3) Copyrights, trademarks, patents, and trade secrets followed by related topics in the regulation of competition.
Effective: Spring 2005
Prerequisite: B LAW 346

B LAW 471 (CRIMJ 471) **Legal Rights, Duties, Liabilities of Criminal Justice Personnel** (3) Civil law issues within a justice agency and between criminal justice agencies and members of the public.
Effective: Spring 2008
Prerequisite: CRIMJ 100

B LAW 473 (CRIMJ 473) **Criminal Procedure and Evidence in the Business Community** (3) Law of evidence and proof, constitutional constraints on police procedures (arrest, search, etc.) in society and the business community.
Effective: Spring 2008
Prerequisite: CRIMJ 100

B LAW 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2003

B LAW 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

B LAW 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

B LAW 497 **Special Topics** (1-9) Formal courses given infrequently to exlore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

B LAW 497A **Legal & Regulatory Environment of Business Relationships** (3) In this course, the legal construct of the employment environment is evaluated, especially the employer-employee relationship.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

B LAW 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

B LAW 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

B LAW 521 **Cyberlaw** (2) Survey of legal, regulatory, and public policy issues related to information technology and eBusiness.
Effective: Summer 2002

B LAW 525 **Business Law for Innovation and Competition** (2) Nature of intellectual property rights, as well as process for

obtaining and enforcing them.
Effective: Summer 2008

B LAW 575 **Legal Environment of the Securities Markets** (2) Impact of securities regulations on corporate finance, investment banking, mergers and acquisitions, venture capital and the securities industry.
Effective: Spring 2003

B LAW 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

B LAW 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1990

B LAW 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

B LAW 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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Business Logistics (B LOG)

B LOG 410 **Transport Economics and Policy** (3) Advanced study of the principles of transportation economics and their application and the impacts of transport policy choices.
Effective: Spring 2007
Prerequisite: SCM 320

B LOG 541 **Seminar in Public Transportation Policy and Management** (3) Role of public transport in social and economic activity, policy, planning, and management topics; analytical methods applied to public transit issues.
Effective: Fall 1993

B LOG 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Winter 1978

B LOG 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

B LOG 597 **Special Topics** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

B LOG 599 (IL) **Foreign Study--Business Logistics** (1-12) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in established exchange program

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Chemical Engineering (CH E)

CH E 410 **Mass Transfer Operations** (3) Introduction to principles and applications of mass transfer, with focus on the design of equilibrium stage and continuous contacting separation processes.
Effective: Spring 2006
Prerequisite: CH E 320, CH E 330, CH E 350

CH E 430 **Chemical Reaction Engineering** (3) Chemical reaction rates and equilibria, reactors, reactor design; emphasis on industrial chemical processes.
Effective: Spring 2006
Prerequisite: CH E 320, CH E 330, CH E 350, CH E 360

CH E 432 (F SC 432) **Petroleum Processing** (3) A study of physical and chemical processes to convert crude oil into desired products with an outlook from present to future.
Effective: Summer 2007
Prerequisite: CHEM 210

CH E 435 (F SC 435) **Industrial Organic Chemistry** (3) Chemistry and processes for producing organic chemicals and materials in existing and emerging new manufacturing sectors of organic chemical industry.
Effective: Summer 2007
Prerequisite: CHEM 210

CH E 438 **Bioprocess Engineering** (3) Introduction to the biotechnology field including consideration of upstream and downstream processing of biochemicals.
Effective: Summer 2007
Prerequisite: CHEM 212

CH E 441 **Polymer Processing** (3) Application of principles of heat, mass, and momentum transfer to the analysis of polymer processing problems.
Effective: Spring 2006
Prerequisite: CH E 330, CH E 350 orMATSE 443

CH E 442 (MATSE 448) **Polymer Processing Technology** (3) Basic principles of polymer melt processing are reviewed and subsequently applied to the most important industrial processing operations.
Effective: Fall 2006
Prerequisite: MATSE 447 orCH E 330

CH E 446 **Transport Phenomena** (3) Fundamental treatment of mass, heat, and momentum transfer; emphasis on transport properties and mathematical models of chemical engineering transport processes.
Effective: Spring 2006
Prerequisite: CH E 330, CH E 350, CH E 360 ; prerequisite or concurrent:CH E 410

CH E 446H **Transport Phenomena** (3) Fundamental treatment of mass, heat, and momentum transfer; emphasis on transport properties and mathematical models of chemical engineering transport processes.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: CH E 330, CH E 350, CH E 360 ; prerequisite or concurrent:CH E 410

CH E 448 **Advanced Mass Transfer Operations** (3) Diffusion and mass transfer as applied to stagewise and continuous contact operations, including equipment design.
Effective: Spring 2006
Prerequisite: CH E 410

CH E 449 **Bioseparations** (3) Analysis and design of separation processes for the purification of biological molecules.
Effective: Spring 2006
Prerequisite: CH E 410

CH E 450 **Process Dynamics and Control** (3) Analysis of time-dependent variables in chemical process plants; reactor design and control; computer applications.
Effective: Spring 2006
Prerequisite: Prerequisite or concurrent:CH E 410, CH E 430

CH E 452 **Chemical Process Safety** (3) This course provides an overview of Process Safety in the Chemical Industry, focusing on the nature of chemical plant addidents.
Effective: Spring 2007
Prerequisite: Prerequisite or concurrent:CH E 410, CH E 430

CH E 453 **Advanced Chemical Engineering Thermodynamics** (3) Physical and chemical equilibria in multicomponent systems, including chemically reacting and heterogeneous systems.
Effective: Spring 2006
Prerequisite: CH E 320

CH E 455 **Advanced Chemical Reactor Design** (3) Application of kinetics to reactor design: nonideal and nonisothermal reactors; scale-up techniques; adsorption and heterogeneous catalysis.
Effective: Spring 2006
Prerequisite: CH E 430

CH E 465 **Design Projects in Chemical Engineering** (1-6) Problems in design and/or synthesis of chemical engineering

processes and/or systems, including a final report on project results.
Effective: Spring 2006
Prerequisite: CH E 410, CH E 430

CH E 470 **Design of Chemical Plants** (3) Lectures and practicum on methods and calculations, including economic evaluations for the design of chemical plants; formal technical report required.
Effective: Spring 2006
Prerequisite: CH E 410, CH E 430

CH E 480M **Chemical Engineering Laboratory (Honors)** (3) Data interpretation and analysis from student-operated experiments on pilot-plant equipment. Individual written and oral technical reports.
Effective: Spring 2008
Prerequisite: ENGL 202C ; prerequisite or concurrent:CH E 410, CH E 430

CH E 480W **Chemical Engineering Laboratory** (3) Data interpretation and correlation from student-operated experiments on pilot-plant equipment. Individual written and oral technical reports.
Effective: Spring 2006
Prerequisite: ENGL 202C ; prerequisite or concurrent:CH E 410, CH E 430

CH E 494 **Research Projects in Chemical Engineering** (1-6) An original problem, including a search of the literature, experimental investigation, and preparation in formal thesis form.
Effective: Fall 2007
Prerequisite: Permission of program

CH E 494H **Research Projects in Chemical Engineering (Honors)** (1-6) An original problem, including a search of the literature, experimental investigation, and preparation in formal thesis form.
Effective: Spring 2008
Prerequisite: Permission of program

CH E 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 1996

CH E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

CH E 497A **Polymers and Complex Fluids** (3) Introduction to the field of complex fluids, or "fluids with stuff in them" polymer melts and solutions (rubber cement, mucus, molten plastics, Silly Putty, DNA), self-assembled fluids (soap suspensions, foams, micromulsions, cell membranes, and colloidal suspensions (milk, paint, ink, blood).
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: CHEM 466

CH E 497A **Chemical Energy Technology** (3) A survey of current and alternative chemical energy sources and conversion approaches.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: CH E 210 andCH E 220

CH E 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Fall 2007

CH E 501 (BIOE 501) **Bioengineering Transport Phenomena** (3) Application of the equations of mass, energy, and momentum conservation to physiological phenomena and to the design of artificial organs.
Effective: Summer 1990

CH E 503 (BIOE 503) **Fluid Mechanics of Bioengineering Systems** (3) Cardiovascular system and blood flow, non-Newtonian fluid description, vessel flows, unsteady flows and wave motion, windkessel theory, transmission line theory.
Effective: Summer 1990

CH E 516 **Methods of Process Design** (3) Survey of mathematical techniques of chemical process design with emphasis on economic choice and optimal decision making.
Effective: Fall 1983

CH E 524 **Chemical Engineering, Application of Thermodynamics** (3) Elements of thermochemistry and thermodynamics of greatest importance in chemical engineering.
Effective: Fall 1983

CH E 528 **Colloidal Forces and Thermodynamics** (3) Unified treatment of formation, growth and stability of colloids based on principles of intermolecular and colloidal forces and thermodynamics.
Effective: Summer 2007
Prerequisite: CHEM 450, CH E 320 or an equivalent background in chemical thermodynamics

CH E 535 **Chemical Reaction Engineering** (3) Optimal design of batch and continuous chemical reactors and reactor

batteries; effect of mixing on reactor operation.
Effective: Winter 1978

CH E 536 **Heterogeneous Catalysis** (3) Thermodynamics and kinetics of adsorption and reactions on solid surfaces, heat and mass transfer effects, theory and correlations in catalysis.
Effective: Summer 2007
Prerequisite: CHEM 450, CHEM 452

CH E 544 **General Transport Phenomena** (3) Formulation and solution of transport problems involving momentum, heat, and mass transfer, with chemical engineering applications.
Effective: Spring 2007
Prerequisite: CH E 330, CH E 350, CH E 410

CH E 545 **Transport Phenomena I** (3) Momemtum transport, laminar and turbulent flow, boundary layer analysis, non-Newtonian flow, mechanical energy balance, chemical engineering applications.
Effective: Fall 1982

CH E 546 **Transport Phenomena II** (3) Heat and mass transfer, steady and unsteady state, coupling, molecular diffusion, moving boundaries, transfer coefficients, chemical engineering applications.
Effective: Fall 1982

CH E 576 (C E 576) **Environmental Transport Processes** (3) Fundamentals of chemical transport in engineered environments, such as biofilm reactors, and natural systems including aquifers and rivers.
Effective: Fall 2001
Prerequisite: C E 475

CH E 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1988

CH E 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2004

CH E 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

CH E 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

CH E 597B **Research Topics in Chemical Engineering** (1) Lecture and discussion by visiting faculty and engineers on the most recent topics in Chemical Engineering.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CH E 597B **Research Topics in Chemical Engineering** (1) Lecture and discussion by visiting faculty and engineers on the most recent topics in Chemical Engineering.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CH E 597C (MATSE 597C) **Surface and Interface Characterization** (3) This course studies the principles and applications of various types of surface and interface characterization techniques that are frequently used.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CH E 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Fall 2007

CH E 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

CH E 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

CH E 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Opportunity for supervised and graded teaching experience for graduate students in chemical engineering.
Effective: Fall 1983
Prerequisite: At least one year of graduate study in chemical engineering.

CH E 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

CH E 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Chemistry (CHEM)

CHEM 400 **Chemical Literature** (1) Instruction in use of the library and of the literature of chemistry.
Effective: Summer 2007
Prerequisite: 12 credits of chemistry

CHEM 402 **Chemistry in the Environment** (3) Chemistry of the atmosphere, natural waters, and the land surface with particular focus on human influence on processes occurring therein.
Effective: Summer 2007
Prerequisite: CHEM 212 . Prerequisite or concurrent:CHEM 450 orCH E 320

CHEM 406 (NUC E 405) **Nuclear and Radiochemistry** (3) Theory of radioactive decay processes, nuclear properties and structure, nuclear reactions, interactions of radiation with matter, biological effects of radiation.
Effective: Summer 2007
Prerequisite: CHEM 452 orPHYS 237 orNUC E 301

CHEM 408 **Computational Chemistry** (3) Introduction to numerical and nonnumerical computer uses in physical science.
Effective: Summer 2007
Prerequisite: Prerequisite or concurrent:CHEM 452

CHEM 410 **Inorganic Chemistry** (3) Conceptual and descriptive aspects of nontransition elements, covering structural, thermodynamic, and kinetic features.
Effective: Summer 2007
Prerequisite: CHEM 112 andCHEM 202 orCHEM 210 . Prerequisite or concurrent:CHEM 450 orCHEM 452

CHEM 412 **Transition Metal Chemistry** (3) Structure and bonding of compounds containing transition metals.
Effective: Summer 2007
Prerequisite: CHEM 112 andCHEM 202 orCHEM 210 . Prerequisite or concurrent:CHEM 450 orCHEM 452

CHEM 413W **Chemistry of the Elements** (4) Theoretical and descriptive chemistry of the elements; laboratory synthesis and measurements in inorganic, coordination, and transition metal chemistry.
Effective: Summer 2007
Prerequisite: CHEM 213

CHEM 423 **Chemical Spectroscopy** (3) Modern methods and instruments of spectroscopy and their applications to problems of chemical structure and analysis.
Effective: Summer 2007 Ending: Fall 2010
Prerequisite: CHEM 452, CHEM 457

CHEM 423W **Chemical Spectroscopy** (4) Modern methods and instruments of spectroscopy and their applications to problems of chemical structure and analysis.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: CHEM 452, CHEM 457

CHEM 425 **Chromatography and Electrochemistry** (3) Gas, liquid, and other forms of chromatography; important techniques of electrochemistry.
Effective: Summer 2007
Prerequisite: CHEM 450 andCHEM 457

CHEM 427W (FRNSC 427W) **Forensic Chemistry** (4) Analytical and instrumental methods used in the forensic sciences with special emphasis on the analysis and characterization of trace evidence.
Effective: Spring 2008
Prerequisite: CHEM 213 andCHEM 227

CHEM 430 **Structural Analysis of Organic Compounds** (3) Spectroscopic methods as tools in gross and detailed structural analysis and interpretation within the framework of modern theory.
Effective: Summer 2007 Ending: Summer 2010
Prerequisite: CHEM 213

CHEM 430 **Structural Analysis of Organic Compounds** (3) Spectroscopic methods as tools in gross and detailed structural analysis and interpretation within the framework of modern theory.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CHEM 210 andCHEM 213 Concurrent: CHEM 213

CHEM 431W **Organic and Inorganic Preparations** (3) Preparation, purification, and characterization of both organic and inorganic compounds by modern methods.
Effective: Summer 2007 Ending: Summer 2010
Prerequisite: CHEM 213

CHEM 431W **Organic and Inorganic Preparations** (4) Preparation, purification, and characterization of both organic and inorganic compounds by modern methods.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CHEM 213

CHEM 440 **Instrumental Analysis** (3) General instrumental theory and methods used in common atomic and molecular analyses.
Effective: Summer 2007

Prerequisite: CHEM 450 andCHEM 221

CHEM 441 **Elemental Analysis and Instrumental Design Laboratory** (1) An introduction to the use of modern instruments for problems in chemical structure and analysis.
Effective: Summer 2007
Prerequisite: or concurrent:CHEM 440

CHEM 443 **Electrochemistry and Chromatography Laboratory** (1) An introduction to the use of modern instruments for problems in chemical structure and analysis.
Effective: Summer 2007
Prerequisite: or concurrent:CHEM 440

CHEM 445 **Atomic and Molecular Spectroscopy Laboratory** (1) An introduction to the use of modern instruments for problems in chemical structure and analysis.
Effective: Summer 2007
Prerequisite: or concurrent:CHEM 440

CHEM 446 **X-Ray Crystallography** (3) Theoretical and practical aspects of structure determination using x-ray diffraction, from crystal growth to structure solution.
Effective: Summer 2007
Prerequisite: CHEM 210

CHEM 448 **Surface Chemistry** (3) Surface chemistry, emphasizing the physical and chemical aspects of surfaces important for applications in colloids, catalysis, microelectronics and biocompatibility.
Effective: Summer 2007
Prerequisite: CHEM 450 andCHEM 452

CHEM 450 **Physical Chemistry - Thermodynamics** (3) Introduction to physical chemistry with primary emphasis on chemical thermodynamics and its molecular interpretation.(Graduate credit not allowed for students majoring in Biochemistry and Molecular Biology, Chemistry, or Chemical Engineering.)
Effective: Summer 2007
Prerequisite: CHEM 112 andMATH 141, PHYS 211 orPHYS 212

CHEM 452 **Physical Chemistry - Quantum Chemistry** (3) Introduction to physical chemistry with primary emphasis on molecular structure, spectroscopy, and chemical kinetics. (Graduate credit not allowed for students majoring in Biochemistry and Molecular Biology, Chemistry, or Chemical Engineering.) **2**
Effective: Summer 2007
Prerequisite: CHEM 112 andMATH 141 andPHYS 211 orPHYS 212

CHEM 457 **Experimental Physical Chemistry** (2) Laboratory experiments designed to illustrate the principles of physical chemistry and teach techniques of error analysis and the presentation of quantitative data. (Graduate credit not allowed for students majoring in Biochemistry and Molecular Biology, Chemistry, or Chemical Engineering.) **2**
Effective: Summer 2007
Prerequisite: or concurrent:CHEM 450 orCH E 320

CHEM 459W **Advanced Experimental Physical Chemistry** (4) Laboratory experiments and projects for students interested in advanced study in physical chemistry.
Effective: Summer 2010
Prerequisite: CHEM 450, CHEM 457 Prerequisite or concurrent:CHEM 452

CHEM 460 **Advanced Thermodynamics** (3) Chemical thermodynamics, with applications to pure phases, solutions, and chemical reactions.
Effective: Spring 2009
Prerequisite: CH E 220 orCHEM 450

CHEM 462 **Advanced Quantum Chemistry** (3) Introduction to quantum chemistry, with emphasis on atomic and molecular structure.
Effective: Summer 2007
Prerequisite: CHEM 452

CHEM 464 **Chemical Kinetics and Dynamics** (3) Introduction to chemical kinetics and molecular dynamics.
Effective: Spring 2009
Prerequisite: CHEM 450 orCH E 220 andCHEM 452

CHEM 466 **Molecular Thermodynamics** (3) Introduction to physical chemistry with a primary emphasis on the statistical and molecular interpretation of thermodynamics.
Effective: Summer 2007
Prerequisite: CHEM 450 orCH E 220

CHEM 472 **General Biochemistry I** (3) Basic structure and function of cellular components; principles of enzyme kinetics and regulation.
Effective: Summer 2007
Prerequisite: CHEM 212

CHEM 474 **Organic Synthesis** (3) Theory and methodology of organic synthesis applied to complex organic molecules.
Effective: Spring 2007
Prerequisite: CHEM 039

CHEM 476 **Biological Chemistry** (3) Fundamentals of Biochemistry for Chemists. Students cannot receive credit for both CHEM 476 and B M B 401 or B M B 402.
Effective: Fall 2009

Prerequisite: CHEM 212 andCHEM 450 Concurrent: CHEM 452

CHEM 494 **Chemical Research** (1-10 per semester/maximum of 20) Experimental investigation of an original research problem. Preparation of a formal thesis is optional. (Credit not allowed for graduate students in Biochemistry, Chemistry or Chemical Engineering.)
Effective: Summer 2007

CHEM 494H **Chemical Research** (1-10 per semester/maximum of 20) Experimental investigation of an original research problem. Preparation of a formal thesis is optional. (Credit not allowed for graduate students in Biochemistry, Chemistry or Chemical Engineering.)
Effective: Fall 2007

CHEM 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 2007
Prerequisite: prior approval of proposed assignment by instructor

CHEM 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1988

CHEM 496A **Synthesis of Polymerization Catalysts** (3) Undergraduate research into the synthesis of sulfur-containing organic molecules for the preparation of polymeric compounds with controlled molecular masses and chain architecture.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CHEM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1982

CHEM 497A **Organic Reaction Mechanisms** (3) This course focuses on the study and analysis of selected electron-pushing mechanisms of organic reactions.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CHEM 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

CHEM 500 **Seminar in Chemistry** (1-2 per semester) No description.
Effective: Spring 2001

CHEM 516 **Inorganic Chemistry** (3) Systematic treatment of inorganic chemistry in terms of modern concepts.
Effective: Winter 1978

CHEM 517 **Organometallic Chemistry** (3) Organometallic compounds and their use in catalysis and organic synthesis.
Effective: Summer 1990

CHEM 518 **Physical Methods in Inorganic Chemistry** (3 per semester) Elements of group theory, transition metal electronic spectroscopy, vibrational spectroscopy, magnetic resonance, magnetism, x-ray and photoelectron spectroscopy, x-ray structure.
Effective: Summer 1990

CHEM 524 **Electroanalytical Chemistry** (3) Modern instrumental methods of analysis; electrochemistry.
Effective: Spring 1987

CHEM 525 **Analytical Separations** (3) Modern instrumental analysis, including chromatography and other separation methods.
Effective: Spring 1987

CHEM 526 **Spectroscopic Analysis** (3) Modern instrumental analysis, including absorption, emission, electronic, and magnetic spectroscopies.
Effective: Spring 1987

CHEM 527 **Special Topics in Analytical Chemistry** (2-12) No description.
Effective: Fall 1983

CHEM 531 **Special Topics in Organic Chemistry** (3-12) No description.
Effective: Fall 1983

Prerequisite: CHEM 536

CHEM 535 **Organic Reaction Mechanisms I** (3) Reaction mechanisms and their determination by kinetic and nonkinetic methods. Reactive intermediates.
Effective: Spring 2009
Prerequisite: CHEM 212

CHEM 536 **Organic Reaction Mechanisms II** (3) Reaction mechanisms and their determination by kinetic and nonkinetic methods. Reactive intermediates.
Effective: Summer 2007
Prerequisite: CHEM 430

CHEM 537 **Synthesis in Organic Chemistry** (3) Theory and methods of directed syntheses, including stereospecific and stereoselected schemes; biologically inspired syntheses.
Effective: Winter 1978
Prerequisite: CHEM 536

CHEM 539 **Mechanistic Bioorganic Chemistry** (3) Advanced organic reaction mechanisms, particularly those applicable to biological systems.
Effective: Fall 1983
Prerequisite: CHEM 535, BIOCH 401

CHEM 540 **Biophysical Chemistry** (3) Structure of biomacromolecules, physical techniques for the study of structure and function, thermodynamic and kinetic studies of biomacromolecules in solution.
Effective: Summer 1991
Prerequisite: CHEM 452

CHEM 543 (MATSE 543) **Polymer Chemistry** (3) This graduate course discusses the new advances in polymer chemistry that leads to new polymeric materials with interesting structures and properties.
Effective: Spring 2005
Prerequisite: MATSE 441 or approval of program

CHEM 544 **Chemical Thermodynamics** (3) Development of thermodynamic theory, with special reference to common physical changes and chemical reactions.
Effective: Fall 1984
Prerequisite: CHEM 452

CHEM 545 **Statistical Thermodynamics** (3) Basic principles of statistical mechanics with application to the calculation of thermodynamic properties of gases and condensed phases.
Effective: Summer 2007
Prerequisite: CHEM 450, CHEM 452

CHEM 560 **Topics in Physical Chemistry** (2-6) No description.
Effective: Fall 1983

CHEM 563 **Chemical Dynamics** (3) Molecular dynamics of chemical reaction, energy transfer, and scattering. Reaction rate theory and experiment.
Effective: Fall 1986
Prerequisite: CHEM 565

CHEM 565 **Quantum Chemistry I** (3) An introduction to the principles of quantum mechanics and their applications to chemistry.
Effective: Fall 1986
Prerequisite: CHEM 452

CHEM 566 **Quantum Chemistry II** (3) Modern techniques in quantum mechanics, with applications to problems in molecular structure and interactions.
Effective: Fall 1986
Prerequisite: CHEM 565

CHEM 567 **Molecular Spectroscopy** (3) Principles and methods of molecular spectroscopy and their applications to chemical problems.
Effective: Fall 1986
Prerequisite: CHEM 565

CHEM 571 **Polymer Chemistry** (3) The synthesis, reactions, and structure determination of high polymers.
Effective: Winter 1978

CHEM 589 **Studies in Chemistry** (1-9) Theoretical research, experimental research, or a critical survey of the literature in an area of chemistry.
Effective: Winter 1978

CHEM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

CHEM 597A **Biophysical Chemistry with Applications to Nucleic Acids** (3) Provide a foundation into biophysical

approaches for studying the quantitative and structure-function relationships in nucleic acids systems.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CHEM 597A **Medicinal Chemistry and Chemical Biology** (3) Principles of conventional medicinal chemistry, case studies of new drug discovery, and latest development in chemical biology will be covered in this course.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: CHEM 212

CHEM 597B **Bioinorganic Chemistry** (3) This course will cover principles of biochemistry for chemists, principles of coordination chemistry of biochemists, spectroscopy, and metallobiochemistry.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CHEM 597C **Theoretical NMR Spectroscopy** (3) The NMR spectrometer, the classical view, the quantum mechanical view, rotations in spin space, the Hamiltonians of NMR, Rotations in Real Space, Effects of Chemical Exchange.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CHEM 597E **Bioorganic Chemistry** (3) Principles of basic molecular and cellular biology from the organic chemical perspective, and the introduction of chemical approaches to study biology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CHEM 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

CHEM 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

CHEM 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching of chemistry undergraduate laboratory and recitation classes with senior faculty instruction supervision.
Effective: Fall 1983

CHEM 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

CHEM 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

1 GN To receive Natural Sciences General Education (GN) credit for certain chemistry courses requires both lecture and laboratory courses be taken. These courses are: (CHEM 106 or CHEM 110 or CHEM 110H) and CHEM 111; (CHEM 112 or CHEM 112H) and (CHEM 113 or CHEM 113B).

2 Graduate credit not allowed for student majoring in BioChemistry, Chemistry, or Chemical Engineering.

3 Students may take only one course for General Education credit from CHEM 101 GN or CHEM 110 GN.

Last Import from UCM: July 10, 2010 3:00 AM

Chinese (CHNS)

CHNS 401 (IL) **Advanced Conversation** (4) Emphasis on oral proficiency through discussions of aspects of contemporary Chinese culture.
Effective: Spring 2010 Ending: Fall 2010
Prerequisite: CHNS 110

CHNS 401 (IL) **Level Three Chinese A** (4) Emphasis on oral proficiency through discussions of aspects of contemporary Chinese culture.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: CHNS 110

CHNS 402 (IL) **Advanced Reading** (4) Readings in representative works of traditional and modern literature; practice in composition; study of aspects of Chinese culture.
Effective: Spring 2010 Ending: Fall 2010
Prerequisite: CHNS 401 OR EQUIVALENT

CHNS 402 (IL) **Level Three Chinese B** (4) Readings in representative works of traditional and modern literature; practice in composition; study of aspects of Chinese culture.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: CHNS 401 OR EQUIVALENT

CHNS 403W **Practical Written Communication: Chinese for Professional and Academic Purposes** (3) Discussions, presentations, readings, and compositions emphasizing written styles used in newspapers, magazines, business reports, academic writing, and other texts.
Effective: Spring 2010
Prerequisite: CHNS 401

CHNS 452 (IL) **Contemporary China: Culture and Trends** (3 per semester/maximum of 6) Survey of aspects of the contemporary Chinese-speaking world. Includes readings from Chinese newspapers, magazines, and fiction. Topics may vary each semester.
Effective: Spring 2010
Prerequisite: CHNS 401

CHNS 453 (IL) **Chinese Film** (3 per semester/maximum of 6) Selected films and directors representing various aspects of Chinese culture and cinema. Topics may vary each semester. Taught in Chinese.
Effective: Spring 2010
Prerequisite: CHNS 401

CHNS 454 (IL) **Introduction to Classical Chinese** (3 per semester/maximum of 6) Basic patterns and structures of Classical Chinese to the first millennium B.C. to the 19th century.
Effective: Spring 2010
Prerequisite: CHNS 401 or equivalent (such as study abroad credit)

CHNS 455 (IL) **Masterpieces of Traditional Chinese Literature** (3) Survey of traditional Chinese literature, including poetry, historical narratives, philosophical texts, and drama and novel.
Effective: Spring 2010
Prerequisite: CHNS 401 or equivalent

CHNS 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2010

CHNS 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2010

CHNS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2010

CHNS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2010

CHNS 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2010

CHNS 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2010

CHNS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1997

CHNS 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

CHNS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

Last Import from UCM: July 10, 2010 3:00 AM

Civ & Comnity Engage (CIVCM)

No courses for department code **CIVCM** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Civil Engineering (C E)

C E 400 **Seminar** (1-3) No description.
Effective: Fall 1992

C E 410W **Sustainable Residential Subdivision Design** (3) Residential subdivision process; site selection; conservation and neo- traditional design; utility design and layout; best management practices for erosion and stormwater.
Effective: Fall 2001
Prerequisite: A E 372 orC E 332 ; seventh-semester standing in Architectural or Civil Engineering

C E 421W **Transportation Design** (3) Design of streets and highway facilities; emphasis on geometric elements, intersections and interchanges, roadway drainage, and pavement design.
Effective: Spring 2002
Prerequisite: C E 321

C E 422 **Transportation Planning** (3) Transportation systems planning, programming, and management; modeling and simulation, data collection, analysis, and forecasting.
Effective: Spring 2002
Prerequisite: 3 credits in probability or statistics

C E 423 **Traffic Operations** (3) The highway capacity manual, concepts and analyses, freeway operations, signalized and unsignalized intersections, signal coordination, traffic impact studies.
Effective: Spring 1997
Prerequisite: C E 321

C E 424 **Optimization in Civil Engineering Systems** (3) Mathematical modeling; linear programming; dynamic programming; network optimization, including network flows, shortest paths, scheduling; decision-making; civil engineering systems applications.
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 202

C E 432 **Construction Project Management** (3) Fundamentals of project management, construction scheduling using the CPM technique, construction project preplanning, and control of quality, safety, and costs.
Effective: Fall 2007
Prerequisite: C E 332

C E 435 **Foundation Engineering** (3) Bearing capacity, settlement, and structural design of shallow foundations; lateral earth pressure; retaining and sheet-pile walls; introduction to deep foundations
Effective: Fall 2001
Prerequisite: C E 335 . Prerequiste or concurrent:C E 341

C E 436 **Construction Engineering Materials** (3) Design, production, application, specification, and quality control of construction materials unique to civil engineering.
Effective: Fall 2001
Prerequisite: C E 336, STAT 401

C E 438W **Construction Engineering Capstone Design** (3) Construction project integrating geotechnical reports; materials specifications; quality control; equipment; estimation; scheduling; design details: excavations, foundations, retaining walls, formwork, pavements.
Effective: Fall 2007
Prerequisite: C E 432 andC E 435 orC E 436

C E 441 **Structural Design of Foundations** (3) Design of concentrically and eccentrically loaded square, rectangular, and combined footings; analysis and design of mat foundations; retaining walls; piles caps; flexible retaining design, and caissons.
Effective: Summer 2009
Prerequisite: C E 335, C E 341 Concurrent: C E 342

C E 445 **Advanced Structural Analysis** (3) Analysis of trusses and frame stiffness matrix method of analysis. Analysis of indeterminate beams, trusses, and frames using classical methods.
Effective: Spring 2008
Prerequisite: CET 430

C E 447 **Structural Analysis by Matrix Methods** (3) Analysis of truss and frame structures using flexibility and stiffness methods of matrix analysis. Computer applications.
Effective: Fall 1992
Prerequisite: C E 340

C E 448W **Advanced Structural Design** (3) Wind, snow, seismic, bridge loads; building design using steel, concrete, and prestressed concrete; advanced steel connections; capstone project; computer applications.
Effective: Spring 2002
Prerequisite: C E 341, C E 342, C E 435

C E 449 **Advanced Structural Design** (3) Special systems, frames and bracing in steel, wood and reinforced or precast concrete. Introduction to composite construction.
Effective: Spring 2008

Prerequisite: CET 430, CET 431, CET 432

C E 450 **Law and Technology** (3) Introduction to legal aspects of engineering and technology, including intellectual property (patents, copyrights) and products liability.
Effective: Spring 2008

C E 454 **Safety** (3) This course will focus on safety issues as they relate to OSHA.
Effective: Spring 2008
Prerequisite: permission of program

C E 456 **Planning and Scheduling** (3) Theory and practice used in planning and scheduling projects; defining task and resources, creating logic diagrams, and monitoring the projects.
Effective: Spring 2008
Prerequisite: C E 333W, CET 435, I E 303

C E 458 **Construction Management II** (3) Procedures in construction organization including procurement, ethics, field supervision, legal and managerial problems, personnel, cost accounting, and construction business practices.
Effective: Spring 2008
Prerequisite: C E 333W, C E 456

C E 461 **Water-resource Engineering** (3) Qualitative and quantitative description of the hydrologic cycle, flood and drought frequency analysis, climate and land use change impacts, risk analysis and uncertainty, water resource management at regional, national and global scale.
Effective: Spring 2010
Prerequisite: C E 360

C E 462 **Open Channel Hydraulics** (3) Free surface flow in rivers, canals, steep chutes, stilling basins, and transitions.
Effective: Spring 2002
Prerequisite: C E 360

C E 465W **Water Resources Capstone Course** (3) Hydraulic design of river structures and open channels including supercritical and spatially varied flow; hydrologic/hydraulic computer modeling; design project.
Effective: Fall 2007
Prerequisite: C E 361 . Prerequisite or concurrent:C E 462

C E 471 **Environmental Sanitation** (3) Public health engineering applications related to communicable diseases, water supply, wastewater disposal, solid wastes, air pollution, food, vectors, and radiation.
Effective: Fall 1992
Prerequisite: seventh-semester standing 3 credits in biology 3 credits in chemistry

C E 472W **Environmental Engineering Capstone Design** (3) Principles and design of unit operations for water; domestic and industrial wastewater treatment; equipment selection and application.
Effective: Spring 2002
Prerequisite: C E 370, C E 371

C E 473 **Water Quality Management** (3) Water quality criteria and standards; fate and impact of pollutants in aquatic systems; technology available for wastewater renovation.
Effective: Fall 1992
Prerequisite: seventh-semester standing

C E 475 **Water Quality Chemistry** (3) Chemistry applicable to the understanding and analysis of water quality, pollution, and treatment.
Effective: Summer 2007 Ending: Fall 2010
Prerequisite: C E 370, CHEM 110, CHEM 111

C E 475 **Water Quality Chemistry** (4) Chemistry applicable to the understanding and analysis of water quality, pollution, and treatment.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: C E 370, CHEM 110, CHEM 111

C E 476 **Solid and Hazardous Wastes** (3) Characteristics and treatment of solid wastes and hazardous wastes.
Effective: Spring 2002
Prerequisite: C E 370, C E 371

C E 479 **Environmental Microbiology Laboratory** (1) Introductory microbiology course; application of diagnostic microbiological techniques to the characterization of wastewater enrichment cultures and pure cultures.
Effective: Fall 1992 Ending: Fall 2010
Prerequisite: MICRB 400 seventh-semester standing

C E 479 **Environmental Microbiology for Engineers** (3) Intro microbiology for engineers; microbe structure, function, and diversity; environmental ecosystems; diagnostic labs.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: CHEM 111, C E 370

C E 488C **Capstone Project - Construction** (4) This course consists of a project either selected by the students with approval or assigned by the instructor.
Effective: Spring 2008
Prerequisite: eighth-semester Structural Design and Construction Engineering Technology student. Previous or concurrent:CET 430, CET 431, CET 432, CET 435, C E 456

C E 488D **Capstone Project - Structural Design** (4) This course consists of a structural design project either selected by the students with approval or assigned by the instructor.
Effective: Spring 2008
Prerequisite: eighth-semester Structural Design and Construction Engineering Technology student. Previous or concurrent:CET 430, CET 431, CET 432 andCET 435

C E 494 **Senior Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Fall 1992

C E 494H **Honors Senior Thesis** (1-6) Investigation of an original project in the area of Civil Engineering.
Effective: Summer 2006

C E 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1992

C E 496A **Housing Competition Project** (1) Student teams will work on a project for the NAHB Housing Competition. Travel involved. Contact Instructor.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

C E 497A **Enviornmental Microbiology** (2) Introductory microbiology course for engineers comprised of the fundamentals of microbiology, and application of these fundamental principles to environmental systems.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C E 497A **Traffic Engineering** (3) Field data collection and analysis; traffic signal design and analysis; unsignalized intersection operations; traffic impact analysis; software applications in traffic engineering.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C E 497C **Analysis of Transportation Policy: The Larson Lectures** (3) Analysis of different areas of transportation policy, including: current transportation challenges, strategic planning and performance measurement; financing; energy and climate issues; changing patterns of travel demand; public transportation and passenger rail; freight transportation, intelligent transportation systems, and safety.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C E 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

C E 511 **Engineering Soil Characteristics** (3) Applications of physico-chemical principles in soil engineering; soil composition; factors influencing engineering soil properties.
Effective: Fall 1992
Prerequisite: C E 335

C E 512 **Soil Mechanics II** (2-5) Evaluation of strength parameters and compressibility of soils; elastic analysis of stress and strain; techniques of forecasting foundation settlement; slope stability analysis.
Effective: Fall 1992

C E 513 **Advanced Foundation Engineering** (3) Practical applications of soil mechanics principles to geotechnical engineering problems; dewatering techniques; design of deep foundations and retaining structures.
Effective: Fall 1992
Prerequisite: C E 335

C E 521 **Transportation Networks and Systems Analysis** (3) Techniques of transportation network, user, stochastic user, and variable demand equilibrium; transportation activity system; computer simulation techniques and forecasting methods.
Effective: Fall 1992
Prerequisite: 3 credits of computer science

C E 522 **Traffic Simulation and Control** (3) Simulation theory, traffic modeling using GPSS, traffic signal optimization using TEXAS, EVIPAS, PASSERII, TRANSYT-7F, TRAF-NETSIM, FRESIM and CORFLO.
Effective: Summer 1997
Prerequisite: C E 423

C E 523 **Analysis of Transportation Demand** (3) Theories of travel behavior, least squares and maximum likelihood, estimation methods, continuous dependent variable models, utility maximization, discrete econometric techniques.
Effective: Fall 1992
Prerequisite: 3 credits of probability and statistics

C E 524 **Advanced Problems in Civil Engineering Materials** (2-6) Study in the literature and by laboratory investigation of selected topics on field-controlled civil engineering materials.
Effective: Fall 1992
Prerequisite: C E 424

C E 525 **Traffic Flow Theory** (3) Microscopic and macroscopic traffic flow characteristics; traffic stream models; shockwaves and queuing for traffic operations.
Effective: Spring 1997
Prerequisite: C E 423

C E 526 **Highway and Street Design** (3) Technical analysis of the design elements of roadways, alinement, cross- section features, and intersection and interchange design considerations.
Effective: Spring 1994
Prerequisite: C E 421

C E 527 **Roadside Design and Management** (3) Roadside safety and design, safety management, pavement management, lighting, signs, signals, and markings, clear zone, guiderail, impact attenuators.
Effective: Spring 1996
Prerequisite: C E 421W

C E 528 **Transportation Safety Analysis** (3) Issues and methods in transportation safety analysis; factors contributing to crashes; crash causation; modeling accident occurrence; identifying sites for treatment.
Effective: Spring 2005
Prerequisite: STAT 401

C E 531 **Legal Aspects of Engineering and Construction** (3) Basic legal doctrines, contractual relationships between parties, analysis of construction contract clauses, contract performance, and professional practice problems.
Effective: Fall 2001
Prerequisite: C E 431W

C E 533 **Construction Productivity Analysis and Performance Evaluation** (3) Construction productivity concepts and models; productivity measurement, control, and forecasting; analysis of factors affecting productivity; methods improvement techniques.
Effective: Fall 1992
Prerequisite: STAT 401;C E 431 orA E 474

C E 539 **Approximate Methods of Structural Analysis** (3) Structural analysis through the application of initial-value methods, Newmark's method, Fourier series, finite difference techniques, and work and energy procedures.
Effective: Fall 1992
Prerequisite: C E 340

C E 540 **Statically Indeterminate Structures** (3) Analysis of statically indeterminate straight/curved beams, grids, 2D/3D frames, arches, cables, and shells using classical and modern techniques.
Effective: Spring 2005

C E 541 **Structural Analysis** (3) Theory of various finite elements as applied to civil engineering structures. Term paper required.
Effective: Fall 1992
Prerequisite: C E 447

C E 542 (A E 542) **Building Enclosure Science and Design** (3) The building enclosure: nature, importance, loadings; building science: control of heat, moisture, air, hygrothermal analysis; design: walls, windows, roofs, joints.
Effective: Summer 2002

C E 543 **Prestressed Concrete Behavior and Design** (3) Design and behavior of prestressed concrete structures: materials and systems losses, flexure, shear, bond, deflections, partial prestressing, continuous beams.
Effective: Summer 2003
Prerequisite: C E 341, A E 402 or approved equivalent

C E 544 **Design of Reinforced Concrete Structures** (3) Advanced topics in design of reinforced concrete structures. Torsion and shear; beam moment-curvature; two-way slab systems; slender columns; strut- and-tie methodology.
Effective: Spring 2007

C E 545 **Metal Structure Behavior and Design** (3) Design philosophies and basis; seismic loading; fatigue; bending, column, plate, and beam-column stability; tapered members; torsion; connections; bracing; frame stability.
Effective: Spring 2007

C E 546 **Reinforced Concrete Slabs** (3) Behavior, analysis, and design of floor systems; elastic, ACI Code method, yield line theory; two-way, flat slab, flat plate.
Effective: Fall 1992
Prerequisite: C E 341

C E 548 **Structural Design for Dynamic Loads** (3) Dynamic behavior of structural systems of one and more degrees of freedom; earthquake, blast-resistant analysis, and design of structures.
Effective: Spring 2008
Prerequisite: E MCH 212, C E 340

C E 549 **Bridge Engineering I** (3) Engineering of modern steel and concrete bridge structures; loading; analysis; design.
Effective: Spring 2000
Prerequisite: C E 448W

C E 550 **Engineering Construction Management** (3) Management fundamentals for construction contracting; organization, project planning, scheduling and control, bonding and insurance, labor legislation and regulation, cost and control.
Effective: Fall 1992
Prerequisite: C E 431

C E 551 **Random Processes in Hydrologic Systems** (3) Hydrologic systems analysis, simulation; design using probability, time series and dynamical systems; formulating models, parameter estimation, environmental impact, resource assessment.
Effective: Summer 1996
Prerequisite: C E 361 ; introductory probability and statistics

C E 552 **Coastal and Nearshore Processes** (3) Hydrodynamics of the near-shore environment, including waves, currents, and storm surges. Coastal response, sediment transport, engineering structures.
Effective: Summer 2004
Prerequisite: C E 360

C E 555 **Groundwater Hydrology: Analysis and Modeling** (3) Introduction to groundwater resource analysis, model formulation, simulation, and design of water resource systems using symbolic and numerical methods.
Effective: Spring 1996
Prerequisite: MATH 251

C E 556 **Tracer and Contaminant Transport in Groundwater Systems** (3) Introduction to mathematical models for tracer and contaminant transport in groundwater. Topics include formulation, visualization, environmental tracers, and remediation.
Effective: Spring 1996
Prerequisite: MATH 251

C E 561 **Surface Hydrology** (3) Quantification of the processes that govern the movement and storage of water near the land-surface including precipitation, evapotranspiration, and runoff.
Effective: Spring 2005

C E 563 **Systems Optimization Using Evolutionary Algorithms** (3) Comprehensive introduction to genetic and evolutionary computation: genetic algorithms, evolutionary strategies, multi-objective optimization, parallelization approaches, and fitness approximation.
Effective: Spring 2005

C E 564 **Sediment Transport in Alluvial Streams** (3) River flow, river channel formation, the physical characteristics of rivers, responses of rivers to natural and human-made changes.
Effective: Spring 2005
Prerequisite: C E 462

C E 566 **Uncertainty and Reliability in Civil Engineering** (3) Introduction to probabilistic modeling, simulation, uncertainty analysis, and reliability estimates applied to civil engineering.
Effective: Spring 2005

C E 567 **River Engineering** (3) Introduction to river mechanics and fluvial geomorphology applied to problems of sediment transport and channel morphology.
Effective: Fall 1999

C E 570 **Environmental Aquatic Chemistry** (3) Speciation, reactivity, and distribution of contaminants in water, with emphasis in inorganic chemicals.
Effective: Fall 1992
Prerequisite: C E 475

C E 571 **Physical-Chemical Treatment Processes** (3) The theory of physical-chemical processes used in the treatment of potable water and municipal and industrial wastewaters.
Effective: Fall 1992
Prerequisite: C E 472, C E 475

C E 572 **Biological Treatment Processes** (3) The theory and application of biological processes to treat organic wastes, including wastewater, solid residuals, and toxic priority pollutants.
Effective: Fall 1992
Prerequisite: or concurrent:C E 475, MICRB 400

C E 573 **Environmental Organic Chemistry** (3) Theory, measurement, and estimation of the characteristics and environmental transformations of hazardous materials.
Effective: Spring 2000
Prerequisite: C E 475

C E 574 **Laboratory Analyses in Water Quality Control** (3) Experiments illustrating current chemical and biochemical methods of water and waste treatment and analytical methods used in research and control.
Effective: Fall 1992

Prerequisite: C E 475

C E 575 **Industrial Waste Management** (3) Surveys and analysis, pollution prevention, regulatory requirements, treatment and disposal of liquid, gaseous and solid residues.
Effective: Spring 1997
Prerequisite: C E 472

C E 576 (CH E 576) **Environmental Transport Processes** (3) Fundamentals of chemical transport in engineered environments, such as biofilm reactors, and natural systems including aquifers and rivers.
Effective: Fall 2001
Prerequisite: C E 475

C E 577 **Treatment Plant Design** (1-6) Design of works for the treatment of water and wastewater for municipalities and industries.
Effective: Fall 1992
Prerequisite: C E 472 ; 3 credits in hydraulics

C E 578 **Groundwater Remediation** (3) Application of fundamental physical/chemical/biological processes in natural and engineered systems for remediation of contaminated soil and groundwater.
Effective: Fall 1999
Prerequisite: C E 475, MICRB 400

C E 579 **Environmental Pollution Microbiology** (3) Fundamentals of microorganisms in water and wastewater treatment; indicators of pollution; activities of microorganisms in polluted waters, including biogeochemical cycles.
Effective: Spring 1998
Prerequisite: MICRB 400

C E 580 **Hydrodynamic Mixing Processes** (3) Physical mixing processes in rivers, estuaries, lakes, and oceans. Analytic methods and computational modeling.
Effective: Spring 2005

C E 581 **Pavement Management and Rehabilitation** (3) Techniques of network and project level pavement management, field evaluation methods and equipment, maintenance and rehabilitation strategies, overlay design procedures.
Effective: Fall 1992
Prerequisite: C E 421

C E 582 **Pavement Design and Analysis** (3) Viscoelastic analysis; non-linear analysis; fatigue and permanent deformation; back-calculation of layer moduli; mechanistic-empirical design methods.
Effective: Summer 1998

C E 583 **Bituminious Materials and Mixtures** (3) Composition, physical behavior, production, and performance of bituminous materials and mixtures.
Effective: Spring 1998

C E 584 **Concrete Materials and Properties** (3) Study of concrete properties and associated variables, prediction models, testing, preventative measures, pozzolans, admixtures.
Effective: Spring 1997
Prerequisite: A E 221 orC E 336

C E 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1992

C E 591 **Environmental Engineering Seminar** (1) Seminar topics selected by faculty and students based on research interests on topics related to environmental engineering and science.
Effective: Spring 2005

C E 592 **Environmental Engineering & Science Topics** (1) Current topics in environmental engineering and science.
Effective: Spring 2005

C E 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1992

C E 596A **Stream Channel Instability at Bridges** (3) River morphology, hydraulics of flow in river channels, scour-related problems, stream stability and classification, and protective measures for stream banks, bridge piers and bridge abutments.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C E 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 1992

C E 597A **Water Resources Seminar** (1) Seminar for water resources grad students.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C E 597A **Geotechnical and Materials Engineering Seminar** (1) Grad student seminar with topical discussions on Geotechnical and Materials Engineering.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C E 597B **Structural Reliability** (3) Introduction to random variables and probability distributions; reliability methods; uncertainty analysis; Monte Carlo simulation; risk and reliability analysis of structures and civil infrastructure systems.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C E 597B **Structures Seminar** (1) Seminar for structural engineering grad students.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C E 597C **How to Initiate Your Academic Career** (1) This class will prepare students to generate competitive application materials for academic positions and education them about the academic hiring process.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C E 597C **Water Resources Seminar** (1) Seminar for water resources engineering grad students.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C E 597D **Geotechnical and Materials Engineering Seminar** (1) Grad student seminar with topical discussions on Geotechnical and Materials Engineering.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C E 597D **Alternate Transportation Approaches** (3) Alternative methods and practices to plan, analyze, design, and operate transportation systems to potentially affect transportation demand and capacity.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C E 597E **Measurement Techniques for Multipurpose Particulate Systems** (3) Concepts, theories, and applications of material property measurement techniques, experimental methods, and instrumentation used in geotechnical and research.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C E 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1996

C E 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2008

C E 600 **Thesis Research** (1-15) No description.
Effective: Fall 1992

C E 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1992

C E 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1992

C E 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1992

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Civil Engr Tech (CET)

CET 430 **Structural Analysis** (3) Analysis of determinate structures; use of influence lines; deflection of structures; classical methods of analysis of statically indeterminate structures.
Effective: Spring 2008
Prerequisite: Statics Strength of MaterialsMATH 140

CET 431 **Structural Design-Steel** (3) Design of steel beams, columns, truss members, decks, bar joists and selected connections.
Effective: Spring 2008
Prerequisite: Statics Strength of MaterialsMATH 140 Concurrent: CET 430

CET 432 **Structural Design-Reinforced Concrete** (3) Design of reinforced concrete beams, columns, slabs, and selected framing systems for bending and shear. Introduction to formwork design.
Effective: Spring 2008
Prerequisite: Statics Strength of MaterialsMATH 140 Concurrent: CET 430

CET 434 **Foundations** (3) Analysis and design of footings, piling, retaining walls; consideration of contruction problems involving soils and foundations of structures.
Effective: Spring 2008
Prerequisite: CET 343, CET 430, CET 432

CET 435 **Construction Estimating** (3) Methods and techniques used in estimating construction cost; practice in takeoffs, costing and final bid preparation; microcomputer applications/class projects.
Effective: Spring 2008
Prerequisite: ED&G 100, ET 200, C E 333W

CET 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2008

CET 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2008

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Classics and Ancient Mediterranean Studies (CAMS)

CAMS 400W **Comparative Study of the Ancient Mediterranean World** (3) Comparative study of ancient Mediterranean civilizations.
Effective: Spring 2001
Prerequisite: 3 credits in Classics and Ancient Mediterranean Studies

CAMS 405 (IL) **Law & Economy in the Ancient Near East** (3) This course is an overview of the legal and economic texts and institutions in the Ancient Near East.
Effective: Spring 2009
Prerequisite: 6 credits in any undergraduate CAMS courses.

CAMS 410 **Classical Epic** (3) Homer, Hellenistic Epic, and Vergil; influences on later epic.
Effective: Spring 1998

CAMS 411W **Classical Drama** (3) Masterpieces of Greek tragedy (Aeschylus, Sophocles, Euripides) and comedy (Aristophanes, Menander); their influence on Roman writers.
Effective: Spring 2001

CAMS 420 **Introductory Targumic Aramaic** (3) Fundamentals of Aramaic grammar, syntax, and vocabulary.
Effective: Spring 2007

CAMS 421 **Introductory Syriac** (3) Fundamentals of Syriac grammar, syntax, and vocabulary.
Effective: Spring 2007

CAMS 440W **Studies in Classical and Ancient Mediterranean Archaeology** (3-6) Selected topics in the literary sources and material evidence for classical and ancient Mediterranean society.
Effective: Summer 2000
Prerequisite: 3 credits from:ANTH 002, ART H 311, CAMS 010, CAMS 020, CAMS 025, CAMS 033, CAMS 140, CAMS 150, HIST 100, HIST 101

CAMS 442 (IL) (KINES 442) **Sport in Ancient Greece and Rome** (3) An examination of the continuity of sport in Greek and Roman societies.
Effective: Spring 2008
Prerequisite: CAMS 025, CAMS 033, CAMS 140, CAMS 150, CAMS 100, CAMS 101 orKINES 141

CAMS 470 (IL) **Languages and Cultures of the Ancient Near East** (3) This course is an overview of the languages and cultures that populated the Ancient Near East.
Effective: Spring 2009
Prerequisite: 6 credits in any undergraduate CAMS courses.

CAMS 471 **Sumerian** (3) Introduction to the Sumerian language and the cuneiform writing system.
Effective: Spring 2009
Prerequisite: 6 credits in any undergraduate CAMS course.

CAMS 472 **Akkadian** (3) Introduction to the Akkadian language (Babylonian & Assyrian) and the cuneiform writing system.
Effective: Spring 2009
Prerequisite: 6 credits in any undergraduate CAMS courses

CAMS 480 (J ST 480) **Greeks and Persians** (3) Development and achievements of the Achaemenid kingdom; relationships between Persians and Greeks.
Effective: Spring 2001
Prerequisite: CAMS 010, CAMS 025 orCAMS 100

CAMS 490 **Ancient Mediterranean Languages** (3-6) Variable topic study of an ancient language of the Mediterranean basin and related areas, other than Greek, Latin, or Hebrew.
Effective: Spring 2001
Prerequisite: GREEK 003 orLATIN 003

CAMS 492 **Intermediate Field Methods** (3-6) On-site experience in archaeological fieldwork in the ancient Mediterranean region.
Effective: Spring 2000
Prerequisite: approval by field school director

CAMS 493 **Intermediate Field Analysis** (3-6) On-site experience in archaeological analysis in the ancient Mediterranean region.
Effective: Spring 2000
Prerequisite: approval by field school director

CAMS 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1997

CAMS 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2001

CAMS 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1999

CAMS 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 1996

CAMS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1997

CAMS 497A (ARAB 497A) **Introduction to Classical Arabic** (3) Introduction to the grammar of classical Arabic.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CAMS 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

CAMS 499A (IL) (ANTH 499A) **Landscape Archaeology** (3) This course introduces students to the basics of archaeological surveys.
Effective: Summer 2010 Ending: Summer 2010

CAMS 499B (IL) **GIS for Archaeologists** (3) This course gives students a hands-on introduction to the use of GIS programs in archaeological research.
Effective: Summer 2010 Ending: Summer 2010

CAMS 499C (IL) (J ST 499C, HIST 499C) **Archaeological Field School** (3-6) This course introduces students to the basics of archaeological field methods.
Effective: Summer 2010 Ending: Summer 2010

CAMS 499D (IL) (J ST 499D, HIST 499D, ANTH 499D) **Conservation and Public Archaeology** (3) The conservation and public archaeology option will entail hands-on conservation of on-site architectural remains.
Effective: Summer 2010 Ending: Summer 2010

CAMS 499E (IL) (RL ST 499E, HIST 499E) **Petra, the Spice Route, and the Decapolis Cities in Roman Palestine** (3) Study tour of Roman Palestine and the Nabateans in Jordan and Israel.
Effective: Summer 2010 Ending: Summer 2010

CAMS 501 **Comparative Greek and Latin Grammar** (3) The evolution of the phonological, morphological, syntactic and lexical structures of Greek and Latin from Proto-Indo-European.
Effective: Spring 2004
Prerequisite: GREEK 003;LATIN 003

CAMS 502 **The Sanskrit Language** (3) An introduction to the structure and history of Sanskrit, with special emphasis on reading and translating.
Effective: Spring 1995
Prerequisite: GREEK 003 orLATIN 003

CAMS 503 **Seminar on Ancient Mediterranean Languages** (3 per semester, maximum of 6) An in-depth examination of the ancient languages of the Mediterranean basin, including Indo-European and non-Indo-European languages.
Effective: Spring 1995
Prerequisite: GREEK 003, LATIN 003, LING 502

CAMS 504 **Topography of Ancient Rome** (3) Lectures and readings on physical development of the ancient city of Rome from earliest habitation to time of later empire.
Effective: Spring 2007

CAMS 520 **Advanced Sumerian** (3) Advanced study of Sumerian grammar and cuneiform writing through the reading of Sumerian literary texts.
Effective: Summer 2009

CAMS 521 **Advanced Akkadian** (3) Advanced study of Akkadian grammar and the cuneiform script through the reading of texts in various dialects.
Effective: Summer 2009

CAMS 522 **Comparative Semitics** (3) Overview of the Semitic language family and introduction to its comparative linguistic study.
Effective: Summer 2009

CAMS 592 **Proseminar** (3) Introduction to the history, research methods, historiography of modern scholarship on ancient Mediterranean studies.
Effective: Summer 2008

CAMS 593 **Research Seminar** (3-6) Significant research experience in the fields represented by CAMS; guided supervision in the preparation of a scholarly article.
Effective: Summer 2008
Prerequisite: CAMS 592

CAMS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1997

CAMS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2001

CAMS 597A **Studies in the History of the Neo-Assyrian, Neo-Babylonian, Persian, and Early Hellenistic Periods** (3) The purpose of this course is to discuss specific problems in the historical study of major and minor states and their international relations.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CAMS 599 (IL) **Foreign Studies** (1-12 per semester, maximum of 24) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005

CAMS 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2002

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College Student Affs (CSA)

CSA 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2009

CSA 501 **Introduction to Student Affairs** (3) An introduction to student affairs in higher education with consideration of various functional areas of the profession.
Effective: Spring 2004

CSA 502 **Organization and Administration in Student Affairs** (3) Formulation of policies as guides to the student personnel service programs; integration of program elements; research; current problems and trends.
Effective: Spring 2004

CSA 503 **Student Development in College Environments** (3) This course covers the knowledge and methods of human development theories and their applications in college settings.
Effective: Fall 2003

CSA 504 **Research and Assessment in Student Affairs** (3) This course provides the basic knowledge and skills necessary to plan, design, implement, and evaluation assessment programs in student affairs.
Effective: Fall 2003

CSA 505 **Capstone Seminar** (2) This seminar provides advanced students an opportunity to apply concepts from previous course work to current issues facing student affairs.
Effective: Summer 2004

CSA 506 **Campus Environments** (3) Examination of theoretical concepts and empirical findings that describe the college environment and explain its impact on students and staff.
Effective: Summer 2009

CSA 507 **Social Justice Issues in Higher Education** (3) Exploration of diverse student population, their different experiences, and the value university communities place on these differences.
Effective: Fall 2010 Future: Fall 2010

CSA 594 **Research Topics** (1-9) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2005

CSA 595 **Internship** (1-9) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 2005

CSA 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2005

CSA 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 2005

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Comm Env &Devlop (CED)

CED 404 (AG EC 404) **Methods in Natural Resource and Environmental Economics** (3) Students will learn empirical research methodology in the areas of environ- mental and natural resource economics.
Effective: Fall 2009 Ending: Summer 2010
Prerequisite: AG EC 201 orECON 302, ECON 428

CED 404 **Survey Research Methods** (3) Students will learn empirical research methodology in the areas of environmental and natural resource economics.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CED 201 orECON 302, ECON 428

CED 409 **Land Use Planning and Procedure** (3) General land use planning laws and procedures.
Effective: Spring 2007
Prerequisite: 6 credits of B LAW CED ECON E R M E RRE PL SC R EST SOC S T S (any combination)

CED 410 **The Global Seminar** (3) Exploration of critical global issues relevant to sustainable development and the environment. Collaborative with other universities worldwide.
Effective: Spring 2007
Prerequisite: ECON 002 orECON 004;R SOC 011 orSOC 001

CED 417 (R SOC 417) **Power, Conflict, and Community Decision Making** (3) Impact of institutions on human interdependence and behavior, the structure of power, and community decision making and public policy.
Effective: Spring 2010
Prerequisite: R SOC 011 orSOC 001

CED 420 (US;IL) (R SOC 420, WMNST 420) **Women in Developing Countries** (3) Analysis of women's work, experiences, and development policies and practices in Africa, Asia, and Latin America.
Effective: Fall 2009
Prerequisite: 5th semester standing or above

CED 425 **International Community and Economic Development** (3) International community and economic development.
Effective: Spring 2007
Prerequisite: CED 152

CED 427W (SOC 427W, S T S 427W) **Society and Natural Resource** (3) Analysis of the relationships between societal development and enhancement and natural resources.
Effective: Summer 2008
Prerequisite: R SOC 011 orSOC 001

CED 429 **Natural Resource Economics** (3) Optimal management of resources; roles of markets and other institutions; resources and economic development; public policy.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: ECON 302

CED 431W **Economic Analysis of Environmental and Resource Policies** (3) Economic analysis of environmental and natural resource policies, benefit-cost analysis, non-market valuation techniques; resource damage assessment.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: ECON 302

CED 450 (IL) **International Development, Renewable Resources, and the Environment** (3) Theories of agricultural and economic development, with particular attention to interactions between development, renewable resources, and the environment.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: 6 credits in agricultural economics or economics

CED 470 **Comparative Community Development** (3) Crosscultural community development projects and the problems encountered in each of the different cultural contexts.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: 6 credits in social or behavioral science

CED 475 **CED Integrated Capstone Experience** (3) An experiential-learning course that provides a capstone learning experience for seniors graduating from the Community, Environment and Development major.
Effective: Spring 2007
Prerequisite: senior status only

CED 495A **Internship in Community, Environment, and Development** (1-15) Supervised field experience in an environmental setting.
Effective: Fall 2009
Prerequisite: prior approval of program

CED 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2009

CED 497 **Special Topics** (1-18) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2009

CED 497A **Community, Local Knowledge & Democracy** (3) Understanding community decision making citizen-expert interactions and methods for resolving semmingly intractable local issues.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ECON 002 andECON 004

CED 497A **Social Demographic Methods** (3) Measurement and analysis of population dynmaics and social trends such as fertility, mortality, migration, families and households, and economic wellbeing.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CED 497B **Land Use** (3) Introduces Policy-relevant issues related to land use change: examinating historical trends, patterns and development, human and environment potential impacts.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CED 497H **Community, Local Knowledge, and Democracy** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Commonwealth College (CWC)

CWC 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Summer 2000

CWC 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Fall 2007

CWC 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 2000
Prerequisite: prior approval of proposed assignment by instructor

CWC 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2000

CWC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2000

CWC 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2000

CWC 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Communication Arts and Sciences (CAS)

CAS 402 **Speech and Human Behavior** (3) General semantics, thought, and human behavior; not offered at University Park campus.
Effective: Spring 2003

CAS 403 **Interpersonal Communication Theory and Research** (3) Examining behavior within interpersonal encounters, with emphasis on both theoretical/applied explanations for how and why people act during such interactions.
Effective: Spring 2003
Prerequisite: CAS 203

CAS 404 **Conflict Resolution and Negotiation** (3) Theories and strategies important for conceptualizing, developing, and managing conflict negotiation, mediation, and third-party intervention.
Effective: Spring 2003
Prerequisite: CAS 100

CAS 405 **Family Communication Theory and Research** (3) Explores the nature and functions of communication in family life; emphasis on meaning, patterns, and styles of family communication.
Effective: Summer 2002
Prerequisite: CAS 101, CAS 202

CAS 406H **Honors Course in Communication Arts and Sciences** (3) Individual study and seminar in selected areas or issues of speech communication.
Effective: Spring 2003
Prerequisite: an all-University average of B; approval of the departmental Honors Committee

CAS 411 **Rhetorical Criticism** (3) Principles of rhetorical criticism examined through analysis of selected texts and critics.
Effective: Spring 2003
Prerequisite: CAS 201 orCAS 100

CAS 415 **Rhetoric of Film and Television** (3) Rhetorical analysis of the artistic forms and cultural structures of film and television; intensive study of selected examples.
Effective: Spring 2003
Prerequisite: CAS 100 orCOMM 150

CAS 420 **Rhetorical Theory** (3) Ancient, medieval, Renaissance, Enlightenment, and contemporary theories of rhetoric.
Effective: Spring 2003
Prerequisite: CAS 201

CAS 421 **Communication and Aging** (3) Concentrates on the pivotal role that communication plays in the social process of aging.
Effective: Summer 2007
Prerequisite: Three credits of CAS

CAS 422 (US) (AAA S 422) **Contemporary African American Communication** (3) A focused study on the continuities between African and African American culture and communication.
Effective: Summer 2005
Prerequisite: CAS 100

CAS 426W **Communication Ethics** (3) Ethical issues in public and private communication; role of communication in expressing and realizing individual and social values.
Effective: Spring 2003
Prerequisite: CAS 100

CAS 438 **Rhetoric of Documentary** (3) Rhetorical analysis of the documentary in film, television, and other media; historical and critical analysis of functions and form.
Effective: Spring 2003
Prerequisite: CAS 201

CAS 450W **Group Communication Theory and Research** (3) Selected theories of problem solving through group discussion emphasizing participation and leadership.
Effective: Spring 2003
Prerequisite: CAS 100 orCAS 250

CAS 452 **Organizational Communication Theory and Research** (3) Explores the nature and functions of communication in organizations; emphasis on concepts, tools, and skills for effective management of communication.
Effective: Spring 2003
Prerequisite: CAS 202 orCAS 252

CAS 452W **Organizational Communication Theory and Research** (3) Explores the nature and functions of communication in organizations; emphasis on writing and exploring concepts, tools, and skills for effective management of communication.
Effective: Spring 2004
Prerequisite: CAS 202 orCAS 252

CAS 453 **Health Communication Theory and Research** (3) Principles of communication about health across the lifespan

and within health-care contexts.
Effective: Spring 2006
Prerequisite: CAS 100

CAS 455 (US) (WMNST 455) **Gender Roles in Communication** (3) Explores the literature on gender research in the discipline of human communication.
Effective: Summer 2005
Prerequisite: CAS 202

CAS 470 **Nonverbal Communication** (3) Examining ways nonverbal messages, such as gestures, posture, vocal intonation, and facial expressions, affect us on a daily basis.
Effective: Spring 2003
Prerequisite: 6 credits in Communication Arts and Sciences

CAS 471 (US;IL) **Intercultural Communication Theory and Research** (3) Intercultural and cross-cultural communication research theory and practice as applied within and across national boundaries.
Effective: Summer 2005
Prerequisite: CAS 271

CAS 471U (US;IL) **Intercultural Communication Theory and Research** (3) Intercultural and cross-cultural communication research theory and practice as applied within and across national boundaries.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: CAS 271

CAS 475 **Studies in Public Address** (3) History and criticism of public discourse; intensive analysis of selected public addresses and social movements.
Effective: Spring 2003
Prerequisite: CAS 100

CAS 478 **Contemporary American Political Rhetoric** (3) Analysis of selected speeches, debates, and persuasive campaigns and movements in recent American political history.
Effective: Spring 2003
Prerequisite: CAS 100

CAS 480 **Group Performance of Literature** (3) Applying storytelling skills and performance theory to the group presention of literature; criticism of literature through group presentations.
Effective: Spring 2003
Prerequisite: CAS 100

CAS 483 **Communication and Information Technology II** (3) Theory and application of interactive internet-based communication and information management; for students who want a Liberal Arts approach.
Effective: Fall 2003
Prerequisite: CAS 283

CAS 494 **Research Topics** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Fall 2003
Prerequisite: prior approval of proposed assignment by instructor

CAS 494H **Research Topics** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Summer 2008
Prerequisite: prior approval of proposed assignment by instructor

CAS 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2003
Prerequisite: prior approval of proposed assignment by instructor

CAS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2002

CAS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2002

CAS 497A **Global Health Campaigns** (3) Theory and experiences with health, persuasive, and intercultural communication; analyze current and to design future health campaigns internationally.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: CAS 253

CAS 497A **New Media and Democracy** (3) This course will discuss 'new' media in the context of democratic citizenship, networked publics, cyberactivism, citizen journalism, and peer- to-peer production.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CAS 497B **Effective Communication Skills for Teachers** (3) Designed for upper level undergraduate and beginning graduate level students, focuses on the communication skills to teach effectiveness in the classroom.

Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CAS 497H **Introduction to Research Topics and Methodologies in Communication Arts andSciences** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CAS 497H **Introduction to Research Topics and Methodologies in Communication Arts andSciences** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CAS 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2002

CAS 498A **Communication for a Position Classroom Environment** (3) This course is designed for upper level undergraduate and beginning graduate level students, focuses on a variety of communication behaviors that affect the level of positive interaction in the classroom.
Effective: Summer 2010 Ending: Summer 2010

CAS 498A **Freedom of Expression** (3) Theories, doctrines, statutes, and cases related to the First Amendment guarantee of freedom of speech.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CAS 498A **Isses in Freedom of Speech** (3) Theories, doctrines, statutes, and cases related to the First Amendment guarantee of freedom of speech.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CAS 499 (IL) **Foreign Studies** (1-9) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

CAS 500 **Historical Public Address** (3 per semester, maximum of 9) Special topics in American public address, 1765-1900; emphasis on rhetoric of revolution, reform, and reaction.
Effective: Spring 2003

CAS 503 **Rhetorical Criticism** (3 per semester/maximum of 6) An advanced seminar inthe history, theory, methods, and practice of rhetorical criticism.
Effective: Spring 2003
Prerequisite: CAS 411

CAS 504 **Contemporary Public Address** (3 per semester, maximum of 9) Special topics in recent history of American public address, including speeches, debates, persuasive campaigns, and social movements in America 1900-pesent.
Effective: Summer 2002

CAS 505 **Historical Development of Rhetorical Theory** (3 per semester/maximum of 9) Study of one or more periods of rhetorical theory from Greek antiquity to 1900.
Effective: Spring 2005
Prerequisite: CAS 420

CAS 506 **Contemporary Rhetorical Theory** (3 per semester/maximum of 6) A study of rhetorical theory from 1930 to the present, focusing on semantic, political, sociological, symbolic, and philosophical perspectives.
Effective: Spring 2005
Prerequisite: CAS 411, CAS 505

CAS 507 **Issues in Rhetorical Theory** (3 per semester, maximum of 6) Theoretical, analytical, philosophical, and critical problems in human communication, with application of humanistic and social scientific research framework.
Effective: Fall 2003
Prerequisite: CAS 420

CAS 510 **Pedagogy in Communication Education** (3) Philosophical, theoretical, and practical issues faced by the beginning college instructor.
Effective: Spring 2003
Prerequisite: SPCOM 502 and 9 additional credits at the 400 or 500 level in speech communication clinical speech or theatre arts

CAS 515 **Rhetoric and Media** (3 per semester, maximum of 9) Seminar in the application of rhetorical theory and criticism to television, film, and other media.
Effective: Spring 2003

CAS 530 **Political Communication and Media** (3) Study of rhetorical and communicative dimensions of contemporary political communication with particular attention to electronic media.
Effective: Spring 2004

CAS 550 **Social Influence** (3 per semester/maximum of 6) Theory and devices of persuasion; analysis of persuasive discourse.
Effective: Spring 2003
Prerequisite: 6 credits in Communication Arts and Sciences

CAS 552 **Organizational Communication** (3) Seminar that explores the major theoretical perspectives and research findings within formal and informal organizations.
Effective: Fall 2003

CAS 553 (HLS 553, PHP 553) **Disaster Communication** (3) This seminar provides students with a comprehensive understanding of the multifaceted nature of disaster communication across phases of a disaster.
Effective: Summer 2006 Ending: Fall 2010

CAS 553 (PHP 553, HLS 553) **Disaster Communication** (3) This seminar provides students with a comprehensive understanding of the multifaceted nature of disaster communication across phases of a disaster.
Effective: Spring 2011 Future: Spring 2011

CAS 554 **Small Group Communication** (3 per semester/maximum of 6) Communication variables in small groups. Experimental research and innovations in communication in vocational, therapeutic, and educational groups.
Effective: Fall 2003

CAS 555 **Interpersonal Communication** (3 per semester/maximum of 6) Investigation of the communicative management of ongoing relationships; examination of how communication both creates and responds to exigencies of friendship.
Effective: Spring 2003
Prerequisite: CAS 403

CAS 556 **Relational Communication** (3) Examines theories and research focused on understanding communication in intimate (or potentially intimate) relationships.
Effective: Spring 2003
Prerequisite: CAS 403

CAS 557 **Health Communication** (3) Provides experience in making decisions about planning, implementing, and evaluating communication in community-based health campaigns to achieve health promotion/education.
Effective: Summer 2002
Prerequisite: CAS 453

CAS 558 **Family Communication** (3) Examines theories and research focused on understanding communication in family contexts.
Effective: Spring 2003
Prerequisite: CAS 405

CAS 559 **Lifespan Communication** (3) How various communication processes such as language skills, interpersonal relationship definition and management, social support change cross the lifespan.
Effective: Spring 2003
Prerequisite: CAS 403 or equivalent

CAS 560 **Communication Theory** (3) This course introduces graduate students to the philosophical underpinnings of communication research and develops skills in theory construction.
Effective: Summer 2002
Prerequisite: CAS 403

CAS 561 **Quantitative Research Methods** (3) Introduces graduate students to principles, issues, and design considerations underlying social scientific methodology; material is applied to communication research.
Effective: Summer 2002
Prerequisite: CAS 403

CAS 562 **Qualitative Research Methods** (3) Qualitative approaches to investigating human experience using tools such as interviewing and observation.
Effective: Spring 2008

CAS 571 **Intercultural Communication** (3) Detailed investigation into intercultural communication, focusing on differences in systems and potential areas of miscommunication.
Effective: Spring 2003
Prerequisite: CAS 471

CAS 581 (APLNG 581) **Discourse Analysis** (3) Overview of theories and approaches to the analysis of spoken and/or written discourse.
Effective: Spring 2004

CAS 582 **Communication and Information Technology** (3) An examination of communication and information

technologies in social, professional, commercial, and educational contexts.
Effective: Summer 2002
Prerequisite: CAS 483

CAS 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 2004

CAS 594 **Research Topics** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Spring 2004
Prerequisite: prior approval of proposed assignment by instructor

CAS 595 **Internship** (1-9) Supervised off-campus, nongroup instruction.
Effective: Spring 2004
Prerequisite: prior approval of proposed assignment by instructor

CAS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2004

CAS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2002

CAS 597A **Textual Criticism: Disciplinary Norms and Critical Practice** (3) This seminar investigates the theories and methods of textual interpretation as a mode of inquiry in Communication Studies, English and American Studies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CAS 597A **Measurement in Communication Science** (3) This will be a course about the theory and technology of measuring variables relevant to the study of social science with an emphasis on communication.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CAS 597B **International Health Campaigns** (3) Experiences with health, influence, and intercultural communication theory and research; analyze current and design future health campaigns internationally.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CAS 600 **Thesis Research** (1-15) No description.
Effective: Spring 2004

CAS 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 2004

CAS 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Students enrolled will, under supervision, teach SPCOM 100--introduction to speech communication: formal speaking, group discussion, analysis and evaluation of messages.
Effective: Spring 2004

CAS 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2004

CAS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 2004

CAS 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 2004

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Communication Sciences and Disorders (CSD)

CSD 433 **Aural Rehabilitation** (3) Methods for improving receptive skills of persons with hearing impairments; clinical observation and practice.
Effective: Fall 2003
Prerequisite: CSD 230

CSD 442 **Introduction to Disorders of Articulation and Phonology** (3) Etiology, diagnosis, and treatment of articulation disorders.
Effective: Fall 2003 Ending: Summer 2010
Prerequisite: CSD 146, CSD 311, CSD 331

CSD 442 **Introduction to Disorders of Articulation and Phonology** (3) Etiology, diagnosis, and treatment of articulation disorders.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CSD 300, CSD 311 plus 3 additional CSD credits at the 300-level

CSD 444 **Introduction to Organic Disorders of Speech and Language** (3) Etiology, diagnosis, and principles of treatment of stuttering, and of speech- language disorders having organic bases.
Effective: Fall 2003 Ending: Summer 2010
Prerequisite: CSD 146, CSD 331

CSD 444 **Introduction to Organic Disorders of Speech and Language** (3) Etiology, diagnosis, and principles of treatment of stuttering, and of speech- language disorders having organic bases.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CSD 301, CSD 331 plus 3 additional credits in CSD at the 300-level

CSD 451 **An Introduction to Augmentative and Alternative Communication** (3) Examination of assessment and intervention issues in augmentative and alternative communication techniques with persons with severe communication disorders.
Effective: Fall 2003 Ending: Summer 2010
Prerequisite: CSD 146, CSD 300

CSD 451 **An Introduction to Augmentative and Alternative Communication** (3) Examination of assessment and intervention issues in augmentative and alternative communication techniques with persons with severe communication disorders.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CSD 300 plus 6 additional CSD credits at the 300-level

CSD 459W **Principles of Clinical Management in Communication Disorders** (3) Survey of principles and practices for diagnosing, interviewing, counseling, treating, reporting, and programming in Communication Disorders.
Effective: Fall 2003 Ending: Summer 2010
Prerequisite: CSD 146

CSD 459W **Principles of Clinical Management in Communication Disorders** (3) Survey of principles and practices for diagnosing, interviewing, counseling, treating, reporting, and programming in Communication Disorders.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CSD 300, CSD 230 plus 3 additional credits in CSD at the 300-level

CSD 462 (US;IL) **Clinical Bases of Language Disorders** (3) Description of pathological language and cognitive development, and principles of assessment and remediation among individuals with communication disorders.
Effective: Summer 2005 Ending: Summer 2010
Prerequisite: CSD 300

CSD 462 (US;IL) **Clinical Bases of Language Disorders** (3) Description of pathological language and cognitive development, and principles of assessment and remediation among individuals with communication disorders.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CSD 300 plus 6 additional credits in CSD at the 300-level

CSD 494H **Senior Honors Thesis** (1-6) Independent study related to a student's interests directed by a faculty super supervisor and culminating in the production of a thesis.
Effective: Spring 2006
Prerequisite: Approval of honors thesis advisor.

CSD 495A **Speech Therapy Practicum** (1-6) Demonstration and practice in examination, diagnosis, and treatment of speech problems.
Effective: Fall 2003
Prerequisite: CSD 395W, CSD 442

CSD 495B **Audiology Practicum** (1-5) Demonstration and practice in examination, diagnosis, and treatment of hearing impairment problems.
Effective: Fall 2003
Prerequisite: CSD 395W, CSD 433

CSD 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2003

CSD 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2003

CSD 497H **Genetics and Communication Sciences and Disorders** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSD 497H **A "Case History" Approach to Communicate Intervention** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CSD 497K **Pre-Practicum and Observation Experiences in CSD** (2) This course will focus on knowledge and skills necessary for students to participate in clinical practicum. Observations, goal-setting, ethical practices will be discussed.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSD 500 **Research Methods in Communication Sciences and Disorders** (3) Methodology necessary for understanding and conducting research in communication disorders.
Effective: Spring 2004
Prerequisite: 15 credits in communication sciences and disorders

CSD 520 **Physiologic and Acoustic Issues in Speech Science** (3) Seminar in the physiologic and acoustic aspect of normal and disordered speech production.
Effective: Spring 2004
Prerequisite: 12 credits in communication sciences and disorders

CSD 531 **Hearing Aids** (4) Hearing aid circuitry, electroacoustic and real-ear measurements, hearing aid evaluation, follow-up procedures, and new advances for infants, children, and adults.
Effective: Spring 2004
Prerequisite: CSD 535

CSD 532 **Instrumentation I** (3) Acoustical instrumentation used for research in hearing, programs of hearing conservation, and noise control, including clinical and industrial applications.
Effective: Spring 2004
Prerequisite: 6 credits in acoustics audiology experimental psychology or speech science at the 400 level

CSD 534 **Noise and Hearing** (2) Noise-induced hearing problems; interference with communication; annoyance and community problems caused by acoustic energy; regulations and standards.
Effective: Spring 2004
Prerequisite: CMDIS 230, CMDIS 433 ; six credits in speech pathology and audiology

CSD 535 **Pure Tone Audiometry and Immitance Measures** (4) Techniques, interpretation, and differential diagnosis of hearing by pure tone audiometry, immitance measures, and related techniques.
Effective: Spring 2004
Prerequisite: CSD 230

CSD 540 **Phonological Disabilities** (3) Speech-sound production disorders in children and adults; methods of examination, diagnosis, and treatment.
Effective: Spring 2006
Prerequisite: CSD 442

CSD 541 **The Voice and Its Disorders** (3) Physical, physiological, and psychological bases of voice production; causes, nature, and symptoms of its disorders; current clinical methods in voice improvement.
Effective: Spring 2006
Prerequisite: CSD 444

CSD 542 **Stuttering** (3) Modern theories of causes of disorders of rhythm; methods of examination, diagnosis, and treatment.
Effective: Spring 2004
Prerequisite: CSD 442, CSD 495A

CSD 545 **Neuromotor Disorders of Speech** (3) Etiology and symptomatology of dysarthric and apraxic speech: diagnosis, treatment, and the team rehabilitative program approach to these disorders.
Effective: Spring 2006
Prerequisite: CSD 444

CSD 546 **Language Disorders in Adults** (3) Nature, etiology, diagnosis, and management of language disorders in adults.
Effective: Spring 2004
Prerequisite: 9 credits in communication sciences and disorders or related fields such as psychology linguistics or human development.

CSD 547 **Language Disorders in Children** (3) Nature, etiologies, diagnosis, and management of language disorders in children.
Effective: Spring 2006
Prerequisite: CSD 300

CSD 548 **Dysphagia** (3) Understanding the process of the swallowing mechanism and the management and treatment of swallowing disorders.
Effective: Summer 2006
Prerequisite: CSD 444 or equivalent

CSD 549 **Speech-Language Pathologists in the Schools** (3) Topics concerning service delivery in the school setting; legislation related to service delivery, special education enrollment, collaboration, caseload management, special populations.
Effective: Summer 2006

CSD 550 **Seminar in Communication Sciences and Disorders** (1-6) Advanced study of special problems and new developments in communication sciences and disorders.
Effective: Spring 2006

CSD 551 **Assessment and Intervention in Agumentative and Alternative Communication** (3) Research results in augmentative and alternative communication (AAC); implications for assessment, prescription of AAC systems, and intervention planning in AAC.
Effective: Spring 2006

CSD 567 **Audiology for Hearing and Speech Clinicians** (3) Etiology, measurement, and differential diagnosis of hearing loss; overview of aural rehabilitation, including hearing aids and auditory training systems.
Effective: Spring 2004
Prerequisite: CSD 230, CSD 433 ; 6 credits in communication sciences and disorders.

CSD 572 **Psychoacoustics in Communication Sciences and Disorders** (4) Perceptual phenomena of normal audition supported by reviews of methods and principles of psycho-physical measurement and of hearing theory.
Effective: Spring 2004
Prerequisite: 6 credits of acoustics or communication sciences and disorders

CSD 574 **Pediatric Audiology** (3) Etiology, differential diagnosis, habilitation, and rehabilitation of hearing loss associated with infants, preschool, and school-age children.
Effective: Spring 2004
Prerequisite: CSD 535 orCSD 567

CSD 575 **Speech and Special Audiological Tests** (4) Theory, administration, and interpretation of special audiological tests to determine the site of lesion of a hearing loss.
Effective: Spring 2004
Prerequisite: CSD 230

CSD 595A **Speech/Language Intervention** (1-3) Instruction in and application of therapy procedures, including a weekly class and direct therapeutic intervention with individuals across the lifespan.
Effective: Spring 2006

CSD 595C **Speech/Language Therapy Externship** (7-15) Full-time clinical experience in speech/language intervention and assessment procedures at an off-campus site.
Effective: Spring 2006
Prerequisite: 45 credits in communication sciences and disorders and accrual of >200 clinical hours

CSD 595E **Audiology Practicum** (1-5) No description.
Effective: Spring 2004
Prerequisite: CSD 531

CSD 595G **Speech/Language Diagnostics Practicum** (1-2) Instruction in and application of assessment procedures, including pre- and post-evaluation meetings and direct assessment with individuals across the lifespan.
Effective: Spring 2006

CSD 595I **Speech Pathology Mini-Placement** (1-6) Part-time clinical experience in speech/language intervention and assessment procedures at an off-campus site.
Effective: Spring 2006

CSD 595J **Audiology Third Site** (1-2) Internship course.
Effective: Spring 2004

CSD 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2004

CSD 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2003

CSD 597D **AAC Research and Clinical Issues** (1-5) This seminar will focus on augmentative and alternative (AAC) research and clinical issues for speech-language pathologists.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSD 597K **MOSAIC: Clinical Issues For SLPs Working with Immigrant Children** (1-5) This seminar will focus on issues for speech-language pathologists serving children who are English Language Learners with communication disabilities.
Effective: Summer 2010 Ending: Summer 2010

CSD 597K **MOSAIC: Clinical Issues For SLPs Working With Immigrant Children** (1-5) This seminar will focus on issues for speech-language pathologists serving children who are English Language Learners with communication disabilities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSD 600 **Thesis Research** (1-15) No description.
Effective: Spring 2005

CSD 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 2005

CSD 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) No description.
Effective: Spring 2005
Prerequisite: 40 graduate credits in CMDIS

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Communications (COMM)

COMM 401 **Mass Media in History** (3) Relationship of news media to social, economic, and political developments in the Western world.
Effective: Fall 1986

COMM 403 **Law of Mass Communications** (3) Nature and theories of law; the Supreme Court and press freedom; legal problems of the mass media.
Effective: Fall 1986

COMM 403H **Law of Mass Communications** (3) Nature and theories of law; the Supreme Court and press freedom; legal problems of the mass media.
Effective: Spring 2006

COMM 405 **Political Economy of Communications** (3) Structure and functions of American and other mass communications systems and their relationship to political and economic systems.
Effective: Fall 1986
Prerequisite: ECON 002

COMM 405H **Political Economy of Communications** (3) Structure and functions of American and other mass communications systems and their relationship to political and economic systems.
Effective: Spring 2006
Prerequisite: ECON 002

COMM 406 **Electronic News Gathering and Editing** (3) Intermediate level skills in creating and editing television news packages.
Effective: Spring 2008
Prerequisite: COMM 315 orCOMM 283W

COMM 407 **Advertising in the American Economy** (3) Economic organization and the nature of economic institutions; evolution of advertising; its performance in the American economy.
Effective: Summer 1992
Prerequisite: ECON 002

COMM 408 (S T S 408) **Cultural Foundations of Communications** (3) Examination of oral, scribal, print, industrial, and electronic cultures; analysis of impact of technology on communications and social structure.
Effective: Spring 2009
Prerequisite: select 3 credits fromCOMM 100, COMM 110, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320, COMM 370 ; or 3 credits of S T S

COMM 409 **News Media Ethics** (3) Ethical problems in the practice of journalism; principal public criticisms of news media; case study approach.
Effective: Fall 2006

COMM 409H **News Media Ethics** (3) Ethical problems in the practice of journalism; principal public criticisms of news media; case study approach.
Effective: Fall 2006

COMM 410 (IL) **International Mass Communications** (3) The role of international media in communication among and between nations and people. Complement to COMM 419.
Effective: Spring 2009
Prerequisite: select 3 credits from the followingCOMM 100, COMM 110, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320 orCOMM 370

COMM 411 **Cultural Aspects of the Mass Media** (3) The mass media as creators and critics of mass culture in American life; relationships between the media and mass culture.
Effective: Spring 2009
Prerequisite: 6 credits in the arts or the humanities; and 3 credits selected from the followingCOMM 100, COMM 110, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320 orCOMM 370

COMM 411H **Cultural Aspects of the Mass Media** (3) The mass media as creators and critics of mass culture in American life; relationships between the media and mass culture.
Effective: Spring 2009
Prerequisite: 6 credits in the arts or the humanities; and 3 credits selected from the followingCOMM 100, COMM 110, COMM 118, COMM 150, COMM 180, COMM 260W, COMM 320 orCOMM 370

COMM 412 **Sports, Media and Society** (3) Sport and media relationship in American culture.
Effective: Summer 2006

COMM 413 **The Mass Media and the Public** (3) Nature of mass communications, relationships between mass media and public, media influences on opinion; social pressures on the media.

Effective: Spring 2009
Prerequisite: 3 credits selected from the following:COMM 100, COMM 110, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320 orCOMM 370

COMM 413W **The Mass Media and the Public** (3) Social-level and political theories of the relationships between media and public; media influences on public opinion; social pressure on the media; political communications.
Effective: Spring 2009 Ending: Fall 2010
Prerequisite: select 3 credits from the followingCOMM 100, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320 orCOMM 370

COMM 413W **The Mass Media and the Public** (3) Social-level and political theories of the relationships between media and public; media influences on public opinion; social pressure on the media; political communications.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: select 3 credits from the followingCOMM 100, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320 orCOMM 370 and select 3 credits from the following:COMM 304, COMM 420

COMM 414 **Media Management** (3) Theoretical bases and practical approaches for management and administration of communications projects, organizations, and resources.
Effective: Spring 2008
Prerequisite: COMM 100 orCOMM 251

COMM 415 **Advanced Photography** (3) Advanced applications in documentary photography emphasizing the narrative qualities of imagery, and utilizing digital technologies.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: COMM 215

COMM 415 **Advanced Photography for Communications** (3) Advanced applications in documentary photography emphasizing the narrative qualities of imagery, and utilizing digital technologies.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: COMM 215 orCOMM 269 and permission of program

COMM 417 **Ethics and Regulation in Advertising and Public Relations** (3) Ethical issues in practice of advertising and public relations; legal and regulatory issues; case studies.
Effective: Spring 2007
Prerequisite: COMM 320 orCOMM 370

COMM 418 **Media Effects: Theory and Research** (3) Investigation of social and psychological effects of media messages and technologies via theories and empirical evidence pertaining to processes of effects.
Effective: Spring 2007
Prerequisite: COMM 118 andCOMM 304 or equivalent

COMM 419 (US;IL) **World Media Systems** (3) Comparative study of modern media systems of mass communications in selected foreign countries.
Effective: Spring 2009
Prerequisite: select 6 credits in the arts or the humanities; and 3 credits from the following:COMM 100, COMM 110, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320 orCOMM 370

COMM 419H (US;IL) **World Media Systems** (3) Comparative study of modern media systems of mass communications in selected foreign countries.
Effective: Spring 2009
Prerequisite: select 6 credits in the arts or the humanities; and 3 credits from the following:COMM 100, COMM 110, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320 orCOMM 370

COMM 420 **Research Methods in Advertising and Public Relations** (3) Primary and secondary research methods used in the development of solutions to advertising and public relations problems.
Effective: Summer 2002
Prerequisite: COMM 320 orCOMM 370;STAT 200

COMM 421W **Advertising Creative Strategies** (3) Planning, designing, writing advertisements; introduction to graphics and production techniques and processes; layout and copywriting practice and critiques.
Effective: Spring 2004
Prerequisite: COMM 320

COMM 422 **Advertising Media Planning** (3) Analysis, selection, and scheduling of advertising media; examination of algorithms, technologies, and software used in media planning.
Effective: Fall 1986
Prerequisite: COMM 320

COMM 424 **Advertising Campaigns** (3) Advertising campaign problems from the viewpoint of the national advertiser and advertising agency; production of a complete advertising campaign.
Effective: Spring 2007
Prerequisite: COMM 420 orCOMM 304;COMM 421W, COMM 422

COMM 425 **Advertising Message Strategy** (3) Advanced work in developing message strategies for advertising campaigns; presentation and defense of strategic plans; extensive practice in creating advertisements.
Effective: Spring 2001
Prerequisite: COMM 421W, COMM 422

COMM 426 **International and Intercultural Strategic Communication** (3) Advertising and public relations in the international and intercultural arenas; multicultural strategic communications strategies.
Effective: Summer 2006

Prerequisite: COMM 320 orCOMM 370

COMM 427 **Client/Agency Relations** (3) Building and maintaining client/agency relationships in advertising, public relations and direct response agency business functions.
Effective: Summer 2006
Prerequisite: Advertising Option - Prerequisite or concurrent - One can be taken concurrently:COMM 421, COMM 422 . Public Relations Option - Prerequisite:COMM 471 Prerequisite or concurrent:COMM 473

COMM 430 **Mass Media and Politics** (3) Study of mass media as institutions and the effects of the mass media on politics, public policy, and citizens.
Effective: Spring 2008
Prerequisite: COMM 100 orCOMM 251

COMM 433 **Film History for Filmmakers II: The Development of the Cinema from 1960 to the Present** (3) History of the art, industry, economics, culture, and technology of cinema from 1960 to the present.
Effective: Summer 2010
Prerequisite: COMM 333

COMM 436 **Advanced Audio Production** (3) Advanced concepts and techniques of audio production in analog and digital formats with hands-on experience in recording, mixing and editing.
Effective: Spring 2008
Prerequisite: COMM 374

COMM 437 **Narrative Video/Filmmaking** (3) Intensive exploration of narrative form through the production of a fiction film or video.
Effective: Summer 1993 Ending: Fall 2010
Prerequisite: COMM 337

COMM 437 **Advanced Documentary Production** (3 per semester/maximum of 6) Advanced exploration of documentary production techniques and aesthetics through the completion of a short video project.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: COMM 337W, COMM 340, COMM 342W

COMM 438 **Non-Fiction Video/Filmmaking** (3) Intensive exploration of documentary traditions through the production of a non-fiction video or film.
Effective: Summer 2002 Ending: Fall 2010
Prerequisite: COMM 337 seventh-semester standing

COMM 438 **Advanced Narrative Production** (3 per semester/maximum of 6) Advanced exploration of narrative production techniques and aesthetics through the completion of a short film or video project.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: COMM 338, COMM 340, COMM 342W

COMM 439 **Alternative Film/Video Production** (3) Intensive exploration of non-narrative form through the production of a film or video.
Effective: Summer 1993 Ending: Fall 2010
Prerequisite: COMM 337

COMM 439 **Advanced Alternative Production** (3 per semester/maximum of 6) Advanced exploration in experimental and animation forms through the production of a film or video project.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: COMM 339, COMM 340, COMM 342W

COMM 440 **Advanced Production Technology and Technique** (3) Intensive practical experience and studies of camera, lighting, audio, and editing.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: COMM 347

COMM 440 **Advanced Cinematography and Lighting Techniques** (3) Advanced exploration in camera, lighting, audio, and color-grading techniques, emphasizing technical skills as well as aesthetics.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: COMM 340, COMM 342W and two of the following:COMM 337, COMM 338 orCOMM 339 or permission of program

COMM 441 **Advanced Graphic Design** (3) Theory and practice designing graphic visual communication in commercial, non- commercial, and fine art formats for print and on-line media.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: COMM 241 orCOMM 371

COMM 441 **Advanced Graphic Design for Communications** (3) Theory and practice designing graphic visual communication in commercial, non- commercial, and fine art formats for print and on-line media.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: COMM 241 orCOMM 371

COMM 442 **Advanced Audio Video Production** (3) Advanced techniques in video production applied to narrative, non-narrative and short documentary formats.
Effective: Spring 2008
Prerequisite: COMM 345

COMM 444 **Advanced Post-Production Techniques** (3) This course offers intensive practical experience in editing, motion graphics and sound mixing techniques, emphasizing both technical skills and aesthetics.

Effective: Summer 2010
Prerequisite: COMM 340, COMM 342W and two of the following:COMM 337, COMM 338 orCOMM 339

COMM 445 **Directing for the Screen II** (3) An advanced course in directing for both narrative and documentary film and video.
Effective: Summer 1993 Ending: Fall 2010
Prerequisite: COMM 345

COMM 445 **Directing Workshop** (3) An advanced aesthetic and skill production course in directing for the screen.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: COMM 340, COMM 342W and two of the following:COMM 337, COMM 338 orCOMM 339

COMM 446 **Writing for the Screen II** (3) An advanced course in screenwriting that further develops elements of storytelling technique.
Effective: Spring 1994
Prerequisite: COMM 346

COMM 448 **Advanced Cinematography and Sound Workshop** (3) Intensive practical experience and studies of camerawork, lighting, and audio production.
Effective: Fall 1986 Ending: Fall 2010
Prerequisite: COMM 342

COMM 448 **Advanced Group Production I** (3) A two semester advanced production course emphasizing intensive collaborative film-video production from script through post-production.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: COMM 340, COMM 342W and two of the following:COMM 337, COMM 338 orCOMM 339 and permission of program

COMM 449 **Advanced Film and Video Projects** (1-6) Applied theory/technique of synchronous sound film and video production; supervised experience in major production. Individual and group-directed study of in-depth projects.
Effective: Spring 2001 Ending: Fall 2010
Prerequisite: COMM 437

COMM 449 **Advanced Group Production II** (3) Continuation of advanced production course emphasizing intensive collaborative film-video production from script through post-production.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: COMM 448

COMM 450 **Analysis of Film Practice** (3) Course is oriented towards video and filmmakers; analyses of how ideas and creative concepts are connected to the production process.
Effective: Summer 1993
Prerequisite: COMM 242, COMM 250

COMM 451 **Topics in American Film** (3 per semester, maximum of 6) Critical and historical studies of American films. Analysis of directing, cinematography, editing, screenwriting, and acting.
Effective: Summer 1989
Prerequisite: COMM 250

COMM 452 **Topics in International Cinema** (3 per semester, maximum of 6) Critical and historical studies of topics in non-American film. Analysis of theory, direction, cinematography, editing, and screenwriting.
Effective: Summer 1989
Prerequisite: COMM 250

COMM 453 (IL) (CMLIT 453) **Narrative Theory: Film and Literature** (3) Comparative study of the aesthetics and techniques of film and literature; close analyses of masters of each art form.
Effective: Fall 2006
Prerequisite: COMM 150 or 3 credits in literature

COMM 454 **Documentary in Film and Television** (3 per semester, maximum of 6) Study of representative films from various documentary movements, examining form, technique, trends, and audience objectives.
Effective: Spring 2001
Prerequisite: fourth-semester standing

COMM 455 **Advanced Film Theory and Criticism** (3 per semester, maximum of 6) Close examination of classic and contemporary film theory and critical perspectives.
Effective: Summer 1989
Prerequisite: COMM 250

COMM 456 **Media Criticism and Theory** (3) Critical and theoretical approaches to the analysis of media and communication.
Effective: Spring 2008
Prerequisite: COMM 371

COMM 457 **Media Audiences and Contexts** (3) Survey of the ways media attempt to influence audience reception and how audiences hold sway over media content.
Effective: Spring 2008
Prerequisite: COMM 100 orCOMM 251

COMM 458 **Media Law and Ethics** (3) The study and practice of key issues in media law and ethics, including libel law, conflict of interest, truth in advertising.
Effective: Spring 2008

Prerequisite: COMM 100 orCOMM 251

COMM 459 **Cultural Effects of Interactive and Online Media** (3) Study of the global social impact and rhetorical limitations of converging media, emphasizing cross-cultural media influences.
Effective: Spring 2008
Prerequisite: COMMS 251

COMM 460W **Reporting Methods** (3) Techniques in reporting news and trends at the local, regional, and county levels. Emphasis on both deadline and interpretive reporting.
Effective: Fall 1990
Prerequisite: COMM 260W

COMM 461 **Professional Journalism Seminar** (3 per semester/maximum of 6) Problems of research, content, and form in journalistic specializations; topics of specialization announced each semester course is offered.
Effective: Spring 1988
Prerequisite: COMM 260W

COMM 462 **Feature Writing** (3) Reporting and writing the human interest article for newspapers and magazines.
Effective: Spring 2008
Prerequisite: COMM 260W

COMM 463 **Newspaper Design** (3) This course will cover newspaper design. Students will learn to solve design problems, edit photos, and work with industry software.
Effective: Spring 2009
Prerequisite: COMM 160, COMM 260, COMM 467 or permission of program

COMM 464W **Editorial, Opinion and Commentary Writing** (3) Introduces techniques of editorial, opinion and commentary writing.
Effective: Spring 2008
Prerequisite: COMM 260W

COMM 465 **Television Reporting** (3) Television news reporting and production.
Effective: Spring 2008
Prerequisite: COMM 360

COMM 466 **Public Affairs Broadcasting** (3) Producing radio and television magazine programs featuring individually-produced mini-documentaries and public affairs interviews.
Effective: Summer 1990
Prerequisite: COMM 383 orCOMM 465

COMM 467 **News Editing and Evaluation** (3) Concepts and procedures involved in processing news for various news media, but with emphasis on print media editing.
Effective: Spring 2001
Prerequisite: COMM 260W

COMM 468 **Graphic Applications in Print Communications** (3) Issues, concepts, and practice identified with contemporary design strategies for print journalism, advertising, and public relations.
Effective: Summer 1988
Prerequisite: COMM 260W orCOMM 320

COMM 469 **Photography for the Mass Media** (3) Development of an informed and critical approach to photocommunication; individual and team projects, seminars, and critiques.
Effective: Fall 1986
Prerequisite: COMM 269

COMM 470A **Convergent Media News Service: Newspaper Production** (3) Practicum emphasizing newsgathering and reporting for newspaper and for additional media formats.
Effective: Summer 2002
Prerequisite: COMM 260W

COMM 470B **Convergent Media News Service: TV** (3) Practicum emphasizing television news package production for periodic campus news program and for additional media formats.
Effective: Summer 2002
Prerequisite: COMM 260W

COMM 470C **Convergent Media News Service: Radio and Online Publications** (3) Practicum emphasizing streaming radio news package production or production of news pieces for online publications and for additional media formats.
Effective: Fall 2008
Prerequisite: COMM 242 orCOMM 374 andCOMM 260W

COMM 471 **Public Relations Media and Methods** (3) Analyzing media and audiences for public relations purposes; planning, designing, and writing public relations communications; press relations and publicity methods.
Effective: Spring 2004
Prerequisite: COMM 260W andCOMM 370

COMM 472 **Public Relations Event Planning** (3) Effective planning, organization, implementation and evaluation of events planning.
Effective: Spring 2008
Prerequisite: COMM 370

COMM 473 **Public Relations Campaigns** (3) Case studies and problems in publicity and public relations in industry,

government, and institutions.
Effective: Spring 2007
Prerequisite: COMM 370, COMM 420 orCOMM 304 andCOMM 471

COMM 474 **Depth Reporting** (3) Exploration of strategies for developing indepth newspaper or magazine articles, with an emphasis on gathering information and long-form writing.
Effective: Spring 2004
Prerequisite: COMM 260W

COMM 475 **Issues for Newsroom Managers** (3) Newspaper and television management, the state of the industry and topics that prospective employees should know about.
Effective: Spring 2004
Prerequisite: COMM 260W

COMM 476 **Sports Writing** (3) Techniques in sports reporting and writing for newspapers and magazines.
Effective: Summer 2005
Prerequisite: COMM 260, COMM 460

COMM 477 **Sports Broadcasting** (3) Techniques of sports broadcasting for radio and television.
Effective: Summer 2005
Prerequisite: COMM 260, COMM 360

COMM 478 **Sports Information** (3) Techniques of effective media relations used in a sports information office.
Effective: Summer 2005
Prerequisite: COMM 260

COMM 479 **Telecommunication Networks** (3) Economic, regulatory/business issues in the design/operation of large-scale telecommunication networks such as telephone, cable, wireless, and computer networks.
Effective: Spring 2002
Prerequisite: COMM 180 andECON 002 orECON 014

COMM 480 **Television News** (3) Produce a weekly television newscast.
Effective: Summer 2007
Prerequisite: COMM 360, COMM 465 permission of program

COMM 481 **Advanced Multimedia Production** (3) Advanced work in multimedia production using web authoring, video editing, audio editing, image editing and animation software.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: COMM 270

COMM 481 **Advanced Multimedia Production** (3) Advanced work in multimedia production using web authoring, video editing, audio editing, image editing and animation software.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: COMM 270 orCOMM 260W plus one of the following:COMM 269, COMM 360, COMM 460, COMM 462 or permission of program

COMM 482 **Advanced Communication Workshop** (4) Conceptualization, planning, and execution of a visual product on a selected topic utilizing an intensive group project-oriented laboratory approach.
Effective: Spring 2008
Prerequisite: COMM 371

COMM 484 **Emerging Telecommunications Technologies** (3) Overview of technology of electronic media and related societal issues.
Effective: Spring 1992
Prerequisite: COMM 180

COMM 484H **Emerging Telecommunications Technologies** (3) Overview of technology of electronic media and related societal issues.
Effective: Spring 2005
Prerequisite: COMM 180

COMM 485 **Analysis of Broadcast-Cable Policy** (3) Analysis of current policy issues in Broadcast/Cable. Standards and methods for evaluating telecomm policy processes and outcomes.
Effective: Fall 2001
Prerequisite: COMM 381 orCOMM 483

COMM 487 **Telecommunication Administration** (3) Operation/administration decision-making for broadcasting, broadband, telecommunications, and information firms including sales, marketing, programming, customer service, technology adoption, finance and capital investment.
Effective: Spring 2002
Prerequisite: COMM 387

COMM 488 **Writers' Seminar** (3) Workshop designed for advanced students interested in professional writing, involving extensive mutual and self-criticism.
Effective: Spring 2008
Prerequisite: COMM 230W orCOMM 260W

COMM 489W **Media and Information Industries** (3) The structure, conduct and performance of firms and industries in the electronic media and information sectors.
Effective: Spring 2004
Prerequisite: COMM 387 or equivalent

COMM 490 **Issues in Electronic Commerce: Policy and Implementation** (3) Analysis of policy, strategic issues, and implications raised by the rapid growth of electronic commerce over the Internet.
Effective: Fall 2001
Prerequisite: COMM 180 for telecom major; permission of instructor for non-telecom majors

COMM 490A **Convergent Media Seminar** (3) This seminar examines media convergence issues, trends, and effects on society through discussions, presentations, and creation of a capstone project.
Effective: Summer 2002
Prerequisite: seventh- or eighth-semester standing and 3 credits ofCOMM 470A, COMM 470B orCOMM 470C

COMM 491 **International Telecommunications and Trade Policy** (3) Development in the law, policy, and business of international telecommunications; emphasis on multilateral forums--International Telecommunications Union and World Trade Organization.
Effective: Fall 2001
Prerequisite: COMM 180

COMM 492 **Internet Law and Policy** (3) Development in the law, policy, and business of Internet-mediated communications and commerce; emphasis on impact on existing legal, regulatory, and economic models.
Effective: Fall 2001
Prerequisite: COMM 180

COMM 493 **Entrepreneurship in the Information Age: Senior Seminar** (3) Provides students with knowledge/tools to take their innovation/technology idea through the business planning, capital, and operations budgeting processes.
Effective: Fall 2001
Prerequisite: COMM 387

COMM 494 **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1994

COMM 494H **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

COMM 495 **Internship** (1-3 per semester/maximum of 6) Supervised practicum with newspapers, broadcasting stations, public relations, and advertising agencies.
Effective: Spring 2008
Prerequisite: continuing student majors in the College of Communications; departmental approval

COMM 495A **Internship** (1-6 per semester/maximum of 6) Supervised practicum with newspapers, broadcasting stations, public relations, and advertising agencies.
Effective: Spring 2008
Prerequisite: continuing student majors in the College of Communications; departmental approval

COMM 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1986

COMM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1986

COMM 497A **Music Video Production** (3) Students will learn to blend pictures and sound by producing several advanced video pieces utilizing music and sound effects.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497B **Diversity Communications** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497C **Globalization and the Media** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497C **Special Topics: AAF National Students Advertising Competition** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

COMM 497D **Media and Government** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497E **Campaigns, Elections and the Media** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497F **Perspectives on American Journalism** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497G **Joe Paterno: Communications & the Media** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497I **Group PR Projects** (3) An incorporation of in-class lessons and on-site activities at a PR agency near campus. Applies PR principles and practice to real-live activities. Students will prepare portfolio materials using actual events and accounts.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497K **Wireless Communication** (3) This course was designed for students who would like to develop a broad perspective of the wireless industry and the various constituents. The course will provide a historical view of the influential people and watershed events that helped shape the wireless industry. In addition, the class will focus on wireless carrier profiles and the correlation between technology, spectrum, and handset providers. The class will also discuss technology evolution considerations and the potential impact WiMAX, Apple and Google may have on wireless devices, products and services.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 497K **Wireless Communication** (3) Formal courses given infreqently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

COMM 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2001

COMM 498B **Webcast Production** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 498B **International Reporting** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

COMM 498C **Public Relations Crisis Communications** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

COMM 498D **Convergence Journalism** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 498E **Big 10 Network** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 498E **Big 10 Network** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

COMM 498F **Webcase Production** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

COMM 498G **Advanced Radio News** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

COMM 499 (IL) **Foreign Study--Mass Communications** (1-12) Study of mass communication systems and practices in selected foreign countries.
Effective: Summer 2005
Prerequisite: departmental approval

COMM 501 **Proseminar in Mass Communications** (3 per semester/maximum of 99) Overview of paradigms in mass communications research
Effective: Spring 2003
Prerequisite: admission to doctoral program

COMM 502 **Pedagogy in Communications** (3) The purpose of this seminar is to train doctoral students to teach in the communications discipline at the college/university level.
Effective: Spring 2004

COMM 504 **Seminar in the History of Mass Communication** (3) No description.
Effective: Fall 1986

COMM 505 **International Communication Problems** (3) Legal and communications problems of the international flow of news and opinion; international press codes.
Effective: Fall 1986

COMM 506 **Introduction to Mass Communications Research** (3) The scientific method; survey of basic concepts of theoretical and empirical research; variety of methodology; criteria for adequate research.
Effective: Fall 1986

COMM 507 **News Media and Public Opinion** (3) Problems in the function, techniques, and responsibilities of press, radio, and television in forming and interpreting opinion.
Effective: Fall 1986

COMM 508 **The Literature of Journalism** (3) No description.
Effective: Fall 1986

COMM 509 **Journalism Ethics** (3) Evolving ethics, standards, and social responsibility in American journalism; business nature of news media; case studies.
Effective: Fall 1986

COMM 510 **Comparative Theories of Press Systems** (3) Institutional structure and normative functions of press systems in modern societies, as shaped by prevailing world view and social organization.
Effective: Fall 1986

COMM 511 **Mass Communications Research Methods II** (3) Problems of bibliographical research; evaluation of sources and materials in mass communications history, biography, structure, ethics, and other areas.
Effective: Fall 1986
Prerequisite: COMM 506

COMM 512 **Government and Mass Communications** (3) Problems of freedom of information; governmental efforts to control mass communication agencies; government news coverage; public information agencies.
Effective: Fall 1986

COMM 513 **Constitutional Problems of the News Media** (3) Problems involving conflict between guarantees of press freedom in the First and Fourteenth Amendments and rights and privileges of others.
Effective: Fall 1986

COMM 514 **Political Economy of Communications** (3) Structure and functions of United States and global media systems and their relationship to political and economic systems.
Effective: Fall 2003

COMM 515 **MA Proseminar in Mass Communications** (3) An introduction to graduate studies for MA students in Media Studies and Telecommunications Studies.
Effective: Fall 2003
Prerequisite: First semester enrollment in MEDIA or TELEC M.A. programs

COMM 516 **Introduction to Data Analysis in Communications** (3) To understand and be able to use data analysis techniques common to research in communications.
Effective: Spring 2004
Prerequisite: COMM 506 or consent of program

COMM 517 **Psychological Aspects of Communication Technology** (3) Investigation of psychological aspects of human-computer interaction (HCI) and computer-mediated communication (CMC).
Effective: Spring 2007

Prerequisite: COMM 304 orCOMM 506

COMM 518 **Media Effects** (3) Advanced study of the effects of media messages and technologies via theories and empirical evidence pertaining to processes of effects.
Effective: Spring 2005
Prerequisite: COMM 506 or permission of instructor

COMM 520 **Seminar in Advertising Problems** (3) No description.
Effective: Fall 1986

COMM 521 **Advertising Perspectives** (3) An overview of advertising in industrial societies including institutional issues; socio-demographic issues; public policy issues; and ethical issues.
Effective: Spring 1992

COMM 522 **Social and Cultural Aspects of Advertising** (3) Analysis of advertising from a cultural/literary perspective; emphasis on semiotic and hermeneutic analysis; advertising as social communicaiton.
Effective: Spring 1992

COMM 540 **Studio in Directing for the Screen** (6 per semester/maximum of 12) Conceptualizing, breaking-down, planning, direction, and editing of narrative, documentary, or experimental films and videos.
Effective: Summer 1990

COMM 542 **Studio in Screenwriting** (6 per semester/maximum of 12) Conception, development, and polishing of screenplays and treatments for narrative, documentary or experimental films and videos.
Effective: Summer 1990

COMM 544 **Studio in Production** (6 per semester/maximum of 12) Conception, development, and polishing of a production specialty.
Effective: Summer 1990

COMM 545 **Studio in Project Development** (4) Conception, development, and polishing of a project proposal.
Effective: Spring 1990

COMM 549 **Combined Seminar in Filmmaking** (2 per semester, maximum of 8) Critical examination of student's work as it relates to the project as a whole.
Effective: Spring 1991
Concurrent: COMM 540 COMM 542 OR COMM 544

COMM 550 **Film Theory and Criticism** (3) Studies in traditional and contemporary film theory and criticism.
Effective: Spring 2005

COMM 553 **Special Problems in Film and TV** (1-3) No description.
Effective: Fall 1986

COMM 556 **Close Textual Analysis--Film and Video** (3) Using theoretically-informed, close textual analysis approach, course will explore the way films and videos generate meaning.
Effective: Spring 1990
Prerequisite: COMM 501

COMM 580 **Seminar in Telecommunications** (3) Study of the historical and contemporary issues and problems in telecommunications.
Effective: Fall 1986

COMM 581 **History of Electrical, Electronic, and Optical Communications** (3) Study of the historical development of the telecommunications industries.
Effective: Fall 2001

COMM 582 **Ethics and Emerging Communications Technology** (3) Identification and analysis of ethical issues raised by electronic communications technologies.
Effective: Spring 2004

COMM 583 **Seminar on United States Telecommunications Policy** (3) Examination of the United States telecommunications policy process and current issues.
Effective: Spring 2004

COMM 584 **International Telecommunications and Trade Policy** (3) An interdisciplinary perspective that investigates contemporary debates and ongoing or anticipated conflicts in international telecommunications and trade policy.
Effective: Fall 2000

COMM 585 **Media & Telecommunications Industries** (3) Study the structure and performance of media, telecommunications and information industries applying principles and ideas from microeconomics, finance and communications.
Effective: Spring 2005

COMM 586 **Issues E-Commerce Policy** (3) To research, understand and analyze selected issues in e-commerce policy.
Effective: Summer 2003

COMM 587 **Internet Law and Policy** (3) Examination of legal, policy and business developments in Internet-mediated communications emphasizing the impact on existing regulatory and economic models.
Effective: Summer 2003

COMM 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

COMM 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2000

COMM 594A **Telecommunications Studies Masters Paper** (3) A significant research paper completed under the direction of a faculty adviser.
Effective: Spring 2002
Prerequisite: admission to the Telecommunications Masters Program

COMM 594B **Research Project Apprenticeship** (1-3 per semester, maximum of 3) Provides opportunities for doctoral students to enhance their knowledge of cmparative research methods by working on established faculty research projects.
Effective: Spring 2002
Prerequisite: doctoral level standing

COMM 595 **Internship** (1-18) Supervised off-campus, non-group instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 2000

COMM 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1986

COMM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

COMM 597A **Is Media Framing a Viable Theory** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2010 Ending: Summer 2010

COMM 597B **Mass Communications and the Environment** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2010 Ending: Summer 2010

COMM 597B **Telecommunications Law and Regulation** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

COMM 600 **Thesis Research** (1-15) No description.
Effective: Fall 1986

COMM 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1990

COMM 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching or assisting in School of Communication courses by graduate students with previous news-editorial, advertising, and broadcasting experience.
Effective: Fall 1986

COMM 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1986

COMM 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1990

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Communications-CI (COMMS)

COMMS 438 **Magazine Editing** (3) Study and practice of the editing and design of magazines and newsletters.
Effective: Spring 2008

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Community and Economic Development (CEDEV)

CEDEV 430 (AG EC 430) **Principles of Community Economic Development** (3) Concepts, strategies, and techniques of local economic analysis, planning, and development; case studies and decision-making exercises.
Effective: Spring 2004
Prerequisite: introductory course in economics

CEDEV 452 (R SOC 452) **Rural Organization** (3) Social organization and change in rural communities; use of sociological principles in analysis of rural problems and rural development.
Effective: Fall 2000
Prerequisite: 6 credits in rural sociology sociology or psychology

CEDEV 470 (R SOC 470) **Comparative Community Development** (3) Crosscultural community development projects and the problems encountered in each of the different cultural contexts.
Effective: Fall 2000 Ending: Summer 2010
Prerequisite: 6 credits in social or behavioral science

CEDEV 500 **Community & Economic Development and Leadership** (3) Understanding principles and strategies of community and economic development in relation to general systems theory, community decision making, and leadership strategies and roles in group and community settings.
Effective: Spring 2004
Prerequisite: graduate standing

CEDEV 505 (R SOC 505, AEE 505) **Leadership Development** (3) Exploration, understanding, and application of leadership roles, strategies, and principles in group and community settings.
Effective: Spring 2010

CEDEV 509 **Population, Land Use, and Municipal Finance** (3) Understanding the interaction of population characteristics, land use, municipal funds, and taxation in a locality and how they impact the operation and management of government jurisdictions.
Effective: Fall 2000
Prerequisite: graduate standing

CEDEV 516 (R SOC 516) **Change in Rural Society** (3) Social change in rural society, emphasizing prediction and control of the change process; even years.
Effective: Fall 2000
Prerequisite: graduate standing

CEDEV 517 (R SOC 517) **International Rural Social Change** (3) Implications of planned change for international rural societies, considering basic structural constraints, known institutional linkages, and potential synergetic consequences.
Effective: Fall 2000
Prerequisite: graduate standing

CEDEV 533 (AG EC 533, AEREC 533) **Rural Development Research Methods and Topics** (3) Advanced theories and methods for rural economic development research.
Effective: Fall 2003 Ending: Fall 2010
Prerequisite: AG EC 502, AG EC 511, ECON 521

CEDEV 533 (AEREC 533) **Rural Development Research Methods and Topics** (3) Advanced theories and methods for rural economic development research.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: ECON 521

CEDEV 575 **Methods and Techniques for Community and Economic Development** (3) Understanding and applying methods and hands-on experience with techniques used in community and economic development. Lab.
Effective: Fall 2000
Prerequisite: graduate standing and approval of the instructor

CEDEV 576 **Applications and Practices for Community and Economic Development** (1-6) Consideration of community and economic development applications in communities and practices of public and private organizations and agencies.
Effective: Fall 2000
Prerequisite: graduate standing and approval of the instructor

CEDEV 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Fall 2000

CEDEV 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2000

CEDEV 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2000

CEDEV 597A **Community Economic Development Summer Institute** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2010 Ending: Summer 2010

CEDEV 599 (IL) **Foreign Studies** (1-12, maximum of 24) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005

CEDEV 600 **Thesis Research** (1-15) No description.
Effective: Fall 2000

CEDEV 602 **Supervised Experience in College Teaching** (1-3) Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Fall 2000

CEDEV 610 **Thesis Research** (1-15) No description.
Effective: Fall 2000

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Comparative Literature (CMLIT)

CMLIT 400Y (US;IL) **Senior Seminar in Literary Criticism and Theory** (3) Discussions of theories of literature, of literary criticism, and particularly of the distinct methods of comparative study; individual projects.
Effective: Spring 2006
Prerequisite: seventh-semester standing; 18 credits in literature

CMLIT 401Y (IL) **The Western Literary Heritage I** (3) Major literary movements and authors in the literature of the Western world from the beginnings through the early Renaissance.
Effective: Spring 2006
Prerequisite: 3 credits in literature or history

CMLIT 402Y (US;IL) **The Western Literary Heritage II** (3) Major literary movements and authors in the literature of the Western world from the late Renaissance to the present time.
Effective: Spring 2006
Prerequisite: 3 credits in literature or history

CMLIT 403 (US) (LTNST 403) **Varieties of Latina/o Cultural Expression** (3) Literary and other forms of cultural expression (film, music, art, and theater) are compared across different Latina/o communities.
Effective: Summer 2006 Ending: Fall 2010
Prerequisite: 3 credits in the humanities or in any LTNST course or 4th-semester proficiency in Spanish

CMLIT 403 (US) (LTNST 403) **Latino/a Literature and Culture** (3) Literary and other forms of cultural expression (film, music, art, and theater) are compared across different Latina/o communities.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: 3 credits in the humanities or in any LTNST course or 4th-semester proficiency in Spanish

CMLIT 404 (IL) **Literary Modes of Asia** (3) Selected works from the major poetry, fiction, and drama of such countries as India, China, Japan.
Effective: Spring 2006 Ending: Fall 2010
Prerequisite: 3 credits in literature or related field appropriate to this course

CMLIT 404 (IL) (ASIA 404) **Topics in Asian Literature** (3) Selected works from the major poetry, fiction, and drama of such countries as India, China, Japan.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: 3 credits in literature or related field appropriate to this course

CMLIT 405 (US;IL) **Inter-American Literature** (3) This course examines the development of literature in Canada, the United States, Spanish America, the Caribbean area, and Brazil.
Effective: Spring 2006
Prerequisite: 3 credits in literature

CMLIT 406 (IL) **Women and World Literature** (3) Literature written by women, especially women from non-Western cultures; the spectrum of genres in which women writers have excelled.
Effective: Spring 2006
Prerequisite: 3 credits in literature or in women's studies

CMLIT 408 (IL) **Heroic Literature** (3) Traditional heroes, their traits and adventures; typical themes and examples chosen from the epics and sagas of world literature.
Effective: Spring 2006
Prerequisite: 3 credits in literature or folklore

CMLIT 410 (IL) **Problems in Translation** (3) Emphasizing literary translation, a study of the theoretical and practical problems encountered in the processes of translation, transmission, and interpretation.
Effective: Spring 2006 Ending: Fall 2010
Prerequisite: 18 credits in a foreign language

CMLIT 410 (IL) **Literary Translation: Theory and Practice** (3) Emphasizing literary translation, a study of the theoretical and practical problems encountered in the processes of translation, transmission, and interpretation.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: 18 credits in a foreign language

CMLIT 415 (GH;US;IL) **World Graphic Novels** (3) Critical analyses of form, genre, medium, and discourse of the graphic novel and its historical precedents in an international and comparative context.
Effective: Summer 2010
Prerequisite: 3 credits in literature

CMLIT 422 (IL) **African Drama** (3) Traditional and popular drama forms; modern anglophone and francophone drama; nationalism and social criticism in contemporary African drama.
Effective: Spring 2006

CMLIT 423 (IL) **African Novel** (3) From traditional oral narratives to modern autobiograhical, historical, satirical, sociological, and allegorical forms; novelist as social critic.
Effective: Spring 2006

CMLIT 429 (ENGL 429) **New Media and Literature** (3) New media literary genres; critical discussion of creative works in digital media.
Effective: Summer 2010

CMLIT 430 (IL) **Global Modernisms** (3) A comparative investigation of global Modernisms, with an emphasis on the relations between modernism, modernity, and modernization.
Effective: Summer 2010
Prerequisite: 3 credits in literature

CMLIT 435 (IL) **Cultures of Globalization** (3) Cultural and literary effects of the process of globalization, with an emphasis on world literatures and transnationalism.
Effective: Summer 2010
Prerequisite: 3 credits of literature

CMLIT 438 (IL) **Fantastic Worlds: International and Comparative Perspectives** (3) A comparative, international study of fantastic worlds in literature and visual culture.
Effective: Summer 2010
Prerequisite: 3 credits in literature

CMLIT 443 (US;IL) **Literary Relations of Germany with England and America** (3-9) Nature and extent of the literary relations of Germany and England; in alternate years, of Germany and America. A reading knowledge of German is recommended but not required. Conducted in English.
Effective: Spring 2006 Ending: Fall 2010

CMLIT 443 (US;IL) **Transatlantic Literature** (3 per semester/maximum of 6) Comparative literary and cultural relations across the Atlantic Ocean; may include Europe, Africa, the Americas, and/or the Caribbean.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: 3 credits in literature

CMLIT 446 (IL) **Postcolonial Literature and Culture** (3) Postcolonial literature and theory in a comparative and international context.
Effective: Summer 2010
Prerequisite: 3 credits in the study of literature

CMLIT 448 (IL) **Literary Cultures of Buddhism** (3) Comparative exploration of various Buddhist literary cultures, from the classical Indian subcontinent to modern movements like the Beats and dalit writing.
Effective: Summer 2010
Prerequisite: 3 credits in literature

CMLIT 449 (IL) **Literary Cultures of Islam** (3) Comparative discussion of the literary cultures of Islam from the seventh century to the present.
Effective: Summer 2010
Prerequisite: 3 credits in the study of literature

CMLIT 453 (IL) (COMM 453) **Narrative Theory: Film and Literature** (3) Comparative study of the aesthetics and techniques of film and literature; close analyses of masters of each art form.
Effective: Fall 2006
Prerequisite: COMM 150 or 3 credits in literature

CMLIT 455 (IL) **Ethics, Justice, and Rights in World Literature** (3) Concepts of ethics, justice, and rights, appearing in world literature and/or film.
Effective: Summer 2010
Prerequisite: 3 credits in the study of literature

CMLIT 459 **Topics in Theory** (3) Selected topics in this history of theory and literary criticism within a global, comparative context.
Effective: Summer 2010
Prerequisite: 3 credits in literature

CMLIT 470 (IL) **Old Masters of the Modern Novel** (3) Major novels of Joyce, Proust, Kafka, Thomas Mann, Nabokov, and others; their contributions to the art of the novel.
Effective: Spring 2006 Ending: Fall 2010
Prerequisite: 3 credits in literature

CMLIT 470 (IL) **The Modern Novel** (3) Major novels of Joyce, Proust, Kafka, Thomas Mann, Nabokov, and others; their contributions to the art of the novel.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: 3 credits in literature

CMLIT 471 (IL) **Poetry and Poetics** (3) Theoretical and practical concepts in the comparative, global history of poetry and/or poetics.
Effective: Summer 2010
Prerequisite: 3 credits in literature

CMLIT 480 (IL) **The International Folktale** (3) Traditional tales from various parts of the world: their origin, characteristics, forms; their transmission as oral narrative and written literature.
Effective: Spring 2006
Prerequisite: 3 credits in literature or folklore

CMLIT 481 (IL) **Theory and Techniques of World Folklore** (3) Provides essential backgrounds to major folklore approaches and gives direction to the application of the most popular analytic methods.
Effective: Spring 2006
Prerequisite: 3 credits in literature

CMLIT 486 (IL) **Tragedy** (3) Development of tragic drama and its relationship to social background and philosophical theory.
Effective: Spring 2006

CMLIT 487 (IL) **Comedy** (3) Development of comic drama and its relationship to social background and philosophical theory.
Effective: Spring 2006

CMLIT 488 (IL) (ENGL 488) **Modern Continental Drama** (3) From Ibsen to the drama of today: Strindberg, Chekhov, Hauptmann, Pirandello, Ionesco, Beckett, Genet, and others.
Effective: Spring 2006
Prerequisite: ENGL 015 orENGL 030

CMLIT 490 **Video Game Studies** (3) A comparative look at the nature and history of video games as cultural artifacts, from Pond to online role-playing.
Effective: Summer 2010
Prerequisite: 3 credits in literature

CMLIT 491 (IL) **Literary Adaptation: International and Comparative Perspectives** (3) A comparative, international study of adapations between literature and other media (film, theater, photography, music).
Effective: Summer 2010
Prerequisite: 3 credits in literature or other fields relevant to this course

CMLIT 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1995

CMLIT 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

CMLIT 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1995

CMLIT 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1995

CMLIT 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1995

CMLIT 499 (IL) **Foreign Study--Comparative Literature** (3-6) Advanced courses offered on comparative literary topics as part of a foreign-study program.
Effective: Summer 2005
Prerequisite: 18 credits or equivalent in the appropriate foreign language; 6 credits in literature or related field appropriate to this course

CMLIT 501 **Comparative Method in Literary Studies** (3) Bibliography, research methods, and studies in comparative literature.
Effective: Summer 1995

CMLIT 502 **Comparative Criticism I: Classical to Neoclassical** (3) Issues in literary criticism from Plato and Aristotle to the mid-eighteenth century.
Effective: Summer 1995

CMLIT 503 **Comparative Criticism II: Romantic to Contemporary** (3) Principles and theories of literary criticism from eighteenth- and nineteenth- century beginnings to twentieth-century expansion and application.
Effective: Summer 1995

CMLIT 504 **Studies in Literary Genres** (3-6) The concept of genre and the evolution of genre theory; application to a specific genre, e.g., the lyric or the novel.
Effective: Summer 1995

CMLIT 505 **Studies in Literary Periods and Movements** (3-6) Comparative approaches to cohesive units within literary history, e.g., the Renaissance, the Enlightenment, Romanticism, Surrealism.
Effective: Summer 1995

CMLIT 506 **Studies in Literary Themes and Motifs** (3-6) Comparative approaches to recurrent literary themes and motifs; application to a specific example, e.g., literary Utopias or the Faust theme.
Effective: Summer 1995

CMLIT 507 **Comparative Poetics** (3 per semester/maximum of 6) Theoretical and practical concepts in the comparative, global history of poetry and/or poetics.
Effective: Summer 2010

CMLIT 510 **Theory and Practice of Translation** (3) Theories of translation and interpretation; importance of translation in literary transmission; application of theoretical concepts to individual translation projects.
Effective: Summer 1995
Prerequisite: 24 credits in a foreign language

CMLIT 521 **Comparative Seminar in Inter-American Literatures** (1-12) Comparative topics presenting literary works of the Americas--North America, South America, and the Caribbean--from early to present times.
Effective: Summer 2000

CMLIT 522 **Comparative Seminar in Asian Literatures** (1-12) Comparative topics presenting literary works of Asia, from the origins of literature in Asia to the present time.
Effective: Summer 2000

CMLIT 523 **Comparative Seminar in African Literatures** (1-12) Comparative topics presenting literary works of Africa, from the origins of literature in Africa to the present time.
Effective: Summer 2000

CMLIT 543 **Literary Relations** (3 per semester/maximum of 6) Mutual influences among specific literatures and cultures; for example, German-American, French-American, Inter-American, or East-West literary relations.
Effective: Summer 1995

CMLIT 570 **Forces in Contemporary Literature** (3-6) Intellectual currents and experimental forms in contemporary world literature.
Effective: Summer 1995

CMLIT 580 **Contemporary Literary Theory** (3) Major issues in contemporary literary theory and their significance for criticism, with emphasis on continental European theorists and their influence.
Effective: Summer 1995

CMLIT 589 (SPAN 589, FR 589, GER 589) **Technology in Foreign Language Education: An Overview** (3) Approaches to the uses and research applications of multimedia and other educational technologies applied to the teaching of foreign languages. (also crosslisted with APLNG 589)
Effective: Spring 2004

CMLIT 590 **Colloquium** (1-3) Continuing seminars which consist of a series of lectures by faculty, students or outside speakers.
Effective: Summer 1995

CMLIT 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1995

CMLIT 596A **Professional Development in Comparative Literature: Teaching Literature** (1-2) Professional development in comparative literature: pedagogical, theoretical, ethical, and practical aspects of teaching literature in compressed formats and online.
Effective: Summer 2010 Ending: Summer 2010

CMLIT 597 **Special Topics** (1-9) Formal courses given on a topical or special inerest subject which may be offered infrequently.
Effective: Summer 1995

CMLIT 597A **Close Reading** (1) This five-week short course on close reading trains students in the basic skills of literary and cultural interpretation.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CMLIT 597B **World Literature** (1) An examination of World Literature as subfield of Comparative Literature - its theoretical, pedagogical, and scholarly implications for literary production.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CMLIT 597C **Research Design in Literary Studies** (1) This short course (4 weeks) will focus on comparative projects and will address different kinds of literary inquiries.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CMLIT 597D **Law and Literature: The Nomological Imagination** (3) This course examines literary, theoretical, and philosophical texts that imagine law, as well as the use of legal actors make of literature and film.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CMLIT 599 (IL) **Foreign Study--Comparative Literature** (1-12) Graduate-level courses offered on comparative literary topics as part of a foreign-study experience approved by the program head.
Effective: Summer 2005
Prerequisite: 24 credits in the appropriate foreign language(s); 18 credits in literature or relevant related fields

CMLIT 600 **Thesis Research** (1-15) No description.
Effective: Summer 1995

CMLIT 601 **Ph.D. Dissertation Full Time** (0) No description.
Effective: Summer 1995

CMLIT 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) Supervision of teaching; consideration of insturctional aims and objectives, methods of lecturing and leading discussions, evaluation of student work.
Effective: Summer 1995

CMLIT 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2000

CMLIT 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1995

CMLIT 611 **PH.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1995

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Comparative and International Education (CI ED)

CI ED 401 (IL) (EDTHP 401) **Introduction to Comparative Education** (3) Origins, nature, scope, basic literature, and methodology of comparative education. Study of sample topics.
Effective: Fall 2007
Prerequisite: 5th semester standing or higher

CI ED 440 (EDTHP 440) **Introduction to Philosophy of Education** (3) Introduction to the examination of educational theory and practice from philosophical perspectives, classical and contemporary.
Effective: Fall 2007
Prerequisite: EDTHP 115

CI ED 444 (WL ED 444) **Language, Culture and the Classroom: Issues for Practitioners** (3) Critical understanding of cultural linguistic diversity to facilitate the inclusion of English Language Learners in a globalized classroom.
Effective: Fall 2007
Prerequisite: WL ED 300 orWL ED 400

CI ED 457 (AGECO 457) **Principles of Integrated Pest Management** (3) Integrated study of pest complexes and their management, emphasizing ecological principles drawing on examples from a range of agricultural, forestry and urban systems. This course is designed for sixth, seventh, and eighth semester and graduate students.
Effective: Spring 2010
Prerequisite: Must take two or more of the following:ENT 313 and/orPPATH 405 and/orPPATH 318 and/orHORT 238

CI ED 470 (ADTED 470) **Introduction to Distance Education** (3) An introduction to the history, theory, organization, technologies, and instructional procedures used in American and foreign distance education.
Effective: Summer 1995

CI ED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1998

CI ED 497A (EDTHP 497A) **Immigration, Ethnicity and the Schools** (3) This class is an introduction to theories and empirical research on various immigrant and race/ethnic groups and their schooling.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CI ED 500 **Comparative Education Proseminar I** (3) Methods of comparative education and case studies of governance and administration; first of two part sequence.
Effective: Spring 1995

CI ED 501 **Comparative Education Proseminar II** (3) Second course of two-part sequence; causes and consequences of increased schooling world-wide.
Effective: Spring 1995

CI ED 503 (EDTHP 507, HI ED 503) **Ethnicity, National Identity, and Education** (3) Surveys group-oriented education policies internationally, especially comparing those of Britain, Taiwan, India.
Effective: Summer 1995

CI ED 504 (C I 504) **Perspectives in African Education** (3) Educational systems in selected african countries are examined with respect to colonial history, social, political, and cultural factors.
Effective: Spring 1995

CI ED 508 (ADTED 508) **Globalization and Lifelong Learning** (3) Examination of globalization discourses and their relationships, implications and impacts on lifelong learning processes and contexts.
Effective: Summer 2004

CI ED 509 (ADTED 509) **Language, Literacy, Identity, and Culture in a Global Context** (3) Examines the relationship between issues of language, identity, and culture for adult learners in an increasingly global context.
Effective: Spring 2004
Prerequisite: CI ED 508

CI ED 516 (EDTHP 516) **Education and Demographic Change in the United States and Abroad** (3) Interrelationship between schooling and employment, marriage, fertility, and migration. Focus comparatively on the United States and developing countries.
Effective: Spring 1998

CI ED 541 (EDTHP 541) **Contemporary Philosophies of Education** (3) Educational theory and practice in relation to contemporary movements in philosophy.
Effective: Spring 2008

CI ED 542 (LL ED 542) **Issues in Literacy Education** (3) Discussion of philosophical, sociological, historical, and curricular issues in literacy education.
Effective: Spring 1997

CI ED 553 (EDTHP 553, HI ED 553, SOC 553) **Educational Mobility in Comparative Perspective** (3) Role of education in social mobility, using quantitative, qualitative, and historical methods; focuses comparatively on Britain, East Asia, and South America.
Effective: Spring 2003

CI ED 555 (EDPSY 555) **Validity of Assessment Results** (3) Concepts, issues, and methods of validation of educational and psychological assessment including models and approaches to validation, bias, and utility.
Effective: Spring 2008
Prerequisite: EDPSY 406, EDPSY 450

CI ED 564 (ADTED 564) **Social and Cultural Contexts of Learning and Work** (3) Examines the relationship between learning and work with special attention given to how certain forms of learning are legitimized.
Effective: Summer 2004
Prerequisite: CI ED 500, ADTED 542

CI ED 570 (ADTED 570) **Comparative and International Adult Education** (3) Critical and comparative analysis of adult education theory and practice outside North America, including international agency involvement.
Effective: Spring 1995
Prerequisite: ADTED 460

CI ED 571 (HI ED 571) **Comparative Higher Education** (3) Comparative methods of studying structural variations in systems of higher education in principal industrialized nations and other selected countries.
Effective: Spring 1995

CI ED 572 (ADTED 572) **Policy Studies in Lifelong Learning** (3) Examine lifelong learning policies and the relationship between lifelong learning issues and problems, policy development, policy actors and institutional structures.
Effective: Summer 2004
Prerequisite: CI ED 508

CI ED 587 (C & S 587, E C E 587) **Curriculum, Culture, and Child Development** (3) Examines human development and cultural factors in planning, designing, and implementing curriculum and instruction in early childhood and childhood education.
Effective: Fall 2001
Prerequisite: HD FS 429

CI ED 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1995

CI ED 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1995

CI ED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1995

CI ED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1995

CI ED 597A (ADTED 597A) **Cross Cultural Research Methods in Education** (3) This course will expose students to comparative and cross-cultural research methods and how this methodology can assist in conducting research with diverse ethnic/cultural groups.
Effective: Summer 2010 Ending: Summer 2010

CI ED 597A **Civic Engagement and Democratic Practices in Schools** (3) Course examines ways in which schools engage in democratic practices. Topics will include student voice, service learning, civic education, and democratic decision making.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CI ED 597B (EDTHP 597B, SOC 597B) **Children and Childhood in Sociological Perspective** (3) The course objective is to investigate social, cultural, political and economic forces that shape childhood around the world, viewed through an educational lens.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CI ED 597C (EDTHP 597B) **Education of Immigrant's Children** (3) This course is designed to give students a broad familiarity with sociological perspectives and research on immigration and schooling for children.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CI ED 597D (EDTHP 597D) **Education Effects on World Health** (3) Research lierature and theory on education's massive effect on world health outcomes are explored in a seminar format.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Computer Engineering (CMPEH)

CMPEH 449 **VLSI Digital Circuits** (3) Modern approaches to using VLSI technology; logic circuits, cell layout and design on CAD systems.
Effective: Spring 2008

CMPEH 472 **Microprocessors** (4) Principles of microprocessors, hardware architecture, assembly language, programming, interfacing, and applications of microprocessors will be studied.
Effective: Spring 2008
Prerequisite: CMPEN 271, CMPEN 275, E E 310

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Computer Engineering (CMPEN)

CMPEN 411 **VLSI Digital Circuits** (3) Basic building blocks of CMOS design, design rules, chip planning, layout design, system power and timing, simulation of VLSI structures.
Effective: Spring 2008
Prerequisite: CMPEN 371 orCMPEN 471;E E 310

CMPEN 416 (E E 416) **Digital Integrated Circuits** (3) Analyses and design of digital integrated circuit building blocks, including logic gates, flip-flops, memory elements, analog switches, multiplexers, and converters.
Effective: Spring 2008
Prerequisite: E E 310

CMPEN 417 (E E 417) **Digital Design Using Field Programmable Devices** (3) Field programmable device architectures and technologies; rapid prototyping using top down design techniques; quick response systems.
Effective: Spring 2008
Prerequisite: CMPEN 331

CMPEN 431 **Introduction to Computer Architecture** (3) Introduction to computer architecture. Memory hierarchy and design, CPU design, pipelining, multiprocessor architecture.
Effective: Spring 2008
Prerequisite: CMPEN 331 orCMPEN 371

CMPEN 431H **Honors Introduction to Computer Architecture** (3) Honors course in principles of computer architecture: memory hierarchies and design, I/O organization and design, CPU design and advanced processors.
Effective: Spring 2008
Prerequisite: CMPEN 331

CMPEN 441 **Operating Systems** (3) Resource management in computer systems. Process scheduling, memory management, file system design, I/O management, Unix operating system.
Effective: Spring 2008
Prerequisite: CMPSC 360

CMPEN 454 (E E 454) **Fundamentals of Computer Vision** (3) Introduction to topics such as image formation, segmentation, feature extraction, matching, shape recovery, object recognition, and dynamic scene analysis.
Effective: Spring 2008
Prerequisite: MATH 230 orMATH 231;CMPSC 121 orCMPSC 201

CMPEN 455 (E E 455) **Digital Image Processing** (3) Overview of digital image processing techniques and their applications, image sampling, enhancement, restoration, and analysis; computer projects.
Effective: Spring 2008
Prerequisite: E E 353 orE E 350;CMPSC 121 orCMPSC 201

CMPEN 461 **Communication Networks** (3) Data transmission, encoding, link control techniques, network architecture, design, protocols, and multiple access.
Effective: Spring 2008
Prerequisite: CMPEN 271;E E 380

CMPEN 471 **Logical Design of Digital Systems** (3) Basic switching theory and design of digital circuits, including combinational, synchronous sequential, and asynchronous sequential circuits.
Effective: Spring 2008
Prerequisite: CMPEN 331

CMPEN 471H **Honors Logical Design of Digital Systems** (3) Honors course in basic switching theory and design of digital circuits, including combinational, synchronous sequential and asynchronous sequential circuits.
Effective: Spring 2008
Prerequisite: CMPEN 331

CMPEN 472 **Microprocessors and Embedded Systems** (3) Microprocessors: architecture, design, assembly language, programming, interfacing, bus structure, and interface circuits and their use in embedded systems.
Effective: Spring 2008
Prerequisite: CMPEN 331

CMPEN 472H **Honors Microprocessors and Embedded Systems** (3) Honors course in microprocessors: architecture, design, assembly language, programming, interfacing, bus structure, and interface circuits and their use in embedded systems.
Effective: Spring 2008
Prerequisite: CMPEN 331

CMPEN 473 **Microcomputer Laboratory** (3) Design of digital systems using microprocessors.
Effective: Spring 2008
Prerequisite: CMPEN 472

CMPEN 475 **Functional Verification** (3) Introduce concepts, methods, and technology for effective functional verification of modern electronic systems.
Effective: Summer 2008
Prerequisite: CMPEN 331

CMPEN 480 **Computer Engineering Design** (3) Engineering design and modeling, engineering economy, project planning, capstone project selections, and technical communication skills.
Effective: Spring 2008
Prerequisite: CMPEN 352W;CMPEN 431

CMPEN 481 **Computer Engineering Project** (3) Group or individual design projects in the area of computer engineering.
Effective: Spring 2008
Prerequisite: CMPEN 480

CMPEN 482W **Computer Engineering Project Design** (3) Computer engineering design project, project management, documentation, reporting, and group and individual communication skills.
Effective: Spring 2008
Prerequisite: E E 310;E E 353;CMPSC 473;ENGL 202C

CMPEN 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

CMPEN 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

CMPEN 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2008
Prerequisite: prior approval of proposed assignment by instructor

CMPEN 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2008

CMPEN 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2008

CMPEN 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010

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Computer Engineering Technology (CMPET)

CMPET 400 **Computer Architecture, Organization, and Design** (4) Instruction sets, formating, sequencing, and addressing modes; central processing unit design; computer peripheral, I/O, memory organization, and computer communications.
Effective: Fall 2007
Prerequisite: CMPET 403

CMPET 401 **Data Communication and Networking** (3) Signal representations, communication techniques, interfacing, serial and parallel communication, modems, error detection, LAN and WAN protocols.
Effective: Spring 2008
Prerequisite: CSE 271 orEE T 117

CMPET 402 **Data Communication and Networking Laboratory** (1) Network operating systems, LAN and WAN protocols, serial and parallel communications, modems, FAX, and other interfacing methods.
Effective: Spring 2001
Prerequisite: or concurrent:CMPET 401

CMPET 403 **Switching Circuit Design** (4) Analysis and design of advanced combinational and sequential circuits using IC logic devices and PLD's while promoting the use of software development tools.
Effective: Spring 2008
Prerequisite: CMPEN 271 orEET 117;CMPEN 275 orEET 120

CMPET 412 **Microcomputers** (4) Design, architecture, programming, and interfacing of microprocessors, enhanced by lab experiments.
Effective: Spring 2008
Prerequisite: CMPEN 271 orEET 117;CMPEN 275 orEET 120

CMPET 456 **Advanced Microprocessors, High Level Interfacing** (3) Operating systems; systems programming; high-level application programming; high-level hardware and software protocols; serial and parallel digital communications.
Effective: Spring 2007
Prerequisite: CMPET 355

CMPET 457 **Software Engineering** (3) Application of modern techniques in software development, including program design based on new methods and tools.
Effective: Spring 2007
Prerequisite: CMPET 355

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Computer Information Systems (CINSY)

CINSY 406 **Microcomputer Technology and Application** (3) Introduction to fundamental components of microcomputer technologies and applications.
Effective: Spring 1995
Prerequisite: CINSY 311

CINSY 408 **Introduction to Object-Oriented Programming and Design** (3) An introduction to object-oriented design and program development; application of concepts will occur using a programming language.
Effective: Spring 2000
Prerequisite: CINSY 311

CINSY 410 **Hypertext Markup Language** (3) The study of WEB applications using HTML; course will cover basic design and applications for the WEB.
Effective: Spring 2000
Prerequisite: CINSY 311

CINSY 411 **Topics in Computer Information Systems** (3) Covers new trends and concepts in information/processing technology and their applications and impact on computer information systems.
Effective: Fall 1987
Prerequisite: permission of program coordinator

CINSY 421 **Multimedia Technologies** (3) Introduces multimedia technologies and concepts; various applications of multimedia technologies will be introduced
Effective: Summer 1995
Prerequisite: CINSY 311

CINSY 425 **Graphical Interface Design and Applications** (3) Study of interface design with special emphasis on design for information system applications; application concepts will occur using programming language.
Effective: Spring 2000
Prerequisite: CINSY 311

CINSY 427 **WEB Programming** (3) Introduction to WEB design, programming, applications, and techniques for WEB development.
Effective: Spring 2000
Prerequisite: CINSY 311, CINSY 410

CINSY 431 **Business Programming with COBOL** (3) Introduction to the syntax and grammer of COBOL language with emphasis on applications to business data processing.
Effective: Fall 1987
Prerequisite: CINSY 311

CINSY 436 **File Management and COBOL** (3) Creation and maintenance of sequential and direct access files, report writing and other advanced programming techniques.
Effective: Fall 1987
Prerequisite: CINSY 431

CINSY 441 **Data Communications** (3) Introduces data communications concepts, evolution, and applications. Computer networking methods and their components will be covered in this course.
Effective: Fall 1987
Prerequisite: CINSY 431 or permission of program coordinator

CINSY 446 **Database Management** (3) Designed to provide students with explanation, comparison of techniques, methodology of systems, limitations, application of various database management systems.
Effective: Spring 2001
Prerequisite: CINSY 408, CINSY 431 or 3 credits in programming

CINSY 451 **Applied Software Project** (3) A project in the design, specification, and programming of a system in an application area.
Effective: Fall 1987
Prerequisite: permission of program coordinator

CINSY 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1999

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Computer Science (CMPSC)

CMPSC 402 **UNIX and C** (3) UNIX operating system, functions, libraries, programming style, operators and variables, data types, control statements, pointers, arrays, strings, lists, input/output, macros.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 121 or equivalent

CMPSC 402 **UNIX and C** (3) UNIX OS including file system, utilities, and shell scripting; C programming, including I/O, pointers, arrays, dynamic memory, macros, and libraries.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 121

CMPSC 409 **Advanced Data Processing with COBOL** (3) Introduction to advanced COBOL features, file structures, and programming techniques and information processing.
Effective: Spring 2008
Prerequisite: CMPSC 109

CMPSC 425 **Advanced Object-Oriented Programming** (3) Advanced object-oriented programming paradigm, exception handling, application programming interface, secure programming, network programming, threads and synchronization.
Effective: Spring 2010
Prerequisite: CMPSC 122

CMPSC 426 **Object-oriented Design** (3) Object-oriented design methodologies and programming.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 422

CMPSC 426 **Object-oriented Design** (3) Object-oriented analysis and design; design patterns such as creational, structural, and behavioral patterns; UML; and unified process.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 425, CMPSC 462

CMPSC 428 **Introductory Ada and Program Design** (3) Structured program design using Ada; strong typing, data abstraction, packages, subprograms, separate compilation, visibility, exceptions, generic units.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 121 or equivalent

CMPSC 428 **Programming in Ada** (3) Structured program design using Ada; strong typing, data abstraction, packages, subprograms, separate compilation, visibility, exceptions, generic units.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 121

CMPSC 430 **Database Design I** (3) Relational database model, query languages, integrity, reliability, and normal forms for design.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 462;MATH 315

CMPSC 430 **Database Design** (3) Relational database model, query languages, integrity, reliability, normal forms for design.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 462

CMPSC 431 **Database Management Systems** (3) Database system concepts: file organizations and retrieval algorithms; the three data models (relational, hierarchical, and network) and their database implementations.
Effective: Spring 2008
Prerequisite: CMPSC 221;ENGL 202C

CMPSC 431W **Database Management Systems** (3) Database system concepts: file organizations and retrieval algorithms; the three data models (relational, hierarchical, and network) and their database implementations.
Effective: Spring 2008
Prerequisite: CMPSC 221;ENGL 202C

CMPSC 436 **Communications and Networking** (3) Data transmission, basic signaling, data encoding, error control, communication protocols, security, network topologies, routing, switching, internetworking, emerging high speed networks.
Effective: Spring 2008
Prerequisite: CMPSC 312

CMPSC 437 **Network Operations and Management** (3) Study of local area network (LAN) and wide area network (WAN) topologies, operations, and management.
Effective: Spring 2008
Prerequisite: CMPSC 335

CMPSC 438 **Computer Network Architecture and Programming** (3) Network architectures, communication protocols, internetworking, network security, client-server computing, web application development, programming with APIs.
Effective: Spring 2010
Prerequisite: CMPSC 312, CMPSC 425

CMPSC 441 **Introduction to Artificial Intelligence** (3) History of AI, problem solving, search techniques, knowledge representation, LISP, learning.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 122 or equivalent;CMPSC 462

CMPSC 441 **Artificial Intelligence** (3) Problem solving, search techniques including local search and genetic algorithms, knowledge representation, planning, learning, and neural networks.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 122;MATH 315

CMPSC 442 **Artificial Intelligence** (3) Introduction to the theory, research paradigms, implementation techniques, and philosophies of artificial intelligence.
Effective: Spring 2008
Prerequisite: CMPSC 122 or equivalent Concurrent: CMPSC 465

CMPSC 443 **Introduction to Computer and Network Security** (3) Introduction to theory and practice of computer security with an emphasis on Internet and operating system applications.
Effective: Spring 2008
Prerequisite: CMPSC 473, CMPEN 362

CMPSC 446 **Computer Vision** (3) Image formation, segmentation, filtering, edge detection, texture analysis, shape from shading, color, stereo matching, and dynamic scene analysis.
Effective: Spring 2008
Prerequisite: MATH 230 orMATH 231;CMPSC 121 orCMPSC 201

CMPSC 450 **Concurrent Scientific Programming** (3) Problems of synchronization, concurrent execution, and their solution techniques. Design and implementation of concurrent software in a distributed system.
Effective: Spring 2008
Prerequisite: CMPSC 121, CMPSC 201 orCMPSC 202;MATH 220;MATH 230 orMATH 231

CMPSC 451 (MATH 451) **Numerical Computations** (3) Algorithms for interpolation, approximation, integration, nonlinear equations, linear systems, fast FOURIER transform, and differential equations emphasizing computational properties and implementation. Students may take only one course for credit from CSE/MATH 451 and CSE/MATH 455.
Effective: Spring 2008
Prerequisite: 3 credits of programming;MATH 230 orMATH 231

CMPSC 452 **Numerical Analysis I** (3) Algorithm efficiency and accuracy, function interpolation and polynomial approximation, numerical differentiation and integration, initial-value problems, and approximation of eigenvalues.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 121 or equivalent;MATH 430

CMPSC 452 **Numerical Analysis** (3) Algorithm efficiency and accuracy, function interpolation and polynomial approximation, numerical differentiation and integration, initial-value problems, and approximation of eigenvalues.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MATH 220

CMPSC 455 (MATH 455) **Introduction to Numerical Analysis I** (3) Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from CMPSC (MATH) 451 and CMPSC (MATH) 455.
Effective: Spring 2008
Prerequisite: MATH 220;MATH 230 orMATH 231 ; and 3 credits of programming

CMPSC 456 (MATH 456) **Introduction to Numerical Analysis II** (3) Polynomials and piecewise polynomial approximation; matrix least square problems; numerical solution of eigenvalue problems; numerical solutions of ordinary differential equations.
Effective: Spring 2008
Prerequisite: CMPSC 455

CMPSC 457 **Computer Graphics Algorithms I** (3) Coordinate systems, clipping, curves and regions, geometric transformations, parallel and projective projections, hidden line and surface removal, interactive techniques, animation.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 422;MATH 430

CMPSC 457 **Computer Graphics Algorithms** (3) Graphics systems/hardware, color models, transformations, projections, clipping, hidden line/surface removal, aliasing, parametric curves/surfaces, 3D modeling animation.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 122;MATH 220

CMPSC 458 **Fundamentals of Computer Graphics** (3) Fundamentals of computer graphics: input/output devices, transformation, projection, clipping, hidden line/surface elimination.
Effective: Spring 2008
Prerequisite: CMPSC 311;MATH 220;MATH 230 orMATH 231

CMPSC 459 **Scientific Visualization** (3) Visualization techniques for data analysis and presentation. Applying visualization and perceptual theory. Using extending platform independent visualization software.
Effective: Spring 2008
Prerequisite: CMPSC 122

CMPSC 460 **Principles of Programming Languages** (3) Design and implementation of high level programming languages and survey of programming language paradigms.
Effective: Spring 2008 Ending: Summer 2010

Prerequisite: CMPSC 312;CMPSC 462;CMPSC 469

CMPSC 460 **Principles of Programming Languages** (3) Design and implementation of high level programming languages and survey of language paradigms including imperative, functional, and object-oriented programming.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 312;CMPSC 462;CMPSC 469

CMPSC 461 **Programming Language Concepts** (3) Fundamental concepts of programming language design, specifications, and implementation; programming language paradigms and features; program verification.
Effective: Spring 2008
Prerequisite: CMPSC 221;CMPSC 360

CMPSC 461H **Honors Programming Language Concepts** (3) Honors course in fundamental concepts of programming language design, specification, and implementation; programming language paradigms and features; program verification.
Effective: Spring 2008
Prerequisite: CMPSC 465

CMPSC 462 **Data Structures** (3) Asymptotic notations, lists, stacks, queues, trees, balanced trees, self- adjusting data structures, hash tables, priority queues, bionomial heaps.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 122 or equivalent; Concurrent: MATH 315

CMPSC 462 **Data Structures** (3) In-depth theoretical study of data structures such as balanced trees, hash tables, priority queues, B-trees, binomial heaps, and Fibonacci heaps.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 360 Concurrent: MATH 315

CMPSC 463 **Design and Analysis of Algorithms** (3) Recurrences, algorithms design techniques, searching, sorting, selection, graph algorithms, NP-completeness, approximation algorithms.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 462;MATH 315 ; some knowledge of basic probability

CMPSC 463 **Design and Analysis of Algorithms** (3) Recurrences, algorithms design techniques, searching, sorting, selection, graph algorithms, NP-completeness, approximation algorithms, local optimization algorithms.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 462 Concurrent: MATH 414 or STAT 301

CMPSC 464 **Introduction to the Theory of Computation** (3) Computability/Complexity: finite automata, regular & context-free languages, Turing machines, Church-Turing Thesis, undecidability, reducibility, completeness, time/space complexity, P versus NP.
Effective: Fall 2009
Prerequisite: CMPSC 465

CMPSC 465 **Data Structures and Algorithms** (3) Fundamental concepts of computer science: data structures, analysis of algorithms, recursion, trees, sets, graphs, sorting.
Effective: Spring 2008
Prerequisite: CMPSC 360 orMATH 311W

CMPSC 466 **Combinatorics and Graph Theory** (3) An introduction to combinatorics and graph theory, with emphasis on applications and their organization for solution on digital computers.
Effective: Spring 2008
Prerequisite: CMPSC 465

CMPSC 467 (MATH 467) **Factorization and Primality Testing** (3) Prime sieves, factoring, computer numeration systems, congruences, multiplicative functions, primitive roots, cryptography, quadratic residues. Students who have passed MATH 465 may not schedule this course.
Effective: Spring 2008
Prerequisite: CMPSC 360 orMATH 311W

CMPSC 468 **Theory of Automata, Languages, and Computability** (3) Language theory: regular and context-free languages; computability: Turing machines, halting problem, undecidable language problems; complexity theory: NP-complete problems.
Effective: Spring 2008
Prerequisite: CMPSC 122;MATH 315, MATH 311W orCMPSC 360

CMPSC 469 **Formal Languages with Applications** (3) Regular, context free, and recursive languages; notations for language specification and applications.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 122 or equivalent;MATH 315

CMPSC 469 **Formal Languages with Applications** (3) Regular, context free, recursive, and recursively enumerable languages; associated machine models; applications.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 360;MATH 315

CMPSC 470 **Compiler Construction** (3) Programming language structure, basic automata theory, design of a complier, scanning and parsing, semantic processing (including type checking), code generation, and error detection.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 312;CMPSC 462;CMPSC 469

CMPSC 470 **Compiler Construction** (3) Compiler design and implementation; scanning, parsing, semantic analysis, optimization (including static analysis), code generation, garbage collection, and error detection.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 312;CMPSC 425;CMPSC 462;CMPSC 469

CMPSC 471 **Introduction to Compiler Construction** (3) Design and implementation of compilers; lexical analysis, parsing, semantic actions, optimization, and code generation.
Effective: Spring 2008
Prerequisite: CMPSC 461

CMPSC 472 **Operating System Concepts** (3) Process management, synchronization, deadlocks, memory management, virtual memory, CPU and process scheduling, file systems, disk scheduling, security, protection, distributed systems.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 312;CMPSC 462

CMPSC 472 **Operating System Concepts** (3) Theoretical and practical issues of operating systems design and implementation, process management, concurrent programming, memory management, scheduling, I/O, and security.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 312;CMPSC 462

CMPSC 473 **Operating Systems Design & Construction** (3) Design and implementation of computer operating systems; management of various system resources: processes, memory, processors, files, input/output devices.
Effective: Spring 2008
Prerequisite: CMPSC 311;CMPEN 331

CMPSC 474 **Operating System & Systems Programming** (3) Operating Systems overview and principles; processes and signals; concurrency and synchronization; memory and file management; client-server computing; scripts; systems-programming.
Effective: Spring 2008
Prerequisite: CMPSC 122;CMPSC 312

CMPSC 479 **Language Translation** (3) Design and implementation of compilers, lexical analysis, syntax/semantic analysis, optimization, and code generation.
Effective: Spring 2008
Prerequisite: CMPSC 465

CMPSC 483W **Software Design Methods** (3) Applications of scientific knowledge and methods in the design and construction of computer software using engineering concepts.
Effective: Spring 2008
Prerequisite: CMPSC 221;CMPSC 465;ENGL 202C

CMPSC 484 **Computer Science Senior Project I** (2) Computer science capstone project with documentation emphasis.
Effective: Spring 2008
Prerequisite: ENGL 202C;CMPSC 221;CMPSC 465

CMPSC 485W **Computer Science Senior Project II** (3) Computer science capstone project with documentation emphasis.
Effective: Spring 2008
Prerequisite: CMPSC 484

CMPSC 487W **Software Engineering and Design** (3) Requirements analysis, specification, design, expectation and testing strategies, development handling, development libraries, approaches to project management, and documentation.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 462;MATH 315

CMPSC 487W **Software Engineering and Design** (3) Software development process, life cycle; requirements analysis, specification, design, prototyping, testing, project management, and documentation.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: ENGL 202C, CMPSC 425, CMPSC 462

CMPSC 494H **Senior Honors Thesis** (1-6) Supervised Honors thesis research in computer science and engineering.
Effective: Spring 2008
Prerequisite: approval of a thesis adviser in the department

CMPSC 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experience, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2008
Prerequisite: prior approval of proposed assignment by instructor

CMPSC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2008

CMPSC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2008

CMPSC 497A **Secure Programming** (3) Secure software design principles/practice, common threats, applied cryptograph, trust management, input validation, OS-/programming language- specific issues, software validation.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

Prerequisite: CMPSC 463

CMPSC 497B **Applications Programming** (3) Development of application software for computing devices including smart phones and tablet computers.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: CMPSC 311;CMPSC 465

CMPSC 497B **Machine Learning** (3) Machine learning is a subfield of AI that studies how a computer system can learn from data. It is a key tool for automating tasks that are typically done by humans. This course will provide an introduction to this field.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CMPSC 497E **Contest Problems** (1-6) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CMPSC 497H **Applications Programming** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CMPSC 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2008

CMPSC 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

CMPSC 512 **Computer Systems Performance Evaluation** (3) Theory and practice of computer system performance evaluation; measurement, simulation, and analytical techniques with strong emphasis on analytical modeling.
Effective: Spring 1987
Prerequisite: CMPSC 511, MATH 414

CMPSC 524 **Design and Specification of Distributed Systems** (3) Specification of distributed systems; safety and liveness properties; temporal logics; trace semantics; logic programs; specification and verification of distributed algorithms.
Effective: Spring 1998
Prerequisite: CSE 520

CMPSC 541 **Database Management Systems** (4) Computer system organization for the management of data, data models, and implementation; primary and secondary key retrieval algorithms.
Effective: Fall 1986
Prerequisite: CMPSC 435 orCMPSC 534

CMPSC 574 **Contemporary Computer Architectures** (3) Contemporary computer organizations and operations; parallel systems: pipelines, array, multiprocessors; shared memory and message passing architectures; data flow architectures.
Effective: Spring 1994
Prerequisite: a course in operating systems

CMPSC 576 **Digital Integrated Systems Design** (3) Introduction to VLSI design and fabrication, design methodologies and CAD tools, system case studies.
Effective: Spring 1994

CMPSC 577 **VLSI Systems Design** (3) Design of VLSI circuits, systems, and CAD tools; study of advanced VLSI architectures, CAD tools for design, and evolving design techniques.
Effective: Fall 1995
Prerequisite: CMPSC 576

CMPSC 581 **Machine Intelligence and Heuristic Programming** (3) Methods for making machines behave intelligently; problem solving, theorem proving, game playing, question answering, learning induction; specialized languages and data structures.
Effective: Spring 1985
Prerequisite: CMPSC 481

CMPSC 587 **Introduction to Computational Linguistics** (3) An introduction to the computational approach to linguistics, covering natural language parsing, meaning representation and inference, and natural language generation.
Effective: Spring 1988
Prerequisite: CMPSC 481

CMPSC 598 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest; several different topics may be taught in one year or semester.
Effective: Summer 1993

CMPSC 600 **Thesis Research** (1-15) No description.
Effective: Fall 1995

CMPSC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1995

CMPSC 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) Teaching of computer science undergraduate sections with senior faculty instruction supervision.
Effective: Fall 1989
Prerequisite: permission of the Department Head

CMPSC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

CMPSC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Computer Science and Engineering (CSE)

CSE 511 **Operating Systems Design** (3) Concurrent programming; design of I/O subsystem, memory management, and user interface; kernel design; deadlocks, protection and security; case studies.
Effective: Spring 2008
Prerequisite: CMPSC 473

CSE 513 **Distributed Systems** (3) Protocol hierarchies; routing and flow control algorithms; distributed operating systems; communication and synchronization mechanisms; resource allocation problems.
Effective: Spring 2009
Prerequisite: CSE 411

CSE 514 **Computer Networks** (3) Network subsystems, ARPANET, SNA, DECNET, network protocols (physical databank, network, transport, sessions, presentation, application), routing and congestion control, network optimization.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: CMPEN 271, CMPEN 362;E E 353 orE E 350

CSE 514 **Computer Networks** (3) Network subsystems, ARPANET, SNA, DECNET, network protocols (physical databank, network, transport, sessions, presentation, application), routing and congestion control, network optimization.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: CMPEN 362;E E 353 orE E 350

CSE 515 (E E 565) **Reliable Data Communications** (3) Discussion of problems and solutions for ensuring reliable and efficient communication over wired and wireless links and data networks.
Effective: Spring 2008
Prerequisite: Communication Networks;STAT 418

CSE 517 **Performance Evaluation** (3) Tools and techniques for PE, Analytical and Simulation models, evaluation of multiprocessors, multicomputer and LANs, scheduling policies, case studies.
Effective: Fall 1995

CSE 520 **Science of Computer Programming** (4) Weakest preconditions, nondeterminism, terminating constructs, formal derivation of some often used algorithms, correctness of programs, formal specification of large systems.
Effective: Spring 2008
Prerequisite: CMPSC 461

CSE 521 **Compiler Construction** (3) Design and implementation of compilers.
Effective: Spring 2001

CSE 522 **Semantics of Programming Languages** (3) Operational, axiomatic, and denotational semantics of programming languages; fixpoint theory of computation, verification of recursive programs; goto statements and continuations.
Effective: Spring 2008
Prerequisite: CMPSC 461

CSE 530 **Fundamentals of Computer Architecture** (3) Advances in computer architecture, Pipelining, parallelism, and multiprocessing.
Effective: Spring 2008
Prerequisite: CMPEN 431

CSE 531 **Parallel Processors and Processing** (3) Parallel processor organization; basic algorithms suitable for such systems; parallel sorting and interconnection networks; applications and discussion of specific processors.
Effective: Fall 1995
Prerequisite: CSE 530

CSE 532 **Multiprocessor Architecture** (3) Fundamental structures of multiprocessors; interprocess communications, system deadlocks and protection, scheduling strategies, and parallel algorithms; example multiprocessor systems.
Effective: Fall 1995
Prerequisite: CSE 530

CSE 536 **Fault Tolerant Systems** (3) Attributes of fault-tolerant systems and their definitions; realability and availability techniques; maintainability and testing techniques; practice of reliable system design.
Effective: Fall 1995
Prerequisite: CSE 530

CSE 537 **Interconnection Networks in Highly Parallel Computers** (3) Study and comparative analysis of various classes of interconnection networks; routing problem; fault tolerance issue; performance evaluation; VLSI implementation.
Effective: Summer 1997
Prerequisite: CSE 530

CSE 539 **Topics in Computer Architecture** (3) Study of current advanced issues in design, implementation and applications of complex computer systems.
Effective: Fall 1995
Prerequisite: CSE 530

CSE 541 **Database Systems I** (3) Data models and relational database design; database integrity and concurrency control;

distributed database design and concurrency control; query optimization.
Effective: Spring 2008
Prerequisite: CMPSC 431W

CSE 542 **Database Systems II** (3) Important in-depth issues relating to data engineering such as distributed databases, information management for engineering design, data models.
Effective: Spring 1996
Prerequisite: CSE 541

CSE 543 **Computer Security** (3) Specification and design of secure systems; security models, architectural issues, verification and validation, and applications in secure database management systems.
Effective: Spring 2008
Prerequisite: CMPSC 461

CSE 544 **System Security** (3) Review current research in computer and operating system security.
Effective: Summer 2008
Prerequisite: CSE 458, CSE 411, CSE 543

CSE 545 **Network Security** (3) Advanced methods and technologies for network security.
Effective: Summer 2008
Prerequisite: CSE 543

CSE 546 **Cryptography** (3) Introduction to the theory and techniques of modern cryptography, with emphasis on rigorous analysis and mathematical foundations.
Effective: Fall 2008
Prerequisite: CSE 465

CSE 550 (MATH 550) **Numerical Linear Algebra** (3) Solution of linear systems, sparse matrix techniques, linear least squares, singular value decomposition, numerical computation of eigenvalues and eigenvectors.
Effective: Spring 2008
Prerequisite: CMPSC 456 orMATH 441

CSE 551 (MATH 551) **Numerical Solution of Ordinary Differential Equations** (3) Methods for initial value and boundary value problems. Convergence and stability analysis, automatic error control, stiff systems, boundary value problems.
Effective: Spring 2008
Prerequisite: CMPSC 451 orCMPSC 456

CSE 552 (MATH 552) **Numerical Solution of Partial Differential Equations** (3) Finite difference methods for elliptic, parabolic, and hyperbolic differential equations; solutions techniques for discretized systems; finite element methods for elliptic problems.
Effective: Spring 2008
Prerequisite: CMPSC 451 orCMPSC 456;MATH 402 orMATH 404

CSE 553 (MATH 553) **Introduction to Approximation Theory** (3) Interpolation; remainder theory; approximation of functions; error analysis; orthogonal polynomials; approximation of linear functionals; functional analysis applied to numerical analysis.
Effective: Fall 1995
Prerequisite: MATH 401 3 credits in Computer Science and Engineering

CSE 554 (E E 564) **Error Correcting Codes for Computers and Communication** (3) Block, cyclic, and convolutional codes. Circuits and algorithms for decoding. Application to reliable communication and fault-tolerant computing.
Effective: Spring 2008
Prerequisite: Communication Networks

CSE 555 (MATH 555) **Numerical Optimization Techniques** (3) Unconstrained and constrained optimization methods, linear and quadratic programming, software issues, ellipsoid and Karmarkar's algorithm, global optimization, parallelism in optimization.
Effective: Spring 2008
Prerequisite: CMPSC 456

CSE 556 (MATH 556) **Finite Element Methods** (3) Sobolev spaces, variational formulations of boundary value problems; piecewise polynomial approximation theory, convergence and stability, special methods and applications.
Effective: Fall 1995
Prerequisite: MATH 502, MATH 552

CSE 557 **Concurrent Matrix Computation** (3) This course discusses matrix computations on architectures that exploit concurrency. It will draw upon recent research in the field.
Effective: Spring 2008
Prerequisite: CMPSC 451, CMPSC 455, CMPSC 450, MATH 451 orMATH 455

CSE 560 **Theory of Graphs and Networks** (3) Theory and applications of graphs, including structure of graphs, network analysis, and algorithms for computer solution of graph-theoretic problems.
Effective: Spring 1996
Prerequisite: CSE 565

CSE 561 **Sequential and Parallel Complexity Theory** (3) Models of sequential and parallel computers; relationships between complexity measures; simulations and universality; resource-bounded hierarchies; lower- bound techniques.
Effective: Spring 2008
Prerequisite: CMPSC 468

CSE 562 **Probabilistic Algorithms** (3) Design and analysis of probabilistic algorithms, reliability problems, probabilistic

complexity classes, lower bounds.
Effective: Fall 1995
Prerequisite: CSE 565

CSE 563 **Parallel Algorithms** (3) Computational aspects of VLSI: synthesis/analysis of efficient parallel and distributed algorithms; computational structures; models of parallel computers and their interrelationships.
Effective: Fall 1995
Prerequisite: CSE 565

CSE 564 **Complexity of Combinatorial Problems** (3) NP-completeness theory; approximation and heuristic techniques; discrete scheduling; additional complexity classes.
Effective: Fall 1995
Prerequisite: CSE 565

CSE 565 **Algorithm Design and Analysis** (4) An introduction to algorithmic design and analysis.
Effective: Spring 2008
Prerequisite: CMPSC 465 Concurrent: CSE 468

CSE 568 **Theory of Formal Languages and Automata** (3) Generation and recognition of formal languages, grammars, Chomsky's hierarchy of languages, closure properties, characterization by automata, algebraic properties, complexity classification.
Effective: Spring 2008
Prerequisite: CMPSC 468

CSE 572 **Microprocessors and Systems Design** (3) Contemporary design issues in microprocessors, including advanced features and system integration issues.
Effective: Spring 2008
Prerequisite: CMPEN 431, CSE 472

CSE 575 **Architecture of Arithmetic Processors** (3) Algorithms and techniques for designing arithmetic processors; conventional algorithms and processor design; high-speed algorithms and resulting architectural structures.
Effective: Spring 1998
Prerequisite: CSE 477

CSE 577 **VLSI Systems Design** (3) Engineering design of large-scale integrated circuits, systems, and applications; study of advanced design techniques, architectures, and CAD methodologies.
Effective: Fall 1995
Prerequisite: CSE 477

CSE 578 **VLSI Computer-Aided Design Tools** (3) VLSI circuit design tools: placement, routing, extraction, design rule checking, graphic editors, simulation, verification, minimization, silicon compilation, test pattern generation.
Effective: Fall 1995
Prerequisite: CSE 477

CSE 583 (E E 552) **Pattern Recognition--Principles and Applications** (3) Decision-theoretic classification, discriminant functions, pattern processing and feature selection, syntactic pattern recognition, shape analysis and recognition.
Effective: Spring 2008

CSE 585 (E E 555) **Digital Image Processing II** (3) Advanced treatment of image processing techniques; image restoration, image segmentation, texture, and mathematical morphology.
Effective: Spring 2008
Prerequisite: CMPEN 455 orE E 455

CSE 586 (E E 554) **Topics in Computer Vision** (3) Discussion of recent advances and current research trends in computer vision theory, algorithms, and their applications.
Effective: Spring 2008
Prerequisite: CMPEN 454 orE E 454

CSE 587 **Interfaces to Virtual Environments** (3) Principles and techniques for sensing and interpretation of human input to computer; virtual reality; augmented reality; issues in multimodality, learning.
Effective: Summer 2000
Prerequisite: graduate standing

CSE 588 (MATH 588) **Complexity in Computer Algebra** (3) Complexity of integer multiplication, polynomial multiplication, fast Fourier transform, division, and calculating the greatest common divisor of poly- nomials.
Effective: Spring 2008
Prerequisite: CMPSC 465

CSE 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1997

CSE 591 **Research Experience in Computer Science and Engineering** (1) Research experience for new doctoral students in computer science and engineering. Research is performed in conjunction with another 500-level CSE course.
Effective: Spring 1998
Concurrent: enrollment in another 500-level CSE course

CSE 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.

Effective: Summer 1997

CSE 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

CSE 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 1996

CSE 597A **Special Topics in Machine Learning: Learning Theory** (3) Learning theory is the branch of machine learning which serves as a guide to the development of practical models and algorithms. It is useful in understanding the effects of model complexity, computational complexity, and sample size on the quality of a learned model. In this class we will study basic ideas in learning theory as well as related inequalities and concentration results.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSE 597B **Theory Seminar** (1.5) Talks on recent advanced in theoretical computer science: algorithms combinatorics, cryptography, quantum computing, complexity theory, computation learning theory.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSE 597B **Theory Seminar** (1.5) Talks on recent advanced in theoretical computer science: algorithms combinatorics, cryptography, quantum computing, complexity theory, computation learning theory.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CSE 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1996

CSE 598A **Machine Learning** (3) Machine learning is a subfield of AI that studies how a computer system can learn from data.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSE 598B (BIOL 598B, STAT 598B) **Bioinformatics I** (3) AR and MA processes, spectrum analysis, regression models, multivariate models.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSE 598C **Vision-based Tracking** (3) Introduction to Bayesian filtering, tracking and data association, with an emphasis on algorithms for single and multiple object tracking.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSE 598D **Topics in Applied Systems Security** (3) This by permission course provides an overview of hot topics in applied system security. Topics studied include data provenance, web systems security, mobile phone system, and information flow systems.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSE 598E **Computational Complexity** (3) Computational complexity theory studies the classification of computational problems according to their inherent difficulty.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSE 598F **Readings in High Performance I/O** (3) This course will cover I/O and related issues in the context of emerging petascale architectures and beyond. The emphasis will be on I/O architectures, file system related issues and program scalability.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CSE 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2008

CSE 600 **Thesis Research** (1-15) No description.
Effective: Spring 1995

CSE 601 **Ph.d. Dissertation Full-Time** (0) No description.
Effective: Spring 1995

CSE 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in

teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Spring 1995

CSE 610 **Thesis Research Off-Campus** (1-15) No description.
Effective: Spring 1995

CSE 611 **Ph.d. Dissertation Part-Time** (0) No description.
Effective: Spring 1995

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Corporate Communication (CC)

CC 401 **Corporate, Non-Profit, and Government Public Relations** (3) Explores issues affecting profit and non-profit public relations, including crisis management, consumer and employee affairs, environmental problems and global concerns.
Effective: Summer 2002
Prerequisite: MKTG 310 and sixth-semester standing

CC 402 **The Media and Public Relations** (3) Publicity strategies involving a variety of media resources.
Effective: Summer 2002
Prerequisite: MKTG 310 and sixth-semester standing

CC 403W **Studies in Public Relations** (3) Capstone course for the major in Corporate Communication; focuses on case studies in public relations: problems and solutions.
Effective: Summer 2002
Prerequisite: MKTG 310 and sixth-semester standing

CC 495A **Internship in Corporate Communication** (3) Internship in a business or agency appropriate for a major in Corporate Communication.
Effective: Summer 2002
Prerequisite: MKTG 310 and sixth-semester standing

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Counseling Psychology (CNPSY)

CNPSY 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2008

CNPSY 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1990

CNPSY 497A **Observational Research** (1-3) Counseling psychology research, including observation of at-risk families and use of a variety of coding systems to study parenting processes, and self/emotion regulation in children and adults, and supervised on an individual basis.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CNPSY 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

CNPSY 502 (CN ED 502) **Advanced Counseling Theory and Method** (3) Assessment, intervention, and evaluation procedures for counseling problems frequently encountered in school, college, and rehabilitation settings.
Effective: Spring 2004
Prerequisite: CN ED 501

CNPSY 503 **Current Topics in Counseling Psychology** (2) Presentation, readings, and discussion of treatment issues; unique concerns of client groups and professional issues that counselors should consider.
Effective: Summer 1994

CNPSY 511 **Modifying Conjugal Life** (1-9) Conceptual foundations, research procedures, and practicum experience in teaching effective communication and problem-solving skills in the marriage relationship.
Effective: Fall 2001
Prerequisite: 6 credits in individual development or psychology; 3 credits in statistics

CNPSY 512 **Filial Relationship Modification** (1-9) Theory, research, and practicum in teaching parents to resolve developmental problems in their own children.
Effective: Fall 2001
Prerequisite: 6 credits in individual development or psychology; 3 credits in statistics

CNPSY 515 **Family Systems Therapy: Theory, Research and Practice** (3) Examines theory, research, and interventions grounded in family systems framework (e.g., Bowenian, Structural Strategic, etc.) from a psychological perspective.
Effective: Summer 2006
Prerequisite: graduate standing; 6 credits in psychological development (e.g. HD FS 429 or equivalent) and/or counseling theory (e.g. CN ED 503 or equivalent).

CNPSY 554 (CN ED 554) **Cross-Cultural Counseling** (3) Examines theory, research, and models of counseling relationships between counselors and clients of different racial and sociocultural backgrounds.
Effective: Spring 2004
Prerequisite: CN ED 507, CN ED 595A orCNPSY 595A

CNPSY 555 (CN ED 555) **Career Counseling** (3) The examination of historical, legislative, and current models of career counseling and the development of pertinent individual and group techniques.
Effective: Spring 2004
Prerequisite: CN ED 505

CNPSY 582 (CN ED 582) **Advanced Group Psychotherapy** (3) Study of group psychotherapy and interventions, with an experiential component. Available only to majors in CN ED and CNPSY.
Effective: Fall 2003

CNPSY 589 (CN ED 589) **Seminar on Counseling Supervision** (1) Study of research about and theoretical models of clinical supervision of counselors; includes preparation for a practicum in counseling supervision.
Effective: Fall 2001
Prerequisite: available only to doctoral-level majors in CN ED and CNPSY

CNPSY 591 **Seminar in Counseling: History and Trends** (1) Discussion of the history of guidance and counseling, emphasizing how the past has shaped the present and portends the future.
Effective: Summer 1990
Prerequisite: 9 credits in counselor education

CNPSY 592 **Legal and Ethical Issues in Counseling** (3) Study and discussion of legal, ethical, and professional concerns of counselors; philosophical underpinnings; and models of ethical decision- making.
Effective: Summer 1994

Prerequisite: 9 credits in counselor education or counseling psychology

CNPSY 593 **Seminar in Counseling: Philosophy** (1) Study and discussion of such philosophical foundations of counseling as phenomenology, idealism, realism, existentialism, and daseinanalytic, theological, and other contemporary thoughts.
Effective: Summer 1990
Prerequisite: 9 credits in counselor education

CNPSY 594 **Research in Counseling** (2-6) The design, implementation, and evaluation of counseling research projects.
Effective: Fall 2001

CNPSY 595A **Counseling Psychology Practicum** (1-3 per semester, maximum of 12) Practice in the application of counseling psychology principles and methods to cases counseled under supervision; case conferences.
Effective: Fall 2001
Prerequisite: available only to majors in CNPSY

CNPSY 595D (CN ED 595D) **Supervision of Counselors** (3-9) Practical experience in supervising and evaluating work of counselors.
Effective: Summer 1992
Prerequisite: CN ED 595A orCN ED 595B; available only to majors in CN ED and CNPSY

CNPSY 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

CNPSY 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1990

CNPSY 597A (CN ED 597A) **Sexuality Issues in Counseling** (3) Overview of Sexuality issues common in counseling. Topics include sexual orientation, HIV/AIDS, infidelity, gender identity, sexual offenses, and sexual development.
Effective: Summer 2010 Ending: Summer 2010

CNPSY 597A **Professional Issues: Ethics and History of Psychology** (3) This course will examine professional issues in counseling psychology including ethics, the history of psychology/counseling psychology, and professional identity.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CNPSY 597B **Research Practicum to Counseling Psychology** (3) Provides orientation to CNPSY program including policies & requirements. Course is part of sequence designed to assist students complete a successful disseration proposal.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CNPSY 597C (CN ED 597C) **Diagnosis for Counselors** (3) Course examines the rudiments of diagnosis for counselors. Focuses on role of identification and assessment of symptoms and behaviors in determining appropriate diagnoses.
Effective: Summer 2010 Ending: Summer 2010

CNPSY 600 **THESIS RESEARCH** (1-15) NO DESCRIPTION.
Effective: Spring 1992

CNPSY 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1990

CNPSY 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) No description available.
Effective: Summer 1990

CNPSY 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1990

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Counselor Education (CN ED)

CN ED 401 **Foundations of Chemical Dependency Counseling** (3) An overview of diagnosis and assessment, models for chemical dependency prevention, counseling, and recovery; contexts of chemical dependency treatment.
Effective: Spring 1994
Prerequisite: 3 credits in general psychology

CN ED 404 **Group Procedures in Guidance and Counseling** (3) The nature and functioning of groups in educational and agency settings. Provides prospective counselors with experience in the group process.
Effective: Summer 1990
Prerequisite: 6 credits in counselor education; 6 credits in psychology sociology or individual and family studies

CN ED 407 **Introduction to Vocational Rehabilitation in Employee Counseling** (3) Use of rehabilitation counseling skills in industrial employee counseling settings; case study and handling; resources for training.
Effective: Summer 1990
Prerequisite: 6 credits in individual and family studies psychology or sociology

CN ED 415 **Counseling Adults** (3) Roles of counselors and counseling in the resolution of educational and career problems and opportunities of adults.
Effective: Summer 1990
Prerequisite: COM S 448, HD FS 249, HD FS 445 orSOC 435

CN ED 416 **Interpersonal Relationships and Alcohol and Other Drugs (AOD) Dependency** (3) This course examines families with chemically dependent members, dynamics, appropriate interventions, and treatment.
Effective: Spring 2009
Prerequisite: CN ED 401 orRHS 301

CN ED 420 **Chemical Dependency: Youth at Risk** (3) Study of youth who are at-risk of developing chemical dependency including the characteristics and factors related to chemical dependency.
Effective: Spring 1994
Prerequisite: CN ED 401

CN ED 421 **Counseling Strategies for Preventing Chemical Dependency** (3) Examines helping professional's role in primary and secondary prevention of substance abuse, and related problems like delinquency, suicide, and pregnancy.
Effective: Spring 1994
Prerequisite: CN ED 401

CN ED 422 **Foundations of Addictions Counseling** (3) Study of the fundamental principles of counseling individuals with a wide variety of addictions.
Effective: Spring 2009
Prerequisite: a minimum of 12 hours of coursework in sociology psychology education or family studies.

CN ED 423 **Student Assistance Programs** (3) Exploration of early stages of adolescent "at-risk" behavior and skills for student assessment and intervention within schools and communities.
Effective: Spring 1994
Prerequisite: CN ED 401

CN ED 430 **Couples and Family Counseling** (3) The theory and practice of counseling with couples and families emphasizing family development and major intervention approaches.
Effective: Spring 2009
Prerequisite: A minimum of 12 hours of coursework in sociology psychology education or family studies.

CN ED 431 **Counseling and Teaching Youth at Risk** (3) This course is focused on how to counsel and/or teach youth at risk for a variety of social, emotions, and educational problems.
Effective: Spring 2009
Prerequisite: A minimum of 12 hours of coursework in sociology psychology education or family studies.

CN ED 432 **Ethical, Legal, and Professional Issues in Counseling** (3) Examination of the current ethical and legal issues related to professional counselors and counseling.
Effective: Spring 2009
Prerequisite: A minimum of 12 hours of coursework in sociology psychology education or family studies.

CN ED 470 **Workshop in Studies in Counselor Education** (1-6) No description.
Effective: Summer 1990

CN ED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

CN ED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1990

CN ED 497A **Counseling without Borders** (1-3) Intensive emersion experience designed to address theoretical and

experiential understandings of multicultural counseling through interactions in Turkey.
Effective: Summer 2010 Ending: Summer 2010

CN ED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

CN ED 498A (WF ED 498D) **Facilitating Career Development** (3) Students acquire relevant competencies to assist others in planning and managing careers. Upon successful completion, students may apply for the GCDF certification.
Effective: Summer 2010 Ending: Summer 2010

CN ED 498A (WF ED 498B) **Facilitating Career Development** (3) Students acquire relevant competencies to assist others in planning and managing careers. Upon successful completion, students may apply for the GCDF certification.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

CN ED 498A (WF ED 498A) **Facilitating Career Development** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

CN ED 500 **Introduction to Counseling and Development** (3) Introduces students to the profession of counseling and to the major models of human growth and development.
Effective: Summer 2007

CN ED 501 **Counseling Theory and Method** (3) Survey of psychodynamic, humanistic, behavioral and cognitive-behavioral approaches to counseling individuals.
Effective: Spring 1991

CN ED 502 (CNPSY 502) **Advanced Counseling Theory and Method** (3) Assessment, intervention, and evaluation procedures for counseling problems frequently encountered in school, college, and rehabilitation settings.
Effective: Summer 2003
Prerequisite: CN ED 501 course open only to CN ED and CNPSY doctoral students.

CN ED 503 **Guidance Services in Elementary Education** (3) Guidance services to elementary school students; guidance opportunities for elementary teachers and principals.
Effective: Summer 1990

CN ED 504 **Guidance Services in Secondary Education** (3) Nature and scope of guidance in secondary schools--services, models, and strategies; the counselor as an agent of change.
Effective: Summer 1990

CN ED 505 **Foundations of Career Development and Counseling Information** (3) Accelerating change in economic, psychological, social, educational influences upon counselees. Utilization of information systems in effecting counselee change.
Effective: Summer 1990

CN ED 506 **Individual Counseling Procedures** (3) Training in listening, responding, challenging skills, and action-oriented techniques for individual counseling.
Effective: Fall 2001
Prerequisite: or concurrent:CN ED 501 ; available only to majors in CN ED and CNPSY

CN ED 507 **Multicultural Counseling: Foundations** (3) Provide foundational information that controverts, complements and extends traditional psychology and counseling theory and practice.
Effective: Fall 2001 Ending: Fall 2010
Prerequisite: CN ED 501, CN ED 506

CN ED 507 **Multicultural Counseling: Foundations** (3) Provide foundational information that controverts, complements and extends traditional psychology and counseling theory and practice.
Effective: Spring 2011 Future: Spring 2011

CN ED 508 **Organization and Administration of Pupil Services** (3) Principles, organization, personnel, functions, integration with school programs, evaluation.
Effective: Spring 1993
Prerequisite: A G.P.A. of 3.00 or better in 27 credits of previous course work covering any three of the following five areas: economics sociology psychology education and anatomy and physiology.

CN ED 509 **Introduction to Rehabilitation Counseling** (3) Provides information about rehabilitation history, legislation, philosophy, and agencies, as well as an overview of a variety of disabling conditions.
Effective: Spring 2001

CN ED 516 **Helping Skills for Student Affairs Professionals** (3) Develop beginning content knowledge and skills related to practice of active listening, attending, and referral necessary for student affairs work.
Effective: Summer 2009
Prerequisite: CN ED 501 Concurrent: CN ED 501

CN ED 523 **Counseling Children** (3) Provides school and clinic approaches for school counselors and others mental health professionals to help children with developmental problems.
Effective: Summer 2009

CN ED 524 **Counseling Adolescents** (3) Provides approaches for school counselors and others working wtih a variety of adolescent obstacles and developmental needs
Effective: Fall 2009

CN ED 525 **Applied Testing in Counseling** (3) Using counseling assessments effectively and ethically in applied settings, with an emphasis on test analysis and evaluation of psychometric properties.
Effective: Summer 2000
Prerequisite: 3 credits of upper-level statistics

CN ED 526 **Research in Counselor Education** (3) Evaluating counselor education research from scientist-practitioner perspective; emphasis on how to develop and use research with an applied focus.
Effective: Spring 2002

CN ED 530 **Family Counseling: Theory and Practice** (3) Conceptualization and application of family counseling frameworks to EC-12 school settings are learned in this course.
Effective: Summer 2003
Prerequisite: CN ED 501

CN ED 541 **Counseling Addicted Clients** (3) This course addresses theories and methods of counseling clients experiencing addiction, as well as professional issues for addiction counselors.
Effective: Spring 2003

CN ED 542 **Dual Diagnosis** (3) Examines issues related to diagnosis and treatment of individuals who have both a mental disorder and a substance abuse disorder.
Effective: Spring 2003

CN ED 543 (S PSY 543) **Prevention** (3) Addresses prevention program development, implementation, and evaluation, along with theoretical and empirical underpinnings, ethical and multicultural issues related to prevention.
Effective: Spring 2003

CN ED 554 (CNPSY 554) **Multicultural Counseling** (3) Examines theory, research, and models of counseling relationships between counselors and clients of different racial and sociocultural backgrounds.
Effective: Summer 2003
Prerequisite: CN ED 507, CN ED 595A orCNPSY 595A

CN ED 555 (CNPSY 555) **Career Counseling** (3) The examination of historical, legislative, and current models of career counseling and the development of pertinent individual and group techniques.
Effective: Summer 2003
Prerequisite: CN ED 505

CN ED 560 **Psychosocial Aspects of Disability** (3) Psychological models of reaction to disability and social consequences in adulthood; generalizations to other life crises; implications for counselor interventions.
Effective: Summer 1990
Prerequisite: 9 credits in counselor education or related area

CN ED 561 **Job Development and Employment of Persons with Disabilities** (3) Assessing client readiness for work, job-seeking skills training, job placement strategies, modifications to the worksite, methods for employer development.
Effective: Fall 1999
Prerequisite: CN ED 509, CN ED 525

CN ED 562 **Current Issues in Rehabilitation Counseling** (3) Forum for advanced graduate students in rehabilitation counseling and related fields to discuss, review, analyze current trends in rehabilitation.
Effective: Spring 1993
Prerequisite: available only to majors in Counselor Education or Counseling Psychology

CN ED 563 **Rehabilitation Administration and Supervision** (3) Focuses on administration and supervision in rehabilitation; emphasis on personnel, facility management, program planning, and administrative and clinical supervision.
Effective: Summer 1999
Prerequisite: CN ED 509

CN ED 580 **Foundations: History and Trends in Counselor Education** (3) Overview of the foundations and issues relevant to the counseling profession and counselor education. Course available only to majors in CN ED.
Effective: Fall 2003

CN ED 581 **Professional Issues in Counselor Education** (3) Forum for doctoral students to examine and analyze issues relevant for counselor educators. Available only to majors in CN ED.
Effective: Fall 2003
Prerequisite: CN ED 580

CN ED 582 (CNPSY 582) **Advanced Group Psychotherapy** (3) Study of group psychotherapy and interventions, with an experiential component. Available only to majors in CN ED and CNPSY.
Effective: Fall 2003

CN ED 589 (CNPSY 589) **Seminar on Counseling Supervision** (1) Study of research about and theoretical models of clinical supervision of counselors; includes preparation for a practicum in counseling supervision.
Effective: Fall 2001
Prerequisite: available only to doctoral-level majors in CN ED and CNPSY

CN ED 595A **Counseling Practicum** (1-6) Practice in the application of guidance principles and methods to cases counseled under supervision; case conferences; seminar in guidance techniques.
Effective: Fall 2001
Prerequisite: CN ED 505, CN ED 506, CN ED 525 ; available only to majors in CN ED and CNPSY

CN ED 595B **Supervised Practicum in Rehabilitation Counseling** (1-6) Application of principles and techniques of rehabilitation counseling to cases involving people with disabilities.
Effective: Fall 1999
Prerequisite: CN ED 505, CN ED 506, CN ED 509, CN ED 525 ; available only to majors in CN ED and CNPSY

CN ED 595C **Professional Experience in Rehabilitation Counseling** (1-15) Supervised internship, with responsibility for a regular case load.
Effective: Spring 2009
Prerequisite: RHS 403, CN ED 595B ; available only to majors in CN ED and CNPSY

CN ED 595D (CNPSY 595D) **Supervision of Counselors** (3-9) Practical experience in supervising and evaluating work of counselors.
Effective: Summer 1992
Prerequisite: CN ED 595A orCN ED 595B ; available only to majors in CN ED and CNPSY

CN ED 595E **Elementary School Counseling Internship and Seminar** (1-3 PER SEMESTER/MAXIMUM OF 6) Off-campus, supervised internships in elementary school settings with supplementary related topics, discussion, and skills training in on-campus seminars.
Effective: Spring 1993
Prerequisite: or concurrent:CN ED 503 ; available only to majors in CN ED and CNPSY

CN ED 595F **Secondary School Counseling Internship and Seminar** (1-3 PER SEMESTER/MAXIMUM OF 6) Off-campus, supervised internships in secondary school settings with supplementary related topics, discussion, and skills training seminars.
Effective: Spring 1993
Prerequisite: or concurrent:CN ED 504 ; available only to majors in CN ED and CNPSY

CN ED 595G **Student Personnel Internship and Integrative Seminar** (1-6 per semester/maximum of 9) Off-campus, supervised internships in postsecondary/related college student personnel settings with pertinent topics, discussion; skills training seminars on campus.
Effective: Summer 1990
Prerequisite: or concurrent:CSA 551 ; available only to majors in CN ED and CNPSY

CN ED 595I **Counselor Education Doctoral Teaching Internship** (3) Practical experience in undergraduate and graduate level teaching under supervision. Available only to CN ED doctoral students.
Effective: Summer 2009
Prerequisite: CN ED 581

CN ED 595K **Counselor Education Doctoral Counseling Internship** (3) Supervised internship, with responsibility for a regular counseling caseload. Available only to CN ED doctoral Students.
Effective: Summer 2009
Prerequisite: CN ED 595P

CN ED 595P **Counselor Education Doctoral Counseling Practicum** (3) Practice in the application of counselor education principles and methods to cases counseled under supervision; case conferences. Available only to CN ED doctoral students.
Effective: Fall 2003

CN ED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

CN ED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1990

CN ED 597A (CNPSY 597A) **Sexuality Issues in Counseling** (3) Overview of Sexuality issues common in counseling. Topics include sexual orientation, HIV/AIDS, infidelity, gender identity, sexual offenses, and sexual development.

Effective: Summer 2010 Ending: Summer 2010

CN ED 597B **Counseling Adolescents** (3) Class discusses techniques, models, approaches, skills. Main mode of learning will be through experiential application. Models/approaches/ techniques will be described then demonstrated and students will practice components.
Effective: Summer 2010 Ending: Summer 2010

CN ED 597C (CNPSY 597C) **Diagnosis for Counselors** (3) Course examines the rudiments of diagnosis for counselors. Focuses on role of identification and assessment of symptoms and behaviors in determining appropriate diagnoses.
Effective: Summer 2010 Ending: Summer 2010

CN ED 597D **Counseling without Borders** (1-3) Intensive emersion experience designed to address theoretical and experiential understandings of multicultural counseling through interactions in Turkey.
Effective: Summer 2010 Ending: Summer 2010

CN ED 600 **Thesis Research** (1-15) No description.
Effective: Summer 1990

CN ED 601 **Thesis Preparation** No description.
Effective: Fall 2004

CN ED 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching of counselor education laboratory, clinical practice, and recitation classes under senior faculty supervision.
Effective: Summer 1990

CN ED 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1990

CN ED 840 **Trends and Issues in Addiction Counseling** (3) This course provides an overview of current professional and ethical issues facing the addictions field.
Effective: Fall 2009

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Criminal Justice (CRIMJ)

CRIMJ 406 (SOC 406, CRIM 406) **Sociology of Deviance** (3) Theory and research concerning behaviors and lifestyles viewed as significant departures from a group's normative expectations.
Effective: Spring 2008
Prerequisite: CRIMJ 100 andCRIMJ 113 andCRIMJ 230 or permission of program

CRIMJ 407 (US) (CRIM 407) **Victimology** (3) This course will explore the legal, emotional, and social responses to the process of victimization by offenders and third parties.
Effective: Spring 2008

CRIMJ 408 **Police Administration** (3) Principles of administration as they relate to a police organization; and policy development.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orCRIM 100 andCRIMJ 210 orCRIM 210

CRIMJ 410 **The Pennsylvania Court System** (3) Tracing the steps of criminal cases through the investigative stage, arrest, trial, sentencing and appellate review in Pennsylvania.
Effective: Spring 2004
Prerequisite: CRIMJ 100, CRIMJ 113

CRIMJ 412 (SOC 412, CRIM 412) **Crime, Social Control, and the Legal System** (3) Legal and extralegal control; public opinion on crime; criminal justice and correctional processes; legal sanctions; control strategies. Field trip.
Effective: Spring 2008
Prerequisite: CRIMJ 012, CRIMJ 013 orSOC 005

CRIMJ 413 (CRIM 413, SOC 413) **Advanced Criminological Theory** (3) This course provides an in-depth look at theories of crime and examines influential empirical studies designed to these theories.
Effective: Spring 2008
Prerequisite: CRIMJ 012, CRIMJ 250W

CRIMJ 414 (SOC 414, CRIM 414) **Criminal Careers and the Organization of Crime** (3) Research on and theory of criminal careers and crime organizations, emphasizing recruitment and disengagement; offender characteristics and lifestyles; policy implications.
Effective: Spring 2008
Prerequisite: CRIMJ 012 orCRIMJ 013 orSOC 005

CRIMJ 415 (PUBPL 415) **Drug Control Policy in Comparative Perspective** (3) Examines the history of drug control policy in the United States; comparisons and contrasts with other countries' experiences.
Effective: Summer 2004
Prerequisite: CRIMJ 200 orPL SC 001 orPL SC 014 orSOC 001

CRIMJ 420 **Criminal Law and Procedure** (3) Common law and statutory crimes; constitutional rights of accused persons, liability of criminal justice professionals.
Effective: Spring 2008
Prerequisite: CRIMJ 113

CRIMJ 421 (CRIM 421) **Violent Crime in the United States** (3) The impact of violent crime on victims, their families, and communities; the police process as it relates to violent crime.
Effective: Spring 2008
Prerequisite: CRIMJ 012

CRIMJ 421W **Violent Crime in the United States** (3) The impact of violent crime on victims, their families, and communities; the police process as it relates to violent crime.
Effective: Spring 2008
Prerequisite: CRIMJ 012

CRIMJ 422 (CRIM 422) **Victimization** (3) Examines the history, how victimization is measured/studied in social sciences, public policy implications of victimization movement in U.S.
Effective: Spring 2008
Prerequisite: CRIMJ 250W

CRIMJ 423 (US) (WMNST 423, CRIM 423) **Sexual and Domestic Violence** (3) Legal, sociological, and psychological perspectives on sexual and domestic violence.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 424 (CRIM 424) **Drugs and Crime** (3) Analysis of international narcotics trafficking in the twentieth century.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 424W **Drugs and Crime** (3) Analysis of international narcotics trafficking in the twentieth century.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 425 (CRIM 425) **Organized Crime** (3) This course examines organized crime in terms of historical antecedents,

structure, related theories, and policy issues.
Effective: Spring 2008
Prerequisite: CRIMJ 100 or permission of program

CRIMJ 426 **Special Offender Types** (3-6) Study of special offender types; relationships with criminal justice system (drug abuse, victimless crime, white collar crime considered different semesters).
Effective: Spring 2008
Prerequisite: 3 credits in Criminal Justice or permission of program

CRIMJ 430 **Alternatives to Incarceration** (3) Control and treatment of offenders in the community, probation and parole organizations, diversion programs, innovative sentences, supervision techniques.
Effective: Spring 2008
Prerequisite: CRIMJ 100 andCRIMJ 113 andCRIMJ 230 or permission of program

CRIMJ 431 **Offender and Prisoner Rights** (3) The identification of correctional problems and the setting of objectives as reflective of court rulings, legislative change, and administrative law.
Effective: Spring 2008
Prerequisite: CRIMJ 100, CRIMJ 113, CRIMJ 230 or permission of program

CRIMJ 432 (CRIM 432) **Crime and the American Court System** (3) This course examines the American court system including structure and the way courts process offenders with special focus on sentencing.
Effective: Spring 2008
Prerequisite: CRIM 100

CRIMJ 433 **Computer Security** (3) Introduction to computer security for Administration of Justice majors, designed to create an educated user of computer security services.
Effective: Spring 2008
Prerequisite: IST 110 or bothMIS 103 andMIS 204

CRIMJ 439 (PL SC 439) **The Politics of Terrorism** (3) Analysis of political terrorism as a violent alternative for peaceful change and traditional warfare in the nuclear age.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orPL SC 014 or permission of program

CRIMJ 441 (US) (CRIM 441) **The Juvenile Justice System** (3) Historical and contemporary view of the juvenile justice system. Focus on analyzing components of the system, their interactions, processing, and handling of youths.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 441W **The Juvenile Justice System** (3) Historical and contemporary view of the juvenile justice system. Focus on analyzing components of the system, their interactions, processing, and handling of youths.
Effective: Spring 2008
Prerequisite: CRIMJ 100 or permission of program

CRIMJ 450W **Senior Seminar** (3 per semester/maximum of 6) Capstone course exploring past, current and future developments in criminal justice.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orCRIM 100 and sixth semester standing or permission of program.

CRIMJ 451 (US) (CRIM 451) **Race, Crime, and Justice** (3) This course focuses on the significance of race, class, and ethnicity to criminal justice processing and criminal offending.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 453 (US) (WMNST 453, CRIM 453) **Women and the Criminal Justice System** (3) This course focuses on the experiences of women as offenders, victims, and professionals in the criminal justice system.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orWMNST 001

CRIMJ 460 **History and Function of Criminal Justice Components** (3) Historical development of criminal justice system components (police, courts, corrections) related to formulation and function of the state.
Effective: Spring 2008

CRIMJ 462 **Comparative Criminal Justice Systems** (3) A comparison of American and selected foreign justice systems to illustrate the variety of possible responses to crime.
Effective: Spring 2008
Prerequisite: CRIMJ 100 or permission of program

CRIMJ 465 **Ethics in Criminal Justice** (3) Ethical behavior in the criminal justice system.
Effective: Spring 2008
Prerequisite: CRIMJ 100 or permission of program

CRIMJ 467 (SOC 467, CRIM 467) **Law and Society** (3) Law and society studies the social origins of law and legal systems; occupational careers, and decision-making of legal officials.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orCRIMJ 113 or permission of program

CRIMJ 469 (HIST 469) **Drugs and Drug Policy in the United States** (3) Examines the history and dimensions of drug use and analyzes the impact of drug policy.
Effective: Spring 2008

Prerequisite: CRIMJ 100 orHIST 021

CRIMJ 471 (B LAW 471) **Legal Rights, Duties, Liabilities of Criminal Justice Personnel** (3) Civil law issues within a justice agency and between criminal justice agencies and members of the public.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 473 (B LAW 473) **Criminal Procedure and Evidence in the Business Community** (3) Law of evidence and proof, constitutional constraints on police procedures (arrest, search, etc.) in society and the business community.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 482 (CRIM 482) **Seminar, Criminal Justice Agency Administration** (3) Relates organizational and public policy management approaches to police, courts, and correctional institutions.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 489W **Victimology: Predatory Crime** (3) This course uses medical, social scientific and legal research to study the complexities of predatory crime.
Effective: Spring 2004
Prerequisite: CRIMJ 407

CRIMJ 494 **Research Topics** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2002

CRIMJ 494H **Research Topics** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

CRIMJ 495 **Internship in Criminal Justice** (3-12) Experience with a criminal justice agency coordinated through readings and discussion.
Effective: Spring 2008
Prerequisite: CRIMJ 100

CRIMJ 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall ourside the scope of formal courses.
Effective: Summer 1987

CRIMJ 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1987

CRIMJ 497D (PSYCH 497D, WMNST 497D, SOC 497D) **Family & Justice** (3) Examination of the relationship between the family and the criminal justice system in which the family operates.
Effective: Summer 2010 Ending: Summer 2010

CRIMJ 499 (IL) **Foreign Studies** (6) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2008

CRIMJ 500 **Advanced Criminological Theory** (3) This course reviews and critiques the major theories of crime causation.
Effective: Summer 2002
Prerequisite: admission to CRIMJ graduate program or permission of program

CRIMJ 501 **Quantitative Methods for Criminal Justice** (3) Advanced research methodology for criminal justice and criminology.
Effective: Summer 2002
Concurrent: CRIMJ 503

CRIMJ 502 **Public Policy and the Criminal Justice System** (3) This course studies the concepts and methods of political and legal activity within the criminal justice system and their impact on society.
Effective: Summer 2002
Prerequisite: a baccalaureate in Criminal Justice or Behavioral related Sciences and admission to graduate study

CRIMJ 503 **Advanced Statistics in Criminal Justice** (3) Advanced statistics in criminal justice and criminology.
Effective: Summer 2002
Concurrent: CRIMJ 501

CRIMJ 504 **Criminal Justice Organization and Management** (3) The course will be a broad overview of the structure and management of criminal justice organizations.
Effective: Summer 2002
Prerequisite: admission to graduate study and permission of program

CRIMJ 563 **Concepts and Practices in Police Administration** (3) Discusses application of police research and management principles to the contemporary policing context.

Effective: Spring 2006
Prerequisite: permission of program

CRIMJ 564 **Administrative and Legal Aspects of Corrections** (3) This course addresses historical and contemporary correctional policy, accountability, and possible remedial alternatives.
Effective: Spring 2006
Prerequisite: permission of program

CRIMJ 565 **Courts in the Criminal Justice System** (3) An analysis of the function and role of the courts and the personnel involved in the American criminal justice system.
Effective: Spring 2006
Prerequisite: permission of program

CRIMJ 567 **Juvenile Justice: Issues and Practice** (3) The systematic application of the juvenile justice system and issues related to juvenile delinquency and constitutional law.
Effective: Summer 2002
Prerequisite: permission of program

CRIMJ 568 **Qualitative Methods for Criminal Justice** (3) This course examines the many facets of qualitiative research methodolgy.
Effective: Fall 2002
Prerequisite: Admission to a graduate program or permission of program.

CRIMJ 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 2002

CRIMJ 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2002

CRIMJ 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 2006
Prerequisite: The applicant must have completeCRIMJ 500, CRIMJ 502, CRIMJ 504 plus three other Masters credits. The applicant also must have a GPA of at least 3.25

CRIMJ 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2002

CRIMJ 600 **Thesis Research** (1-15) No description.
Effective: Summer 2002

CRIMJ 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 2002

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Criminology (CRIM)

CRIM 406 (CRIMJ 406, SOC 406) **Sociology of Deviance** (3) Theory and research concerning behaviors and lifestyles viewed as significant departures from a group's normative expectations.
Effective: Spring 2008
Prerequisite: CRIM 012

CRIM 407 (CRIMJ 407) **Victimology** (3) This course will explore the legal, emotional, and social responses to the process of victimization by offenders and third parties.
Effective: Spring 2008

CRIM 412 (CRIMJ 412) **Crime, Social Control, and the Legal System** (3) Legal and extralegal control; public opinion on crime; criminal justice and correctional processes; legal sanctions; control strategies. Field trip.
Effective: Spring 2008
Prerequisite: CRIM 012, CRIM 013 orSOC 005

CRIM 413 (SOC 413, CRIMJ 413) **Advanced Criminological Theory** (3) This course provides an in-depth look at theories of crime and examines influential empirical studies designed to these theories.
Effective: Spring 2008
Prerequisite: CRIM 012, CRIM 250W

CRIM 414 (CRIMJ 414, CRIM 414) **Criminal Careers and the Organization of Crime** (3) Research on and theory of criminal careers and crime organizations, emphasizing recruitment and disengagement; offender characteristics and lifestyles; policy implications.
Effective: Spring 2008
Prerequisite: SOC 012 orSOC 013 orSOC 005

CRIM 421 (CRIMJ 421) **Violent Crime** (3) Examines the nature and causes of violence. Several theoretical perspectives are reviewed including biological, psychological, social, and cultural.
Effective: Spring 2008
Prerequisite: CRIM 100, CRIM 250W

CRIM 422 (CRIMJ 422) **Victimization** (3) Examines the history, how victimization is measured/studied in social sciences, public policy implications of victimization movement in U.S.
Effective: Spring 2008
Prerequisite: CRIM 250W

CRIM 423 (US) (CRIMJ 423, WMNST 423) **Sexual and Domestic Violence** (3) Legal, sociological, and psychological perspectives on sexual and domestic violence.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orWMNST 001

CRIM 424 (CRIMJ 424) **Drugs and Crime** (3) Analysis of international narcotics trafficking in the twentieth century.
Effective: Spring 2008
Prerequisite: CRIM 100 orWMNST 001

CRIM 425 (CRIMJ 425) **Organized Crime** (3) This course examines organized crime in terms of historical antecedents, structure, related theories, and policy issues.
Effective: Spring 2008
Prerequisite: CRIM 100

CRIM 429 **Seminar in Criminal Behavior** (3-4 per semester/maximum of 7) This course explores the study of the application of criminological theories to our understanding of various forms of criminal behavior.
Effective: Spring 2008
Prerequisite: CRIM 012

CRIM 430 **American Correctional System** (3) Study of corrections from probation, intermediate punishment, adult and juvenile correctional institutions to parole.
Effective: Spring 2008
Prerequisite: CRIM 100, CRIM 250W

CRIM 432 (CRIMJ 432) **Crime and the American Court System** (3) This course examines the American court system including structure and the way courts process offenders with special focus on sentencing.
Effective: Spring 2008
Prerequisite: CRIM 100

CRIM 433 **Sentencing** (3) This course studies sentencing from prosecutorial charging decisions through revocation of probation, and the complex goals and responsibilities at sentencing.
Effective: Spring 2008
Prerequisite: CRIM 100, CRIM 250W

CRIM 435 **Policing in America** (3) This course will focus on current, historical, theoretical, and research issues surrounding law enforcement in the United States.
Effective: Spring 2008
Prerequisite: CRIM 100, CRIM 250W

CRIM 441 (US) (CRIMJ 441) **Delinquency and Juvenile Justice** (3) Course examines delinquency and the juvenile justice system including delinquency's nature, causes, and prevention and the processing of juveniles.
Effective: Spring 2008
Prerequisite: CRIM 100

CRIM 449 **Seminar in Criminal Justice** (3-4 per semester/maximum of 7) Examines criminal justice decision-making and operation such as the role of contemporary movements in law enforcement, the courts and corrections.
Effective: Spring 2008
Prerequisite: CRIM 100, CRIM 113, CRIM 250W

CRIM 451 (US) (CRIMJ 451) **Race, Crime, and Justice** (3) This course focuses on the significance of race, class, and ethnicity to criminal justice processing and criminal offending.
Effective: Spring 2008
Prerequisite: CRIM 100

CRIM 453 (US) (WMNST 453, CRIMJ 453) **Women and the Criminal Justice System** (3) This course focuses on the experiences of women as offenders, victims, and professionals in the criminal justice system.
Effective: Spring 2008
Prerequisite: CRIM 100 orWMNST 001

CRIM 467 (CRIMJ 467, SOC 467) **Law and Society** (3) Law and society studies the social origins of law and legal systems; occupational careers, and decision-making of legal officials.
Effective: Spring 2008
Prerequisite: CRIM 100, CRIMJ 113 or permission of program

CRIM 469 **Seminar in the Law** (3-4 per semester/maximum of 7) The focus of this seminar is the law such as the laws of sentencing, appellate course decisions and their impact.
Effective: Spring 2008
Prerequisite: CRIM 113

CRIM 480H **Research Topics in Crime, Law, and Justice** (1) Students are exposed to a variety of research topics related to crime, law, and justice.
Effective: Spring 2008
Prerequisite: CLJ major and admission to the Schreyer Honors College

CRIM 481H **Information Literacy in Crime, Law, and Justice** (1) Students are exposed to a variety of information sources related to crime, law, and justice.
Effective: Spring 2008
Prerequisite: CLJ 480H

CRIM 482 (CRIMJ 482) **Seminar, Criminal Justice Agency Administration** (3) Relates organizational and public policy management approaches to police, courts, and correctional institutions.
Effective: Spring 2008
Prerequisite: CRIM 100

CRIM 490 **Crime Policy** (3) This course focuses on criminal justice policy and the factors that influence policy development and implementation.
Effective: Spring 2008
Prerequisite: CRIM 100, CRIM 113, CRIM 250W 6 credits of 400-level CRIMJ courses and 7th semester standing

CRIM 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

CRIM 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2008

CRIM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2008

CRIM 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2008

CRIM 805 (HLS 805) **Violence, Threats, Terror, and Insurgency** (3) This course provides an overview of the domestic and global issues related to homeland security.
Effective: Summer 2010

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Curriculum and Instruction (C I)

C I 400 **Introduction to Research Literature** (3) Introduction to research literature and methodology; stress on interpretation, sources, and research reporting.
Effective: Fall 1981
Prerequisite: student teaching or teaching experience

C I 405 (EDLDR 405) **Strategies in Classroom Management** (3) Managing and coping with disruptive student behavior in instructional settings so that they support the teaching/learning process.
Effective: Fall 2008
Prerequisite: teaching experience or supervised practicum experience

C I 408 **Methods of Teaching Basic Skills** (4-6) Strategies and materials for teaching basic skills in the elementary and secondary schools.
Effective: Spring 2007
Prerequisite: EDPSY 010 orPSYCH 212;EDPSY 014;SPLED 105 orSPLED 400

C I 412W **Secondary Teaching** (3) Study of the teacher's responsibilities, steps in planning instruction, and various strategies for implementing and assessing teaching.
Effective: Spring 2007
Prerequisite: C I 295, EDPSY 014, EDTHP 115

C I 494H **Research Techniques in Curriculum and Instruction** (1-3) Examination, application, assessment, and presentation of research modes and techniques in Curriculum and Instruction. Limited to University scholars in the College of Education.
Effective: Spring 1988
Prerequisite: second-semester standing

C I 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Fall 2001
Prerequisite: prior approval of proposed assignment by instructor

C I 495A **Clinical Application of Instruction--Early Childhood Education** (3) Practicum situation for demonstration of selected instructional strategies and management skills acquired in professional training. To be offered only for Satisfactory/Unsatisfactory grading.
Effective: Spring 1997
Prerequisite: C I 295, EDPSY 014, EDTHP 115 . Official clearances required. See: http://www.ed.psu.edu/preservice/clearance.htm Concurrent: regular professional methods courses in area of certification.

C I 495B **Clinical Application of Instruction--Elementary and Kindergarten Education** (3) Practicum situation for demonstration of selected instructional strategies and management skills acquired in professional training. To be offered only for Satisfactory/Unsatisfactory grading.
Effective: Spring 1997
Prerequisite: C I 295, EDPSY 014, EDTHP 115 . Offical clearances required. See: http://www.ed.psu.edu/preservice/clearance.htm Concurrent: SS ED 430W MTHED 420 SCIED 458

C I 495C **Clinical Application of Instruction--Secondary Education** (3) Practicum situation for demonstration of selected instructional strategies and management skills acquired in professional training. To be offered only for Satisfactory/Unsatisfactory grading.
Effective: Spring 1997
Prerequisite: C I 295, EDPSY 014, EDTHP 115 . Official clearances required. See: http://www.ed.psu.edu/preservice/clearance.htm Concurrent: C I 412 and special methods course(s) in area of certification

C I 495D **Practicum in Student Teaching--Elementary and Kindergarten Education** (12) Full-time classroom instruction in early childhood and elementary education. Students supervised by University personnel and practicing teachers. No concurrent courses other than C I 495F permitted.
Effective: Spring 1997
Prerequisite: C I 495A orC I 495B ; a grade of C or higher in all specified and professional courses. Official clearances required. See: http://www.ed.psu.edu/preservice/clearance.htm

C I 495E **Practicum in Student Teaching--Secondary Education** (15) Full-time classroom instruction in secondary education. Students supervised by university personnel and practicing teachers. No concurrent courses permitted.
Effective: Spring 1997
Prerequisite: C I 495C seventh-semester standing and grade of C or higher in all specified and professional courses. Official clearances required. See: http://www.ed.psu.edu/preservice/clearance.htm

C I 495F **Professional Development Practicum** (3) Instruction concurrent with student teaching practicum. Students focus on the solution of instructional problems identified at the practicum site.
Effective: Spring 1997
Prerequisite: Official clearances required. See: http:www.ed.psu.edu/preservice/clearance.htm Concurrent: C I 495D

C I 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

Effective: Fall 1983

C I 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

C I 497B **Elementary Education Disciplinary Block** (12) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 497B **Elementary Education Disciplinary Block** (12) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 497C **Mental Health Issues in the Classroom** (3) Course provides opportunities for students to explore impact curriculum, teaching methods, family involvement and teacher-child & child-child interactions have on mental health of all individuals in classroom.
Effective: Summer 2010 Ending: Summer 2010

C I 497C **Language Learning Abroad** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 497D **Preparing for Overseas Student Teaching** (1) The Overseas Student Teaching Seminar intends to equip students with knowledge and tools for a successful student teaching experience abroad.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 497D **Preparing for Overseas Student Teaching** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 497E (HIST 497E, A ED 497E) **Consuming Child** (3) Explores linkages between new ideas about childhood and commercial/media culture since the Enlightenment through sponsored guest presentations and readings.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

C I 498A **Classroom Instruction that Works** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

C I 498A **Instructional Supervision and Coaching for Mentor Teachers** (3) This course is designed for all teachers and administrators in local school districts who are interested in learning about the process for mentoring novice and preservice teachers.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 498B **Curriculum and Instruction That Engages and Motivates Adolescent Learners** (3) Course explores both the cultures of curriculum and the value of importance of curriculum research.
Effective: Summer 2010 Ending: Summer 2010

C I 498B **Curriculum and Instruction that Engages and Motivates Adolescent Learners** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 500 **Multiple and Mixed Methods in Curriculum Inquiry** (3) Multiple and mixed methods of inquiry to investigate problems in the practice of curriculum and instruction.
Effective: Summer 2007

C I 501 **Teaching as Inquiry** (3) Course guides teachers to develop systematic inquires into effective teaching and learning.
Effective: Summer 1998

C I 502 **Qualitative Research in Curriculum and Instruction I** (3) Presentation of theoretical and practical issues related

to designing and proposing qualitative research concerning curriculum, teaching and/or learning.
Effective: Summer 1998
Prerequisite: admission to a doctoral program

C I 503 **Qualitative Research in Curriculum and Instruction II** (3) Considers forms of qualitative data, data analyses, procedures to generate data relationships, interpretation, and presentation of data.
Effective: Summer 1998
Prerequisite: C I 502

C I 504 (CI ED 504) **Perspectives in African Education** (3) Educational systems in selected African countries are examined with respect to colonial history, social, political, and cultural factors.
Effective: Spring 1995

C I 534 **Historical Research in the Curriculum** (3) The course addresses the practice of historical research in curriculum, burrowing from the techniques of historians, journalists, and educators.
Effective: Spring 1999

C I 550 **Overview of Contemporary School Curriculum** (3) Current school programs and options and their impact on pupils; problems in introducing new content into the curriculum.
Effective: Fall 1981
Prerequisite: 12 credits in education and psychology or teaching experience

C I 577 (LL ED 577) **Multicultural Issues in Literacy Education** (3) Explores research questions, and theoretical frameworks, and analyzes multicultural issues in popular media in the context of American schools.
Effective: Spring 1997
Prerequisite: LL ED 542

C I 580 (LL ED 580) **Media Literacy, Language, and Literacy in Schools** (3) Theories of media literacy, issues of non-print technology in language and literacy.
Effective: Spring 1997
Prerequisite: LL ED 480

C I 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

C I 595 **Internship in Curriculum, Supervision, or Instruction** (1-6) Internship in schools or other educational settings under supervision of graduate faculty in student's area of specialization.
Effective: Spring 1987
Prerequisite: approval by program head and at least 15 graduate-level credits in Education

C I 596 **Individual Studies** (1-9) Creative projects including nonthesis research, supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

C I 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Spring 1987

C I 597A **Reforming Public Schools** (3) This course will historically examine the public school reform movement and critique the idea of "failing schools."
Effective: Summer 2010 Ending: Summer 2010

C I 597A **Foundations of Educational Research** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 597A **Article Writing** (3) Doctoral students will revise existing work into a journal article for publication. Intensive writing workship addressing genre and style.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 597B **Professional Writing for Teachers** (1-3) This course is for teachers who wish to write for publication. It encourages free expression of teachers' voices.
Effective: Summer 2010 Ending: Summer 2010

C I 597B **English Language Learners Reading and Writing** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 597B **English Language Learning and Teacher Education** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 597C (INSYS 597A) **Technology in Teacher Education, A Critical Consideration** (3) This seminar has been designed to consider how technologies have been used in teacher preparation programs and what we as teacher educators can do to take more control over the use of appropriate technologies in our classrooms.
Effective: Summer 2010 Ending: Summer 2010

C I 597C **Vygotsky and Education** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 597C **Media and Social Education** (3) Study of how popular-culture media texts convey meanings about the past and present, human societies, language and culture.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 597D **Reconsidering Responsive Classroom Management** (2-3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Summer 2010 Ending: Summer 2010

C I 597D **Language, Culture and Society Seminar** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 597D **Foucault** (3) In-depth readings of works of Michel Foucault, commentators, and researchers/ theorists using Foucault in education.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 597E **Qualitative Research 2** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 597E **Educational Ethnography** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

C I 597F **Theories of Identity** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 597G **Children's/Young Adult Africana Literature and Literacy** (3) Formal courses given on a topical or special interest subject which may be offered frequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

C I 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2005

C I 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

C I 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

C I 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching experience in Curriculum and Instruction undergraduate faculty supervision.
Effective: Fall 1983
Prerequisite: admission to C&I doctoral program and program head permission

C I 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Summer 2000

C I 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

C I 611 **Ph.D. Dissertation Part-Time** (0) No description.

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Effective: Fall 1983

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Curriculum and Supervision (C & S)

C & S 401 **Measurement and Evaluation of Instruction, K-12** (3) Developing tests used for appraising academic growth of students, application of specific evaluative activities associated with student progress.
Effective: Fall 1983
Prerequisite: EDTHP 115 or Education Theory and Policy selection;EDPSY 014

C & S 470 **Workshop in Selected Studies in Curriculum** (1-6) Intensive work on selected current problems in curriculum.
Effective: Winter 1978
Prerequisite: 12 credits in education and teaching experience

C & S 471 **Workshop in Selected Studies in Supervision** (1-6) Intensive work on selected current problems in supervision.
Effective: Winter 1978
Prerequisite: 12 credits in education and teaching experience

C & S 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

C & S 554 **Long-Range Planning for School Programs** (3) Strategies and techniques for conducting long-range planning of educational programs.
Effective: Fall 1981
Prerequisite: C I 550 orEDLDR 551

C & S 587 (CI ED 587, E C E 587) **Curriculum, Culture, and Child Development** (3) Examines human development and cultural factors in planning, designing, and implementing curriculum and instruction in early childhood and childhood education.
Effective: Fall 2001
Prerequisite: HD FS 429

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Dance (DANCE)

DANCE 431 **Advanced Ballet I** (1.5) An advanced ballet training course.
Effective: Spring 2006
Prerequisite: DANCE 232

DANCE 432 **Advanced Ballet II** (1.5) A continuation of Advanced Ballet I to augment technical proficiency.
Effective: Spring 2006
Prerequisite: DANCE 431

DANCE 441 **Advanced Jazz I** (1.5) An advanced course in the techniques of jazz dance.
Effective: Spring 2006
Prerequisite: DANCE 242

DANCE 442 **Advanced Jazz II** (1.5) A continuation of Advanced Jazz I to augment technical proficiency.
Effective: Spring 2006
Prerequisite: DANCE 441

DANCE 451 **Advanced Tap I** (1.5) An advanced course in the techniques of tap dance.
Effective: Spring 2006
Prerequisite: DANCE 252

DANCE 452 **Advanced Tap II** (1.5) A continuation of Advanced Tap I to augment technical proficiency.
Effective: Spring 2006
Prerequisite: DANCE 451

DANCE 461 **Advanced Modern Dance I** (1.5) Development of dance technique and movement combinations on the advanced level.
Effective: Spring 2006
Prerequisite: DANCE 262

DANCE 462 **Advanced Modern Dance II** (1.5) A continuation of Advanced Modern Dance I to augment technical proficiency.
Effective: Spring 2006
Prerequisite: DANCE 461

DANCE 480 **Choreographic Projects** (2) Choreographic practicum experiences for concert performances.
Effective: Spring 2006
Prerequisite: DANCE 381

DANCE 482 **Introduction to Laban Movement Analysis** (3) Observe and analyze movement elements by exploring concepts of Body, Effort, Shape, and Space to increase personal communication and expression.
Effective: Summer 1999

DANCE 484 (US;IL) **Dance History** (3) Survey of dance history concerning perspectives of culture, race, and gender with a focus on Nineteenth and Twentieth centuries.
Effective: Fall 2006

DANCE 485 **Contemporary Dance Repertory** (1-2) An advanced dance course in the choreographic process with emphasis on original choreography in performance.
Effective: Spring 2006

DANCE 487 **Advanced Hip Hop Dance** (1.5) Advanced Hip Hop Dance reinforces and expands concepts from Beginning Hip Hop Dance. Free expression of the body, freestyle, and choreography are emphasized.
Effective: Summer 2007
Prerequisite: DANCE 283

DANCE 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 1999

DANCE 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1999

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Dickinson Scl Of Law (LAWUN)

No courses for department code **LAWUN** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Dietetic Food Systems Management (D S M)

No courses for department code **D S M** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Early Childhood Education (E C E)

E C E 451 **Instruction in Early Childhood Education Derived from Development Theories** (3) Curriculum and instruction for early childhood education; program practice with pluralistic theoretical foundations for early childhood education.
Effective: Spring 2007
Prerequisite: HD FS 229, HD FS 428, HD FS 429 orPSYCH 212

E C E 452 **Approaches to Contemporary Early Childhood Education Programs** (3) Description and analysis of early childhood programs; cycles, trends, progressions in early childhood education.
Effective: Spring 1992
Prerequisite: E C E 451

E C E 453 **parent Involvement in Home, Center, and Classroom Instruction** (2-3) Parent involvement, programs, and methodologies that strengthen bonds between home and community for educators of children.
Effective: Spring 1992
Prerequisite: 6 credits in education

E C E 454 (HD FS 454) **Development and Administration of Child Service Programs** (3) Planning, administering, and evaluating child service programs at several administrative levels using methods from relevant disciplines.
Effective: Spring 1992
Prerequisite: HD FS 453;C I 295 orHD FS 330

E C E 479 **The Young Child's Play as Educative Processes** (3) Young child's play as educative processes and uses of materials in curricular settings are examined.
Effective: Spring 2007
Prerequisite: E C E 451;HD FS 229 orHD FS 429 orPSYCH 415

E C E 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1991

E C E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1991

E C E 497A **E C E Projects** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

E C E 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

E C E 498A **Engaging Cultural Context in a Pre-K Setting** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E C E 572 **Issues and Trends in Early Childhood Education** (3 per semester/maximum of 9) Research, experimental programs, and emerging trends in early childhood education; relationships between educational experiences and later intellectual and emotional development.
Effective: Spring 1992
Prerequisite: E C E 452, EDPSY 400

E C E 580 **Young Multilingual/Multicultural Learners** (3) Multilingual/multicultural dimensions of young learners; language, cultural- ethnic social milieu and family, school, community, religious impacts, and acculturation philosophies.
Effective: Summer 1993
Prerequisite: E C E 452 orE C E 479 orE C E 453

E C E 587 (C & S 587, CI ED 587) **Curriculum, Culture, and Child Development** (3) Examines human development and cultural factors in planning, designing, and implementing curriculum and instruction in early childhood and childhood education.
Effective: Fall 2001
Prerequisite: HD FS 429

E C E 588 **Educational Role of the Family** (3) Parent-child-teacher relationships, cognitive socialization, and academic attainments; proximal/distal variables: family structure, history, processes, content, community, culture.
Effective: Summer 1992
Prerequisite: E C E 453, HD FS 418 orSOC 315

E C E 589 **Play and Early Childhood Education** (3) Developmental significance of play, processes, and development; role of the adult in child's play; educational practices.
Effective: Spring 2007

Prerequisite: HD FS 429 orPSYCH 415

E C E 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1995

E C E 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1991

E C E 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1991

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Earth Sciences (EARTH)

EARTH 400 **Earth Sciences Seminar** (3) Interdisciplinary study of environmental problems in the earth sciences.
Effective: Spring 2001
Prerequisite: seventh-semester standing in the Earth major

EARTH 402 **Evolution of the Atmosphere and Oceans** (3) A quantitative journey through the history of atmospheric and oceanic composition and the earth's climate.
Effective: Summer 2007
Prerequisite: CHEM 110, MATH 140, PHYS 201

EARTH 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2001
Prerequisite: prior approval of proposed assignment by instructor

EARTH 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

EARTH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

EARTH 497A **Modeling the Earth System** (3) A quantitative introduction to the evolution of Earth's biosphere, atmosphere, and hydrosphere, with emphasis on the carbon cycle and climate.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: MATH 140 orMATH 110 orMATH 083, CHEM 110

EARTH 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

EARTH 500 **Earth Sciences Research** (1-6) Relationships between the earth sciences revealed by theory, analytical methods, or a selected problem.
Effective: Winter 1978

EARTH 501 **Contemporary Controversies in the Earth Sciences** (3) Exploration of current areas of research in the Earth Sciences.
Effective: Summer 2008

EARTH 520 **Plate Tectonics and People: Foundations of Solid Earth Science** (3) Solid Earth geophysics and geological hazards presented within the grand unifying theory of plate tectonics.
Effective: Summer 2008

EARTH 530 **Earth Surface Processes in the Critical Zone** (3) Introduction to Earth surface processes including weathering and soils, geomorphology, erosion and sedimentation, hydrogeology, low-temperature geochemistry and Earth systems.
Effective: Summer 2008

EARTH 540 **Essentials of Oceanography for Educators** (3) Chemical and physical principles of the oceans and their interaction with the biosphere, atmosphere and the solid Earth.
Effective: Summer 2008

EARTH 591 **Individual Studies: Research Project** (3) Development of a capstone project, supervised on an individual basis outside the scope of formal courses.
Effective: Summer 2008
Prerequisite: 24 credits in the Master's Degree program in Earth Science Education

EARTH 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1994

EARTH 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

EARTH 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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Earth and Mineral Sciences (EM SC)

EM SC 420 (SOC 420, S T S 420) **Energy and Modern Society** (3) Technology and economics of energy resources, production, and consumption; environmental factors, exhaustion, new technology.
Effective: Fall 1986

EM SC 440 **Science Diving** (3) Advanced scuba diving skills applied to underwater research.
Effective: Summer 2003
Prerequisite: basic and second level open water scuba certification from an internationally recognized certification agency and a minimum of 20 additional logged dives beyond the basic certification dives.

EM SC 468 **Computational Thinking in Earth Systems** (3) Development and application of computational protocols used in earth sciences.
Effective: Summer 2000

EM SC 470W **Undergraduate Collaborative Research in Earth and Materials Sciences** (3-6) Interdisciplinary research seminar involving students in the process of discovery, writing, and debate on issues of broad interest to Earth and Materials Sciences.
Effective: Spring 1998

EM SC 470Y (IL) **Undergraduate Collaborative Research in Earth and Materials Sciences** (3-6) Interdisciplinary research seminar involving students in the process of discovery, writing, and debate on issues of broad interest to Earth and Materials Sciences.
Effective: Summer 2005

EM SC 494 **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1994

EM SC 494H **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

EM SC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2003

EM SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

EM SC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

EM SC 602 **Supervised Experience in College Teaching** (2-3) Students enrolled will lead discussion sections, grade papers and examinations, give an occasional lecture, and assist instructors in planning survey level courses.
Effective: Fall 2004

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Economics (ECON)

ECON 400M **Honors Seminar in Economics** (3-12) Readings, discussion, and oral and written reports on selected topics in economics.
Effective: Spring 1993
Prerequisite: ECON 302, ECON 304 fifth-semester standing admission into Honors program

ECON 401 **History of Economic Thought** (3) Survey of economic ideas from Greco-Roman times to the present.
Effective: Spring 2001
Prerequisite: ECON 302 orECON 304

ECON 402 **Decision Making and Strategy in Economics** (3) Development and application of the tools for decision making under uncertainty and for game theoretic analysis of economic problems.
Effective: Spring 2007
Prerequisite: ECON 302;SCM 200 orSTAT 200

ECON 403W **The Economics of Arts and Entertainment** (3) Supply and demand of creative goods and services; industry structure; role of information; policy issues.
Effective: Summer 2008
Prerequisite: ECON 302 andECON 490

ECON 404 **Current Economic Issues** (3) An analytical survey of significant problems of current economic policy and the application of economic analysis to important social issues.
Effective: Summer 2001
Prerequisite: ECON 302 orECON 304

ECON 404W **Current Economic Issues** (3) An analytical survey of significant problems of current economic policy and the application of economic analysis to important social issues.
Effective: Spring 1993
Prerequisite: ECON 302 orECON 304

ECON 405 **Seminar in Economic Analysis** (3) Development and application of tools of economic analysis; recent analytical developments; policy problems. Primarily for senior-year economics majors.
Effective: Fall 1981
Prerequisite: ECON 302, ECON 304

ECON 406W **The Economics of Social Conflict** (3) Economic theory of the resolution of social conflicts: social choice theory, voting, noncooperative games, voluntary trade, and allocation by force.
Effective: Summer 2008
Prerequisite: ECON 402 andMATH 110 orMATH 140

ECON 407W **Political Economy** (3) Applications of the tools of game theory to analyze topics in collective decision making.
Effective: Summer 2008
Prerequisite: ECON 402

ECON 408W **Intellectual Property** (3) A comparative and cost-benefit analysis of intellectual property that examines patents, copyrights, government supported research, and prizes.
Effective: Summer 2008
Prerequisite: ECON 402 orECON 444

ECON 409W **Economics of Terrorism** (3) Terrorism throughout history; economic causes, costs, sources, and consequences.
Effective: Summer 2008
Prerequisite: ECON 402

ECON 410 **Economics of Labor Markets** (3) Economic analysis of the employment relationship from the microeconomic perspective, with emphasis on current labor-market problems and public policy issues.
Effective: Spring 2008
Prerequisite: ECON 002

ECON 411W **Behavioral Economics** (3) Topics in behavioral economics; selected games; evolutionary models of social behavior; culture and social behavior; herding; overconfidence.
Effective: Summer 2008
Prerequisite: ECON 402 orECON 444

ECON 412 **Labor Economics and Labor Markets: Theory, Evidence, and Policy** (3) Advanced topics in labor economics: theory, empirical evidence, and policy.
Effective: Spring 2009
Prerequisite: ECON 302 orECON 315

ECON 413W **Economic Growth and the Challenge of World Poverty** (3) Economic prosperity in historical perspective; recent successes (East Asia, China, India); ongoing challenges (the bottom billion; sub-Saharan Africa).
Effective: Summer 2008
Prerequisite: ECON 471

ECON 414W **The Economic Way of Looking at Life** (3) Economics/life according to Gary Becker: criminal behavior;

economics of the family (marriage, divorce, intrahousehold resource allocation, bequests), policy issues.
Effective: Summer 2008
Prerequisite: ECON 412

ECON 415W **The Economics of Global Climate Change** (3) Evidence on climate change; economic models of the environment and market failure; cost-benefit analysis of policy options; carbon markets.
Effective: Summer 2008
Prerequisite: ECON 428

ECON 417W **The Economics of Uncertainty** (3) Uncertainty is examined in contracts, with an emphasis on limited liability. Asymmetric information and economic puzzles are also considered.
Effective: Summer 2008
Prerequisite: ECON 402 orECON 444

ECON 418W **A Comparative and Cost-Benefit Analysis of State Government Activities** (3) This course examines federalism with a particular focus on the activities undertaken by the state of Pennsylvania.
Effective: Summer 2008
Prerequisite: ECON 490

ECON 421 **Analysis of Economic Data** (3) Economic analysis of data: sources, variable definitions, miscodings, missing observations, censoring and truncation, applications.
Effective: Summer 2008
Prerequisite: ECON 402 orECON 451;ECON 490

ECON 422W **Applying Monetary Theory to Monetary History** (3) Monetary history is examined. Special attention is paid to commodity-based systems, private money, and government monopolies on currency.
Effective: Summer 2008
Prerequisite: ECON 451

ECON 423 **State and Local Taxation** (3) Representative state and local tax systems, including analysis of state-local fiscal relationships and proposals for tax revision.
Effective: Winter 1978
Prerequisite: ECON 323

ECON 424 **Income Distribution** (3) Inequality and poverty in the United States, measurement problems, determinants of inequality, arguments for and against equality, impact of redistributive policies.
Effective: Fall 1992
Prerequisite: ECON 302, ECON 315 orECON 323

ECON 425 **Economics of Public Expenditures** (3) Analytic and policy aspects of public expenditure decisions; applications from areas of contemporary public interest.
Effective: Summer 1992
Prerequisite: ECON 302 orECON 323

ECON 427 (EDLDR 427) **Economics of Education** (3) Theoretical and empirical concepts in economics applied to education.
Effective: Fall 2004
Prerequisite: ECON 302, ECON 315 orEDLDR 480

ECON 428 **Environmental Economics** (3) Environmental pollution, the market economy, and optimal resource allocation; alternative control procedures; levels of environmental protection and public policy.
Effective: Summer 1992
Prerequisite: ECON 302 orECON 323

ECON 429 **Public Finance and Fiscal Policy** (3) Analysis of public revenue and expenditure structure primarily at the federal level; federalism; fiscal policy and public debt.
Effective: Fall 1983
Prerequisite: ECON 323;ECON 302 orECON 304

ECON 430 **Regional Economic Analysis** (3) Analysis of personal and industrial location decisions, regional economic growth, migration patterns, and regional policy; emphasis on tools and techniques.
Effective: Spring 2008
Prerequisite: ECON 002 orECON 004

ECON 432 **Urban Economics** (3) Theories and methods for economic analysis of such urban problems as housing, segregation, government services, and transportation.
Effective: Summer 1992
Prerequisite: ECON 302 orECON 323

ECON 433 **Advanced International Trade Theory and Policy** (3) Causes/consequences of trade; effects of tariffs and quotas; strategic trade policy; political economy of trade restrictions and other topics.
Effective: Summer 1992
Prerequisite: ECON 302 orECON 333

ECON 434 **International Finance and Open Economy Macroeconomics** (3) Trade balance movements, exchange rate determination; monetary and fiscal policies in open economies; international policy coordination; the world monetary system.
Effective: Spring 1992
Prerequisite: ECON 304 orECON 333

ECON 435 **Black American Economic Development** (3) Analytical and theoretical aspects of Black American economic

development: discrimination, development approaches, historical experience, public and private policies.
Effective: Summer 1992
Prerequisite: ECON 302 orECON 304

ECON 436W (US) **Economics of Discrimination** (3) Analysis of the economic characteristics of women and minorities, with examination of race and sex discrimination and related government policies.
Effective: Fall 2007
Prerequisite: ECON 302 orECON 315

ECON 437W **Multinationals and the Globalization of Production** (3) This course will focus on trade, multinationals and offshoring, and explore their implications for the U.S. and developing countries.
Effective: Summer 2008
Prerequisite: ECON 433

ECON 438W **Winners and Losers from Globalization** (3) The economic effects of globalization on individuals, governments, nation- states and business.
Effective: Summer 2008
Prerequisite: ECON 433 andECON 490

ECON 439 **Economics of Technology Diffusion** (3) Technology Diffusion: Globalization, productivity measurement, intellectual property.
Effective: Summer 2008
Prerequisite: ECON 433

ECON 440 **Trade and Labor Markets** (3) International trade and its impacts on markets in industrialized and development economies; low-skilled workers in the emerging global economy.
Effective: Summer 2008
Prerequisite: ECON 433

ECON 441 **Introduction to Business Economics** (3) The study of economic theory as it relates to the problems of the firm.
Effective: Spring 2008
Prerequisite: ECON 002, ECON 004

ECON 442 **Managerial Economics** (3) Application of economic theory to managerial decision making; risk, uncertainty; models and statistical techniques.
Effective: Spring 2008
Prerequisite: ECON 002

ECON 443 **Economics of Law and Regulation** (3) An economic analysis of property rights, contractual arrangements, illegal activities, and regulation; competitive problems due to externalities and market failure.
Effective: Summer 1992
Prerequisite: ECON 302 orECON 342

ECON 444 **Economics of the Corporation** (3) Coordination and incentive issues within a corporation. Topics include employment contracts, performance incentives and pricing of financial assets.
Effective: Summer 1997
Prerequisite: ECON 302

ECON 445 (H P A 445) **Health Economics** (3) Economic analysis of U.S. health care system; planning, organization, and financing; current public policy issues and alternatives.
Effective: Spring 1994
Prerequisite: ECON 302, ECON 315 orECON 323

ECON 445W (H P A 445W) **Health Economics** (3) Economic analysis of U.S. health care system; planning, organization, and financing; current public policy issues and alternatives.
Effective: Spring 2008
Prerequisite: ECON 302, ECON 315 orECON 323

ECON 446W **Economics of Industry Evolution** (3) Dynamics of industry evolution; empirical evidence and theoretical modeling of firm entry, growth, and exit; entrepreneurship; investment and strategic behavior.
Effective: Summer 2008
Prerequisite: ECON 444 andECON 490

ECON 447W **Economics of Sports** (3) Examination of economic issues pertaining to professional and collegiate sports, including analysis of industrial organization, labor markets, and local economies.
Effective: Spring 2009
Prerequisite: ECON 302 andECON 490

ECON 448W **Economics of Auctions and Procurements** (3) Theoretical and empirical analyses of auctions and procurements; different modeling environments; econometric analysis of auction and procurement data.
Effective: Summer 2008
Prerequisite: ECON 402 orECON 444 andECON 490

ECON 449W **Economics of Collusion** (3) Theoretical and empirical analysis of collusion among firms, case studies of cartel behavior, bidding behavior at auctions and procurements.
Effective: Spring 2008
Prerequisite: ECON 302 orECON 342 andECON 490 or permission of instructor

ECON 450 **The Business Cycle** (3) Measurement and theories of the business cycle; stabilization policies; forecasting.
Effective: Summer 1992

Prerequisite: ECON 304 orECON 351

ECON 451 **Monetary Theory and Policy** (3) Monetary and income theory; monetary and fiscal policy.
Effective: Winter 1978
Prerequisite: ECON 304 orECON 351

ECON 452W **Financial Crises** (3) Examination of causes and consequences of financial crises; asset pricing theory, market efficiency, speculative bubbles; policy considerations.
Effective: Summer 2008
Prerequisite: ECON 451

ECON 453 **Monopolization and Vertical Restraints** (3) Monopolization and vertical restraints: exclusive dealing, bundling, tying, predation and entry deterrence; empirical evaluation.
Effective: Summer 2008
Prerequisite: ECON 444 andECON 490

ECON 454 **Economics of Mergers** (3) Economic analysis of horizontal and vertical mergers; econometric issues in measurement of unilateral and coordinated effects; policy issues.
Effective: Summer 2008
Prerequisite: ECON 444 andECON 490

ECON 455W **Economics of the Internet** (3) Economics of the Internet; electronic commerce and network economics; pricing issues; intellectual property.
Effective: Summer 2008
Prerequisite: ECON 402 orECON 444

ECON 457W **Economics of Organizations** (3) An advanced course in the economics of organizations. The focus is on coordination, incentives, contracts, and information in corporations.
Effective: Summer 2008
Prerequisite: ECON 402 orECON 444

ECON 462 **American Economic Development** (3) Quantitative aspects and theories of American economic development; resource and technological considerations; economic policies and growth.
Effective: Summer 1992
Prerequisite: ECON 302 orECON 304

ECON 463 (IL) **Economic Demography** (3) Microeconomics of demographic behavior; interrelationships between demographic and economic factors, in developing and industrialized economies; economic welfare and policy implications.
Effective: Spring 2006
Prerequisite: ECON 302 orECON 304 ; or 9 credits in demography

ECON 463W **Economic Demography** (3) Microeconomics of demographic behavior; interrelationships between demographic and economic factors, in developing and industrialized economies; economic welfare and policy implications.
Effective: Summer 2008
Prerequisite: ECON 412 orECON 471 or 9 credits in demography

ECON 465W **Cross Sectional Econometrics** (3) Discrete choice models, censored and truncated regression models, longitudinal models, applications.
Effective: Summer 2008
Prerequisite: ECON 302 andECON 490

ECON 466W **Panel Data Models** (3) Random and fixed effects, endogeneity, balanced and unbalanced panels, censoring of spells, differences in differences, applications.
Effective: Summer 2008
Prerequisite: ECON 302 andECON 490

ECON 470 (IL) **International Trade and Finance** (3) Economic analysis of why nations trade, barriers to trade, the international monetary system, and macroeconomic policy in an open economy.
Effective: Spring 2008
Prerequisite: ECON 002 orECON 004

ECON 471 **Growth and Development** (3) Problems of capital formation, institutional considerations, theories of economic growth.
Effective: Summer 1997
Prerequisite: ECON 302 orECON 304 orECON 370 orECON 372

ECON 472 **Transition to Market Economies** (3) Economics of transition to a market economy; problems of former Soviet-type economies; privatization, stabilization, and institutional change.
Effective: Fall 2005
Prerequisite: ECON 302 orECON 304

ECON 473 (IL) **China in the Global Economy: History, Culture, and Society** (3) Analysis of China's role in the global economy and the impact on U.S. as well as global business and society.
Effective: Spring 2008
Prerequisite: ECON 002 orECON 004 or permission of program

ECON 474 **East Asian Economies** (3) Development, structure, and policies of the economies of East Asian pacific rim nations.
Effective: Spring 1992

Prerequisite: EA ST 187 orECON 370;ECON 002 orECON 004

ECON 475W **Migration and Development** (3) Human Capital Approach to Migration; Economics of Family Migration; Evidence: Micro and Macro Perspectives; Migration Policies.
Effective: Summer 2008
Prerequisite: ECON 471 orECON 412;ECON 490

ECON 476W **The Economics of Fertility in the Developing World** (3) Demand for children, supply of children, and costs of fertility regulation; fertility transition; public policies to affect fertility.
Effective: Summer 2008
Prerequisite: ECON 471 andECON 490

ECON 477 **Labor Markets in Developing Countries** (3) Labor demand and supply in developing countries; urban and rural labor markets, modern and informal sectors; policy issues.
Effective: Summer 2008
Prerequisite: ECON 471 orECON 412

ECON 478 **Incomplete Markets** (3) Rural land markets, fragmented credit markets, risk and insurance, human capital and labor markets, innovation and technology spillovers, coordination failures.
Effective: Summer 2008
Prerequisite: ECON 471

ECON 479W **Economics of Matching** (3) Economic application of matching to employment, marriage, organ markets, and medical residents.
Effective: Summer 2008
Prerequisite: ECON 402 orECON 412 orECON 444

ECON 480 **Mathematical Economics** (3) Mathematical techniques employed in economic analysis; formal development of economic relationships.
Effective: Summer 1992
Prerequisite: ECON 302, ECON 304, MATH 110

ECON 481 **Business Forecasting Techniques** (3) A survey of contemporary business forecasting techniques, with emphasis on smoothing, decomposition, and regression techniques.
Effective: Spring 2008
Prerequisite: SCM 200 orSTAT 200

ECON 482 **Advanced Business Forecasting Techniques** (3) Advanced forecasting, time-series models, Box-Jenkins methodology, model identification, estimation, and diagnostic checking.
Effective: Spring 2008
Prerequisite: SCM 200 orSTAT 200

ECON 483 **Economic Forecasting** (3) Forecasting time series, using linear regression models and econometric software; useful forecasting models; financial and seasonal time series; trends.
Effective: Summer 2008
Prerequisite: ECON 490

ECON 485 **Econometric Techniques** (3) Applying statistical techniques to test and explain economic relationships; integration of economic theory with observed economic phenomena.
Effective: Spring 2008
Prerequisite: ECON 002 orECON 004;SCM 200 orSTAT 200

ECON 489M **Honors Thesis** (1-6) No description.
Effective: Spring 1993
Prerequisite: ECON 302, ECON 304 and admission into the departmental honors program

ECON 490 **Introduction to Econometrics** (3) Use of simple and multiple regression models in measuring and testing economic relationships. Problems including multicollinearity, hetroskedasticity, and serial correlation.
Effective: Summer 2000
Prerequisite: MATH 110, ECON 390

ECON 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

ECON 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

ECON 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1995
Prerequisite: prior approval of proposed assignment by instructor

ECON 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

ECON 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

ECON 499 (IL) **Foreign Study--Economics** (2-6) Study in selected countries of economic institutions and current economic problems.
Effective: Summer 2005
Prerequisite: ECON 002, ECON 004

ECON 500 **Introduction to Mathematical Economics** (3) Mathematical Economics: Applications of Mathematical Techniques to Economics.
Effective: Spring 1990

ECON 501 **Econometrics** (3) Econometrics: Applications of Statistical Techniques to Economics
Effective: Summer 1989

ECON 502 **Microeconomic Analysis** (3) Economic behavior under pure and imperfect competition; price and output determination in product markets; prices and employment in factor markets.
Effective: Winter 1978

ECON 503 **Macroeconomic Analysis** (3) National income accounts; determination of income, employment, interest rates, and the price level; stabilization policy.
Effective: Winter 1978

ECON 506 **Problems in Economics** (1-12) Planned projects involving library, laboratory, or field work.
Effective: Winter 1978

ECON 507 **International Trade** (3-6) Theory of international trade and investment; effect of commercial policy on trade and income distribution; multinational corporations and international trade.
Effective: Spring 1993

ECON 510 **Econometrics I** (3) General linear model, multicolinearity, specification error, autocorrelation, heteroskedasticity, restricted least squares, functional form, dummy variables, limited dependent variables.
Effective: Fall 2003
Prerequisite: ECON 501 orSTAT 462 orSTAT 501

ECON 511 **Econometrics II** (3) Stochastic regressors, distributed lag models, pooling cross-section and time- series data, simultaneous equation models.
Effective: Fall 2003
Prerequisite: ECON 510

ECON 515 **Labor Economics I** (3) Labor supply and income maintenance; human capital, job search and training; labor demand, minimum wage, and discrimination.
Effective: Fall 1983

ECON 516 **Labor Economics II** (3) Earnings differentials, unemployment, and related policy. Institutional aspects of labor economics, including dual labor markets, collective bargaining, and unionism.
Effective: Fall 1983

ECON 517 **Open Economy Macroeconomics and International Finance** (3-6) The balance of payments, portfolio allocation, monetary and fiscal policy in an open economy, exchange rate regimes, selected policy issues.
Effective: Spring 1993

ECON 521 **Advanced Microeconomic Theory** (3-6) Theory of consumer behavior; theory of the firm; price determination in product and factor markets; introduction to welfare economics.
Effective: Fall 1983

ECON 522 **Advanced Macroeconomic Theory** (3-6) Measurement of income; theories of consumption, investment, and money holdings; static determination of income and employment; introduction to dynamic analysis.
Effective: Winter 1978

ECON 524 **Applied Welfare Economics and Income Distribution** (3-6) Public resource allocation problems; alternative collective policies and organizations; income and wealth distribution; measuring inequality; income dynamics; poverty; public policy.
Effective: Spring 1993

ECON 525 **Technological Change and Research and Development Policy** (3) Theoretical, empirical, and policy analysis of investments in research and development; effects of research and development on profitability, economic growth,

international competition.
Effective: Spring 1998

ECON 529 **Public Finance** (3-6) Effects of taxes, expenditures, debt on allocation, employment, distribution; cost-benefit analysis; collective decision mechanisms; fiscal federalism; current fiscal policy problems.
Effective: Fall 1983

ECON 532 **Urban Economics** (3) Urban structure; migration of capital and households; urban public finance.
Effective: Fall 1983

ECON 534 **Game Theory** (3) Foundations of current research in game theory.
Effective: Summer 2006
Prerequisite: ECON 521 or permission of program

ECON 543 **Industrial Organization and Public Policy** (3-6) The structure of American industry; performance and behavior; public policies toward business.
Effective: Summer 1980

ECON 550 **Economic Fluctuations** (3) Analysis of the various theories of economic fluctuations; their methodological premises.
Effective: Winter 1978

ECON 558 **Development of Monetary Theory** (3) Classical and neoclassical quantity theories of money and contemporary criticism; Keynesian monetary theory and its critics.
Effective: Fall 1983

ECON 559 **Current Monetary Theory and Policy** (3) Post-Keynesian reformulation of quantity and Keynesian theories of money; liquidity and general equilibrium approaches; current issues in theory and policy.
Effective: Fall 1983

ECON 570 **Development Economics** (3-6) Resources and institutions; quantitative measures; theories of economic growth in developing areas; developmental policies.
Effective: Summer 1997

ECON 571 **Economics of Transition** (3-6) Problems of transition to a market economy. Economic problems of former Soviet-type economies. Economics of privatization, stabilization and restructuring.
Effective: Summer 1997

ECON 572 **Soviet and Other Centrally Planned Economies** (3-6) Principles, structure, and performance of centrally planned economies, with special emphasis on the Soviet Union.
Effective: Fall 1983

ECON 589 **Seminar in Econometric Theory** (3) Theories and methods relevant to the application of statistical methods to economics.
Effective: Fall 2003
Prerequisite: ECON 510, ECON 511

ECON 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

ECON 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

ECON 597A **Special Topics in Microeconomic Theory** (3) Game theory and its applications to prepare PhD students to undertake research in this field.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ECON 597B **Empirical Methods** (1) An overview of empirical research methods that students receive in the core PhD program to understand high-quality empirical research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ECON 597C **Theory of Empirical Processes** (3) Intro to the theory of empirical processes with some applications to parametric inference.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ECON 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

ECON 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

ECON 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

ECON 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Educ Leadership Prog (EDLDR)

EDLDR 405 (C I 405) **Strategies in Classroom Management** (3) Managing and coping with disruptive student behavior in instructional settings so that they support the teaching/learning process.
Effective: Fall 2008
Prerequisite: teaching experience or supervised practicum experience

EDLDR 409 **Leadership Studies in Popular Film** (3) In-depth analysis of leadership dynamics revealed in popular film. Focus on cinematic depictions of theory and practical application of leadership.
Effective: Summer 2006
Prerequisite: EDTHP 115 junior standing or permission of program

EDLDR 427 (ECON 427) **Economics of Education** (3) Theoretical and empirical concepts in economics applied to education.
Effective: Fall 2004
Prerequisite: ECON 302, ECON 315 orEDLDR 480

EDLDR 476 **The Teacher and the Law** (3) An introduction to education law as it affects the teacher.
Effective: Fall 2004
Prerequisite: 9 credits in education or the social sciences

EDLDR 480 **Introduction to Educational Leadership** (3) Development of educational leadership. Relationships among local, state, and federal agencies. Introduction to current concepts and theories.
Effective: Fall 2004
Prerequisite: 3 credits in social science sociology anthropology community development business administration or political science

EDLDR 481 **Collective Bargaining in Education** (3) Analysis of public bargaining, including history, development of legislation, analysis of current laws, and strategies and techniques, including simulated bargaining.
Effective: Fall 2004
Prerequisite: EDLDR 480

EDLDR 485 **Principal as Instructional Leader** (3) Knowledge and skills principals need to lead instructional design and implementation.
Effective: Fall 2004
Prerequisite: EDLDR 480

EDLDR 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2004

EDLDR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2004

EDLDR 497A **Case Studies in Educational Leadership** (3) Case study analyses of schools as social systems. Focus on issues of school leadership, culture, policy, and organizational dynamics.
Effective: Summer 2010 Ending: Summer 2010

EDLDR 497A (EDTHP 497B) **Law and Policy for Teachers** (3) Students study and discuss legal issues facing teachers and schools today.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 497A (EDTHP 497A) **Law and Policy for Teachers** (3) Students study and discuss legal and policy issues facing teachers and schools today.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDLDR 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2004

EDLDR 498A **Teacher as Supervisor: Becoming aore Effective Mentor Teacher** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 498A **Teacher as Supervisor: Becoming a More Effective Mentor Teacher** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDLDR 528 **Educational Politics in the United States** (3) Social and institutional forces which shape the public school system and determine national, state, and local educational policy and politics.
Effective: Fall 2004

EDLDR 530 **Leadership for Inclusive Education** (3) In-depth analysis and discussion of the school leaders's role in creating and sustaining an inclusive learning enviroment for all.
Effective: Summer 2009

EDLDR 533 **The Politics of Local School Districts** (3) Theory and practice of the politics and governance of local school districts; issues and methods in studying political decision making.
Effective: Fall 2004

EDLDR 540 **Technology Applications in Educational Leadership** (3) Development and use of information technology applications to analyze common problems faced by educational administrators.
Effective: Spring 2008

EDLDR 549 **School District Improvement and Systemic Change** (3) This course focuses on understanding and leading systemic district improvement efforts.
Effective: Spring 2010
Prerequisite: EDLDR 559 orEDLDR 578

EDLDR 551 **Curriculum Design: Theory and Practice** (3) The analysis and use of the foundations which underlie models of curriculum design.
Effective: Fall 2004
Prerequisite: C I 550

EDLDR 553 **Issues in Curriculum** (3 per semester/maximum of 6) In-depth study of issues and trends in the understanding and practice of curriculum.
Effective: Fall 2004
Prerequisite: formal acceptance as a doctoral student in the Curriculum and Supervision option area

EDLDR 555 **Development of Teacher Education Programs** (3) Study of the components and design of teacher education programs within the constraints of institutional, professional, and legal contexts.
Effective: Fall 2004
Prerequisite: C I 550 orEDLDR 551

EDLDR 557 **Seminar in Curriculum Research** (3) Analysis of particular curriculum studies, methods and paradigms, and the general status of current research in the general curriculum field.
Effective: Fall 2004
Prerequisite: C I 400, C I 550

EDLDR 558 **Standard Works in Curriculum and Instruction** (3) Study of significant empirical, historical, evaluative, philosophical, and critical works having an impact on curriculum and instruction practice.
Effective: Fall 2004
Prerequisite: EDLDR 551

EDLDR 559 **School Improvement** (3) The course examines how educational leaders at all levels can determine, promote, support, and achieve successful school improvement.
Effective: Spring 2005

EDLDR 560 **Principles of Instructional Supervision** (3) Social and institutional settings for instructional supervision; functions, activities, and practices of supervision; supervisory case studies.
Effective: Fall 2004
Prerequisite: teaching or school administrative experience; 18 credits in education at least 5 of which are methods of teaching

EDLDR 562 **Methods of Classroom Supervision and Coaching** (3) Strategies and techniques for supervision/coaching of instruction intended to enhance teacher reflection, self-direction, and autonomy.
Effective: Fall 2004
Prerequisite: C & S 560 teaching administrative or other professional educational work experience

EDLDR 563 **Designing Staff Development Programs** (3) Designing, implementing, and evaluating effective staff development programs for personnel in educational settings.
Effective: Fall 2004
Prerequisite: EDLDR 560

EDLDR 564 **Supervision Theory** (3) Critical analysis of alternative theories of instructional supervision and in-depth examination of trends and issues in supervision.
Effective: Fall 2004
Prerequisite: EDLDR 560

EDLDR 565 **Personnel Management and Contract Administration** (3) Practice and theory of personnel supervision at the central office and building level, including contract administration and grievance handling.
Effective: Fall 2004
Prerequisite: 18 credits in education and three years' teaching experience

EDLDR 567 **Organizational Supervision** (3) Principles and practices of supervision in schools related to instructional and support personnel.
Effective: Fall 2004
Prerequisite: EDLDR 480

EDLDR 568 **The Principalship** (3) Principles and practices of administration of elementary and secondary schools.
Effective: Fall 2004

EDLDR 569 **Decision Making in Educational Organizations** (3) Decision making in organizational and environmental contexts; case studies of administrative problems; application of decision making models.
Effective: Fall 2004
Prerequisite: EDLDR 480 or teaching supervisory or administrative experience or permission of program.

EDLDR 571 **Educational Facilities Planning** (3) Educational facilities planning, including use of demographic, curriculum, resource, energy data, and state building construction guidelines.
Effective: Fall 2004
Prerequisite: EDLDR 480

EDLDR 573 **Public School Finance** (3) Financing of public education, including values underlying system, revenue sources and taxation, school funding formulas, equity, and school finance reform.
Effective: Fall 2004
Prerequisite: EDLDR 480 or teaching administrative or supervisory experience

EDLDR 574 **Theory and Current Issues in Public Bargaining** (3) Theories of bargaining; legal basis for public bargaining; state and federal labor relations agencies; supervisory bargaining.
Effective: Fall 2004
Prerequisite: EDLDR 481

EDLDR 575 **Ethics in Educational Leadership** (3) Course explores the moral and ethical dimensions of the work of educational leaders.
Effective: Spring 2008

EDLDR 576 **The Law and Education** (3) Legal bases for education; rights and responsibilities of school board members, administrators, teachers, students, and parents; due process.
Effective: Fall 2004
Prerequisite: EDLDR 480 or teaching or administrative or supervisory experience

EDLDR 577 **Law and Ethics in Education** (3) Course focuses on legal and ethical dimensions issues for educational leaders and their impact on best interests of the students.
Effective: Spring 2008

EDLDR 578 **Schools as Organizations** (3) Intraorganizational relationships; administration and the school in its organizational and environmental contexts.
Effective: Fall 2004
Prerequisite: EDLDR 480 or teaching or administrative or supervisory experience

EDLDR 579 **Financial Management for Schools** (3) Financial management concepts and techniques for educators: district and school level budgeting process, hands-on budget preparation workshop, and budget management.
Effective: Spring 2008
Prerequisite: EDLDR 480 or teaching administrative or supervisory experience

EDLDR 580 **The Use of Theory in Educational Administration** (3) Critical analysis of current theories; problem finding and hypothesis formulation.
Effective: Fall 2004
Prerequisite: EDLDR 480 6 credits in educational leadership

EDLDR 581 **Field Research in Educational Leadership** (3) Field study and qualitative methods in research on educational organizations.
Effective: Fall 2004
Prerequisite: EDLDR 480 6 credits in educational leadership

EDLDR 583 **Current Administrative Practice** (3) Practice oriented skills and experiences facilitating effective administration.
Effective: Fall 2004
Prerequisite: EDLDR 480

EDLDR 584 **Evaluation in Educational Organizations** (3) Naturalistic and empirical evaluation methods and procedures for educational organizations.
Effective: Fall 2004
Prerequisite: a course in educational administration; a course in basic statistics.

EDLDR 585 (EDTHP 585, HI ED 585) **Research Design: Implications for Decisions in Higher Education** (3) A capstone course on research design and analytical approaches to support decision-making in administration and policy-making.
Effective: Fall 2004
Prerequisite: EDPSY 400, EDPSY 406 ; orAG 400, R SOC 573

EDLDR 586 (HI ED 586, EDTHP 586) **Qualitative Methods in Educational Research** (3) Exploration of the theoretical framework undergirding qualitative research and its attendant practices and techniques.

Effective: Fall 2004

EDLDR 587 (EDTHP 587, HI ED 587) **Education Policy and Politics** (3) The political economy and bureaucratic politics of educational organizations, with special attention to the policy making, implementation, and evaluation processes.
Effective: Fall 2004

EDLDR 588 (EDTHP 588, HI ED 588) **Qualitative Methods in Educational Research II** (3) Advanced study of methods involved in executing and analyzing qualitative research in education.
Effective: Summer 2007
Prerequisite: EDLDR 586

EDLDR 589 **Mixed Methods in Educational and Social Scientific Research** (3) This course considers the epistemological and paradigmatic implications of mixed methods research within educational and other social scientific research contexts.
Effective: Fall 2009

EDLDR 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2004

EDLDR 594 **Seminar in School Law** (3) Research in substantive issues in school law.
Effective: Fall 2004
Prerequisite: EDLDR 576

EDLDR 595 **Internship** (1-15) Guided experience in a school or other educational organization in which the student is not regularly employed, under supervision of a graduate faculty member.
Effective: Fall 2004
Prerequisite: EDLDR 480 teaching experience and a professional certificate

EDLDR 595A **Principal Internship** (3) Internship field experience required for students seeking their principal certification for the PA Dept of Ed.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: EDLDR 480 teaching experience and a professional certificate

EDLDR 595A **Principal Internship** (3) Internship field experience required for PA Dept. of Education principal certificate.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: EDLDR 480 teaching experience and a professional certificate

EDLDR 595B **Superintendency Internship** (3) Internship field experience required for students seeking their letter of eligibility certification for the PA Dept of Ed.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: EDLDR 480 teaching experience and a professional certificate

EDLDR 595B **Superintendent Internship** (3) Internship field experience required for PA Dept. of Education letter of eligibility certificate.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: EDLDR 480 teaching experience and a professional certificate

EDLDR 596 **Individual Studies** (1-9) Creative projects including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2004

EDLDR 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2004

EDLDR 597A **Collaborative Mentoring & Coaching** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

EDLDR 597A **Leadership and Diversity** (3) Course examines what it means to lead educational organizations in an increasingly diverse society.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 597A **Policy Seminar in Educational Leadership** (3) Course will focus on promising policy ideas and research for comprehensive and systematic school reform.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDLDR 597B **The Law and Education Institute** (1-3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

EDLDR 597B **Pro Seminar in Educational Leadership** (3) Course designed as an orientation for doctoral studies in educational leadership. Course will include an overview of the requirements to complete doctoral studies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 597B **Pro-Seminar in Educational Leadership** (3) Orientation to doctoral studies in Educational Leadership. Course will include requirements for all doctoral students, and other related areas.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDLDR 597C **Superintendency Seminar** (3) Course explores the knowledge, skills and core values required to successfully fulfill the role of superintendent.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 597C **Curriculum Leadership** (3) Course will study curriculum, comparing and contrasting curriculum theory with current practice.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDLDR 597D **American Indian Seminar** (3) Course focuses on current and past issues for the American Indian students.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 597D **American Indian Seminar** (3) Course focuses on current and past issues for the American Indian Students.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDLDR 597E (HI ED 597E, EDTHP 597E) **Foundations of Research** (3) This course is designed to begin a reading of the history and philosophies of education research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 597E **Sociology of Rural Schools and Communities** (3) Introduction to the intellectual core of community sociology in order to better understanding the roles played by educational institutions in rural communities.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDLDR 597F **Collaborative Mentoring and Coaching** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 597G **Sociology of Rural Schools and Communities** (3) Introduction to the intellectual core of community sociology in order to better understand the roles played by educational institutions in rural communities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDLDR 600 **Thesis Research** (1-15) No description.
Effective: Fall 2004

EDLDR 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 2004

EDLDR 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 2004

EDLDR 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 2004

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Education (EDUC)

EDUC 400 **Diversity and Cultural Awareness Practices in the K-12 Classroom** (3) This course addresses diversity, cultural awareness and sensitivity about cultures, concepts and methods in society, communities and educational settings.
Effective: Summer 2008

EDUC 401 **Early Childhood Education** (3) Organization, methodology, and materials for nursery school and kindergarten programs.
Effective: Winter 1981

EDUC 402 **Language Development, Self-Expression, and Literature in Early Childhood Education** (3) Examining the development of language and self-expression in young children, and the role of children's literature in facilitating development.
Effective: Winter 1981

EDUC 403 **Curriculum for Early Childhood** (3) Examining early childhood programs and methodology, focusing on areas of social studies, mathematics, and science.
Effective: Winter 1981

EDUC 404 **Young Children's Behavior: Observation and Evaluation** (3) Observation, recording and evaluation of student behaviors, and the use of prescription techniques for early childhood students with special needs.
Effective: Winter 1981

EDUC 405 **Early Childhood Education: Infancy and Toddlerhood** (3) Models of infant development with focus on the first three years of life--cognitive and socio-emotional milestones will be analyzed.
Effective: Spring 2005

EDUC 406 **Human Sexuality** (3) Examination of physiology, diseases, attitudes, morality, and controversial topics related to sexuality. Consideration of sex eduction in the school curriculum.
Effective: Winter 1981

EDUC 408 **Administration of Early Childhood Education Programs** (3) The role of the early childhood administrator as it relates to regulations, staffing, management, funding and curriculum.
Effective: Winter 1981
Prerequisite: EDUC 401

EDUC 410 **The Child and Social Institutions** (3) The effects of the family on a child's development, especially in the infancy and preschool years.
Effective: Winter 1981

EDUC 412 **Early Literacy Intervention I** (3) Participants will better understand factors affecting early reading behavior through diagnostic techniques, observation techniques, and literacy intervention strategies.
Effective: Summer 1996
Prerequisite: permission of the program

EDUC 413 **Early Literacy Intervention II** (3) Participants will continue to learn skills, knowledge, and experience processes to implement the early literacy intervention program.
Effective: Summer 1996
Prerequisite: EDUC 412

EDUC 415 **Teaching Secondary Social Studies** (3) Study of the objectives, content, methods, and evaluation of procedures of social studies. Students design units and lesson plans.
Effective: Spring 2001
Prerequisite: EDUC 314, EDUC 315 and admission into Secondary Social Studies Certification Program

EDUC 416 **Teaching Secondary English and the Humanities** (3) Study of the objectives, content, and methods of English and humanities courses.
Effective: Spring 2001
Prerequisite: EDUC 314, EDUC 315 and admission into Secondary English Certification Program

EDUC 417 **Teaching Secondary Mathematics** (3) Study of the objectives, content, methods, and evaluation procedures of mathematics.
Effective: Spring 2001
Prerequisite: EDUC 314, EDUC 315 and admission into Secondary Mathematics Certification Program

EDUC 418 **Positive Classroom Climate for Positive Attitudes About Learning** (3) Participants will learn strategies for creating classroom climates which encourage positive attitudes toward learning while preventing and correcting student misbehavior.
Effective: Summer 1995

Prerequisite: permission of program

EDUC 421 **Children's Literature** (3) Knowledge of literature appropriate for elementary school children and utilization of literature-related activities in teaching reading.
Effective: Spring 2001
Prerequisite: admission into Elementary Education Major

EDUC 422 **Literature for Children and Adolescents** (3) Literature for children and adolescents, approaches for using such literature in the school curriculum.
Effective: Fall 2008

EDUC 424 **Folk and Fairy Tales** (3) In this course students will examine the social and psychological significance of folk tales, make cross-cultural comparisons, and study story grammars of these stories.
Effective: Summer 1991
Prerequisite: 6 credits in humanities

EDUC 425 **Literacy Assessment** (3) This course emphasizes alternative literacy measures focusing on portfolio assessment and performance assessments.
Effective: Spring 1997
Prerequisite: permission of the program

EDUC 432 **Children's Literature in Teaching Writing** (3) Introduction to introduces methods for transferring writing skills and literary devices from literature to student writing in all subject areas.
Effective: Summer 2008

EDUC 435 **Addressing the Needs of Special Learners** (1) An examination of attitudes toward, barriers experienced by, and special needs of special learners in the schools.
Effective: Spring 2001
Prerequisite: eighth-semester standing in Secondary Teacher Certification Program

EDUC 436 **Inclusion Practices in Education** (3) The educational, social, and political foundations for inclusion practices in public education.
Effective: Summer 1995
Prerequisite: permission of program

EDUC 440 **Educational Statistics and Measurements** (3) Descriptive statistics, correlation, reliability, validity, scaling techniques, and introduction to item analysis.
Effective: Winter 1981

EDUC 450 **Current Topics in Education** (1-15) No description.
Effective: Fall 1983

EDUC 452 **Teaching Writing** (3) Techniques for teaching the writing process, kindergarten through grade 12, including writing in content areas; workshop format.
Effective: Fall 1983

EDUC 458 **Behavior Management Strategies for Inclusive Classrooms** (3) Provides knowledge and skills essential for designing positive learning environments in secondary classrooms with the inclusion of exceptional learners.
Effective: Summer 2009
Prerequisite: admission to teacher education

EDUC 459 **Strategies for Effective Teaching in Inclusive Classrooms** (3) Course examines effective strategies for accommodating and adapting instruction for exceptional learners in secondary classrooms.
Effective: Spring 2009 Ending: Fall 2010
Prerequisite: EDUC 285 Concurrent: EDUC 490

EDUC 459 **Strategies for Effective Teaching in Inclusive Classrooms** (3) Course examines effective strategies for accommodating and adapting instruction for exceptional learners in secondary classrooms.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: EDUC 285

EDUC 460 **Field Study in Ecology** (4) Study and analysis of the ecology of various regions of the world. May be repeated for credit.
Effective: Summer 1995
Prerequisite: EDSCI 454

EDUC 462 **Computers for Classroom Teachers** (3) An introduction: microcomputers and their educational applications.
Effective: Spring 2001
Prerequisite: admission into Elementary Education Major

EDUC 463 **The Internet and K-12 Education** (3) Relates educational theory and practice to applications of the Internet, applying content from educational foundations, curriculum, and research.
Effective: Spring 2003
Prerequisite: EDUC 462 or approval of program.

EDUC 464 **Technology and the Learning Process** (3) Evaluates the relationship between technology-based resources and

learning theories through design, implementation, and evaluation of online instructional modules.
Effective: Spring 2003
Prerequisite: EDUC 462 orEDUC 463 or permission of program

EDUC 465 **Serving Culturally and Linguistically Diverse (CLD) Learners** (3) The course provides teachers with knowledge, understandings, and skills to engage culturally and linguistically diverse (CLD) students in mainstream classrooms.
Effective: Spring 2009

EDUC 466 **Foundations of Teaching English as a Second Language** (3) Overview of various legal, historical, and socio-cultural implications of teaching and learning English as a Second Language.
Effective: Summer 2006
Prerequisite: permission of program

EDUC 467 **English Language Structure for English as a Second Language Teachers** (3) An in-depth study and review of general linguistic concepts and their application to ESL pedagogy.
Effective: Summer 2006
Prerequisite: EDUC 466 or permission of program

EDUC 468 **Language Acquisition for English as a Second Language Teachers** (3) Study of the theory, research, and processes involved in first and second language development, acquisition, and assessment.
Effective: Summer 2006
Prerequisite: EDUC 466 andEDUC 467 or permission of program

EDUC 469 **Teaching Methods and Assessment of English as a Second Language** (3) Integration of theory, research, and practice about ESL curriculum, instructional methods, assessment, and literacy development.
Effective: Summer 2006
Prerequisite: EDUC 466, EDUC 467, EDUC 468 or permission of program

EDUC 470W **Higher-Order Thinking for Educators** (3) Presentation of strategies, techniques, and principles of higher-order thinking which are grounded in relevant research and practice will be presented.
Effective: Fall 2006
Prerequisite: admission into Elementary Education Major

EDUC 471 **Best Practices in Literacy** (3) An application of best literacy practices to classroom instruction and assessment of reading, writing, listening, and speaking.
Effective: Spring 2003
Prerequisite: EDUC 320 orEDUC 321

EDUC 472 **Teaching Reading Through the Content Areas** (3) Designed to enable teachers of content areas to improve the reading/study skills needed by their students.
Effective: Winter 1981

EDUC 474 **Advanced Whole Language** (3) To support and encourage educators teaching in whole language classrooms with emphasis on strategies and processes relevant to all.
Effective: Summer 1995
Prerequisite: EDUC 471

EDUC 475 **ESL Leadership, Research and Advocacy** (3) Teachers will develop their skills as instructional leaders and researchers by conducting school-based action research projects.
Effective: Summer 2010
Prerequisite: EDUC 469

EDUC 476 **The Effects of Environment on Child Development** (3) The effects of environmental forces such as mother's anxiety during the prenatal period and culture on childhood and adolescence.
Effective: Winter 1981

EDUC 477 **Teaching Struggling Readers and Writers** (3) A comprehensive overview of learning problems and effective strategies for teaching K-12 students who have difficulties reading and writing.
Effective: Spring 2008

EDUC 484 **School Law for Teachers** (3) This course will focus on increasing teacher awareness of law and how it impacts on daily performance and job security.
Effective: Summer 1995
Prerequisite: permission of program

EDUC 490 **Student Teaching** (1-12) Observation and teaching in selected elementary or secondary schools under direction of cooperating classroom teachers and University supervisors. Regular seminars. GPA 3.0 or higher. Passing scores on required Praxis I tests.
Effective: Fall 2003
Prerequisite: eight semester standing approval of program

EDUC 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1994

EDUC 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

EDUC 495 **Internship** (1-15) Supervised off-campus, non-group instruction including individual field experiences, practicums or internships. Written and oral critique of activity required.
Effective: Fall 1983
Prerequisite: prior approval of proposed assignment by instructor

EDUC 495A **Junior Field Experience** (1) Second semester juniors assigned to a suburban elementary school for the purpose of actively participating in classroom activities.
Effective: Summer 2003
Prerequisite: prior approval of proposed placement by instructor.

EDUC 495B **Senior Field Experience** (1) First semester seniors assigned to an urban elementary school for the purpose of actively participating in classroom activities.
Effective: Summer 2003
Prerequisite: prior approval of proposed placement by instructor.

EDUC 495C **Early Childhood Field Experience** (1) First semester seniors assigned to an urban elementary school for the purpose of actively participating in an early childhood classroom.
Effective: Summer 2003
Prerequisite: prior approval of proposed placement by instructor and completion of all four early childhood prerequisite courses.

EDUC 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 1983

EDUC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1983

EDUC 497A **Teacher in the Workplace** (3) A two-day pre-worksite experience workshop involves activities in the classroom to enable the educators to glean the most of the one-site work experience. Educators will participate in a 30-40 hour opportunity to explore a company and learn those aspects that are related to the competencies being mastered in their classrooms. A two-day post experience workshop which culminates in the development of activities for the students to gain relevancy and importance of the competencies being mastered, is slated at the end of the term.
Effective: Summer 2010 Ending: Summer 2010

EDUC 497B **The Hispanic Experience** (3) This course is designed to provide teachers of Spanish Language classes and ESL instruction with relevant background information regarding the culture of Hispanic and Latino students. Participants will receive instruction from faculty at the University of Sacred Heart to Puerto Rico which will include: Spanish Language, History and Geography of Puerto Rico, People of Puerto Rico: Individuals, Families, and Communities, Culture of Puerto Rico: Music, Dance, and Latino Students, Education of Hispanic and Latino Students, Culture of Puerto Rico: Festivals, Foods, and Religion.
Effective: Summer 2010 Ending: Summer 2010

EDUC 497C **Science Assessment for Secondary Teachers** (3) This course is a required element for teachers participating in the NIH-SEPA grant in collaboration with the College of Medicine. The dates for this course are June 14 to 18 from 8:15 to 3:00; June 21 from 8:15 to 3:00.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: permission of program

EDUC 497D **Science Curriculum for Secondary Teachers** (3) This course is a required element for teachers participating in the NIH-SEPA grant in collaboration with the College of Medicine. The dates for this course are June 21 from 8:15 to 3:00, June 22 from 8:15 to 12:30, and June 28 to July 2 from 8:15 to 3:00.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: permission of program.

EDUC 497E **ESL Leadership, Research and Advocacy** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

EDUC 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1995

EDUC 499 (IL) **Foreign Studies** (1-12) Study of educational topics in a country other than the United States.
Effective: Summer 2007
Prerequisite: permission of instructor

EDUC 500 **Professional Learning Communities** (3) Defines elements of effective learning communities and explores

educators' roles as consumers and creators of research, theory, and best practices.
Effective: Spring 2008
Prerequisite: admission to program

EDUC 501 **History of American Education** (3) An examination of the rise and transformation of American public schools from pre-colonial America to the present.
Effective: Spring 1998
Prerequisite: approval of program

EDUC 503 **Cultural and Ethnic Groups Education** (3) Approaches to teaching in an environment of differing cultures and ethnic groups.
Effective: Spring 1998
Prerequisite: approval of program

EDUC 505 **Curriculum Foundations** (3) Provides a comprehensive overview of the philosophical, historical, psychological, and social foundations that affect the school curriculum.
Effective: Spring 2010
Prerequisite: EDUC 520

EDUC 506 **Curriculum Development and Instructional Design** (3) Examination of theory, issues, problems, organization, and application of instructional design in planning and developing a curriculum.
Effective: Fall 2008
Prerequisite: EDUC 505

EDUC 508 **Teaching Gifted Students in Heterogeneous Groups** (3) This course is designed to help regular classroom teachers to meet the needs of gifted students in a heterogeneous classroom.
Effective: Summer 1997
Prerequisite: approval of program

EDUC 520 **Learning Theory for the Classroom** (3) An application of learning theories from psychological, sociological, and physiological disciplines to educational settings for children and adolescents.
Effective: Fall 2008 Ending: Fall 2010
Prerequisite: EDUC 500

EDUC 520 **Learning Theory for the Classroom** (3) An application of learning theories from psychological, sociological, and physiological disciplines to educational settings for children and adolescents.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: admission to program

EDUC 539 **Educational Assessment** (3) This course will prepare students with the knowledge and skills necessary to monitor, assess, and report student achievement.
Effective: Fall 2008
Prerequisite: EDUC 520

EDUC 560 **Classroom Management** (3) Analysis of teaching styles, classroom behavior and interaction, organization and correlation of classroom activities and subject areas. (Requires practical application in an actual teaching situation.)
Effective: Winter 1981

EDUC 561 **Psychology of Reading** (3) Examination of the theoretical bases for reading which have direct practical implication for teaching reading.
Effective: Fall 2008
Prerequisite: EDUC 471, EDUC 425, EDUC 477

EDUC 562 **Diagnostic Evaluation of Reading Problems** (3) Utilization of formal and informal instruments and techniques appropriate in analyzing reading disabilities, grade K through 12; includes practicum.
Effective: Spring 2009
Prerequisite: EDUC 561

EDUC 563 **Methods in Teaching Reading** (3) Development of advaned diagnostic and instructional techniques for teaching reading, with emphasis on individual and small group instruction.
Effective: Fall 2008
Prerequisite: EDUC 562

EDUC 564 **Reading Clinic** (6) Culminating course for the M.Ed. degree in literacy education requiring demonstration of competency in working with children possessing reading problems.
Effective: Fall 2008
Prerequisite: EDUC 565

EDUC 565 **Literacy and Leadership** (3) Principles of supervision, organization, management, and evaluation of literacy programs will be presented.
Effective: Spring 2009
Prerequisite: EDUC 466, EDUC 563

EDUC 571 **Great Teachers** (3) Study of one or more great teachers, e.g., Socrates, Comenius, Locke, Rousseau, Pestalozzi, Herbart, Froebel, Dewey, Kilpatrick.
Effective: Winter 1981

EDUC 572 **Comparative Education: World Perspectives** (3) An evaluative comparison of American education with Western and non-Western educational systems.

Effective: Winter 1981

EDUC 582 (HLHED 582) **Spirituality and Culture in Health and Education Professions** (3) This course focuses on the cultural aspects of spirituality and its place in the health and education professions.
Effective: Summer 2009

EDUC 583 **Problems in Teaching: Selected Subject Areas** (3) An analysis of a teaching problem with review of research literature to seek solutions to that problem.
Effective: Fall 1983

EDUC 584 **Analysis of Research: Selected Topics** (3) A review and analysis of research in a specified area.
Effective: Fall 1983
Prerequisite: EDUC 586

EDUC 586 **Educational Research Designs** (3) Focuses on methods of research in educational settings to help participants become informed consumers of the educational research literature.
Effective: Fall 2008
Prerequisite: EDUC 539 ; orTRDEV 418 andTRDEV 460

EDUC 587 **Master's Project** (3) The development of an original master's project (paper, essay, production, practicum) supervised and judged by an appropriate faculty committee.
Effective: Fall 1983

EDUC 589 **Problems in Urban Education** (3) Independent study of selected topics related to urban education.
Effective: Fall 1983

EDUC 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

EDUC 591 **Education Seminar** (1-6) The capstone seminar course for the M.Ed. degree requiring an appropriate scholarly term paper.
Effective: Fall 2008
Prerequisite: EDUC 506, EDUC 586 and completion of 33 credits in the Teaching and Curriculum program or approval of program

EDUC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

EDUC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

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Education Mathematics (EDMTH)

EDMTH 432 **Diagnostic and Prescriptive Mathematics: Basic Principles** (3) Examination of the basic principles of diagnostic and prescriptive mathematics for elementary and secondary teachers.
Effective: Spring 1990

EDMTH 433 **Diagnostic and Prescriptive Mathematics: Classroom Applications** (3) The application of the diagnostic and prescriptive skills of DP Math in a practical setting and administering a laboratory program.
Effective: Spring 1990
Prerequisite: EDMTH 432

EDMTH 441 **Geometry and Measurement Across the K-12 Curriculum** (3) The course presents participants with investigations of reports, research, and recent trends related to teaching geometry and measurement.
Effective: Spring 2008
Prerequisite: permission of program

EDMTH 442 **Algebra and Functions Across the K-12 Curriculum** (3) The course presents participants with investigations of reports, research, and recent trends related to teaching algebra and function concepts.
Effective: Spring 2008
Prerequisite: permission of program

EDMTH 443 **Data Analysis and Probability Across the K-12 Curriculum** (3) The course presents participants with investigations of reports, research, and recent trends to teaching data analysis and probability concepts.
Effective: Spring 2008
Prerequisite: permission of program

EDMTH 444 **Numbers and Operations Across the Curriculum** (3) The course focuses on investigating reports, research, and recent trends related to teaching number and operation concepts K-12. A student who has passed MATH 200 may not take EDMTH 444 for credit.
Effective: Summer 2009

EDMTH 455 **Current Issues in Mathematics Education** (3) An examination and analysis of contemporary trends and concerns in the teaching of mathematics.
Effective: Fall 1983
Prerequisite: EDMTH 302 orEDUC 417

EDMTH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in-depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1990

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Education Science (EDSCI)

EDSCI 454 **Modern Elementary Science Education** (3) Introduction of content, methods, and materials used in modern elementary science with emphasis upon modern elementary science programs.
Effective: Spring 2001
Prerequisite: seventh-semester standing in Elementary Education Major

EDSCI 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1985

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Educational Psychology (EDPSY)

EDPSY 400 **Introduction to Statistics in Educational Research** (3) The foundations of statistical techniques used in educational research; distributions, central tendency, variability, correlation, regression, probability, sampling, hypothesis testing.
Effective: Summer 1990

EDPSY 406 **Applied Statistical Inference for the Behavioral Sciences** (3) Common techniques (parametric) covered through two-factor analysis of variance (independent samples); hypothesis testing, confidence interval, power, robustness; MINITAB frequently used.
Effective: Spring 1991
Prerequisite: EDPSY 400 orSTAT 200

EDPSY 421 **Learning Processes in Relation to Educational Practices** (3) An introduction to the empirical study of variables and conditions that influence school learning.
Effective: Spring 2007
Prerequisite: EDPSY 014 orPSYCH 212

EDPSY 450 (PSYCH 404) **Principles of Measurement** (3) Scale transformation, norms, standardization, validation procedures, estimation of reliability.
Effective: Spring 2007
Prerequisite: EDPSY 400 orPSYCH 200 orPSYCH 100;STAT 200

EDPSY 475 **Introduction to Educational Research** (3) Scientific method; classes of variables in educational research; the measurement of classroom behavior; survey, predictive, and experimental studies.
Effective: Summer 1990
Prerequisite: EDPSY 400

EDPSY 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

EDPSY 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1990

EDPSY 497A **Meeting Instructional Needs of English Language Learners with Special Needs** (3) The course content combines theory and research on the instructional needs of English Language Learners with the knowledge base on effective instructions for students with special needs.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDPSY 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

EDPSY 506 **Advanced Techniques for Analyzing Educational Experiments** (3) Analytical and experimental control considerations for designs involving nested and/or crossed subjects. Analysis of variance and multiple comparisons via computers.
Effective: Spring 2007
Prerequisite: EDPSY 406 orPSYCH 400

EDPSY 507 **Multivariate Procedures in Educational Research** (3) Introduction to matrix algebra, computer programming, multiple regression analysis, multiple and canonical correlation, multiple discriminant analysis, classification procedures, factor analysis.
Effective: Spring 2007
Prerequisite: EDPSY 406 orPSYCH 400

EDPSY 512 **Group Processes in the Classroom** (3) Basic concepts and perspectives in the study of group processes; instructional group interaction; analysis of classroom behavior.
Effective: Spring 1998

EDPSY 513 **Individual and Group Differences** (3) Description, causes, and interpretation of individual variation over the life- span, with application to school and institutional practices.
Effective: Summer 1990
Prerequisite: EDPSY 400 orEDPSY 450

EDPSY 520 **Problems in the Education of the Mentally Gifted** (2-4) Analysis of educational needs of the mentally gifted; curriculum construction and curricular materials.
Effective: Summer 1994
Prerequisite: teaching experience

EDPSY 523 **Concept Learning and Problem Solving** (3-4) Theoretical-empirical trends in concept learning, problem solving, and creativity related to instructional psychology.
Effective: Summer 1990
Prerequisite: EDPSY 421

EDPSY 524 **Theories of Learning and Instruction** (3) Study of major classical theories of learning and recent developments in learning and instructional theory.
Effective: Summer 1990
Prerequisite: EDPSY 421

EDPSY 526 (LL ED 526) **The Psychology of Reading** (3) Psychological principles underlying the process of reading and comprehending, with application to instruction.
Effective: Spring 1993
Prerequisite: EDPSY 421

EDPSY 527 **Psychology of Adults as Learners** (3) Psychological principles related to learning by adults, with application to instruction and other educational practices.
Effective: Summer 1990
Prerequisite: EDPSY 421

EDPSY 528 **Instructional Psychology** (3) Application to instructional design of current developments in research on human development, information processing, learning strategies, memory structures, instructional processes.
Effective: Summer 1990
Prerequisite: EDPSY 421

EDPSY 530 **Achievement Motivation** (3) Within a seminar format, this course addresses both theoretical and empirical approaches to motivation and other related affective constructs.
Effective: Summer 2009
Prerequisite: EDPSY 421

EDPSY 550 **Design and Construction of Psychological Measures** (3) Lecture-practicum involving planning, construction, administration, and analysis of a psychological test; lectures stress construct validity, item analysis, and predictive validity.
Effective: Summer 1990
Prerequisite: EDPSY 450

EDPSY 554 **Theories of Psychological Measurement** (3) Basic true-score and error models; their extensions to test reliability and test validity; problems of item analysis and weighting.
Effective: Summer 1990
Prerequisite: EDPSY 450

EDPSY 555 (CI ED 555) **Validity of Assessment Results** (3) Concepts, issues, and methods of validation of educational and psychological assessment including models and approaches to validation, bias, and utility.
Effective: Spring 2008
Prerequisite: EDPSY 406, EDPSY 450

EDPSY 556 **Foundations and Applications of Item Response Theory** (3) Unidimensional models for dichotomously scored and polytomously scored items and their applications in instrument/test development.
Effective: Summer 2009
Prerequisite: EDPSY 450 andEDPSY 507

EDPSY 560 **Contemporary Issues in the Evaluation of Educational Programs** (3) Practical and theoretical issues in the planning, execution, and interpretation of program evaluations.
Effective: Spring 1993
Prerequisite: EDPSY 450, EDPSY 475

EDPSY 575 **Seminar in Educational Psychology** (1-6) A seminar dealing with specific topics in educational psychology. Open to advanced students in the behavioral sciences.
Effective: Summer 1999

EDPSY 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

EDPSY 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1990

EDPSY 597A **Data Analysis Workshop** (3) This course is designed for students with a desire to increase their conceptual understanding of basic statistics and their proficiency with analytical techniques. This course will be held in a computer lab and the primary statistical analysis package used will be SPSS.
Effective: Summer 2010 Ending: Summer 2010

EDPSY 597A **Structural Equation Modeling** (3) This course covers basic issues in Structural Equation Modeling (SEM).
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDPSY 597A **Mind, Brain, and Education** (3) Today thee exists a rich theoretical and empirical literature pertaining to

various aspects of learning including cognition, motivation, and self- regulation, as well as the measurement of these constructs. Despite these amaxing achievements, many questions remain unresolved or even unaddressable with even the most sophisticated and widely-accepted educational measurement techniques.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDPSY 597B **Applications from Research in Intelligence and Creativity** (3) The purpose of this course is to consider theory, research, methodologies and issues related to definition, identification and assessment of intelligence and creativity.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDPSY 597B **Research Methods in Teacher Education** (3) This doctoral-level course explores research methods with attention to those most applicable to the study of teacher education.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDPSY 597C (HD FS 597G, PSY 597B) **Ties Fellowship Seminar: School Interventions** (2) TIES seminar on issues in literacy and conducting literacy research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDPSY 597D (PSY 597C, HD FS 597D) **Conducting Cluster Randomized Trials in Schools: Social Intervention** (2) This seminar will focus on conducting CRT's in schools. The emphasis will be on the development and evaluation of interventions aimed at enhancing the social context of learning.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDPSY 600 **Thesis Research** (1-15) No description.
Effective: Summer 1990

EDPSY 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1990

EDPSY 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching of Educational Psychology classes under senior faculty supervision.
Effective: Summer 1990

EDPSY 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1990

EDPSY 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1990

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Educational Technolo (EDTEC)

EDTEC 400 **Introduction to Instructional Technology for Educators** (1-3) Use of microcomputers, video, and other media in education; models use technologies including video, audio, print, computer, and telephone.
Effective: Fall 2005
Prerequisite: EDPSY 014

EDTEC 440 **Educational Technology Integration** (3) Technology integration in educational settings.
Effective: Fall 2008
Prerequisite: EDPSY 014 and 6th semester standing

EDTEC 448 **Using the Internet in the Classroom** (3) This course introduces students to methods and models of using the Internet effectively in their classroom.
Effective: Fall 2005
Prerequisite: EDTEC 400 or demonstrated Internet awareness

EDTEC 449 **Video and Hypermedia in the Classroom** (3) Skills and knowledge needed to direct the use of learning technologies in educational settings.
Effective: Fall 2005
Prerequisite: INSYS 415

EDTEC 461 **Designing Computer Networks for Education** (3) Applying fundamental concepts of computer networking to design effective networks for educational purposes.
Effective: Fall 2005
Prerequisite: EDTEC 448

EDTEC 462 **Coordinating Technology Use in Education** (3) Skills and knowledge needed to direct the use of learning technologies in educational settings.
Effective: Fall 2005
Prerequisite: EDTEC 448

EDTEC 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2010

EDTEC 498A **Emerging Web 2.0 Technologies and Learning** (3) This course examines emerging Web 2.0 technologies and explores their application to learning and education.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTEC 561 **Measuring the Impact of Technology on Learning** (3) Prepares teachers to evaluate the effects of technology use.
Effective: Summer 2005
Prerequisite: EDPSY 421 or equivalent andAEE 521 or equivalent

EDTEC 562 **Effective Technology Use in My Classroom** (3) Develop, implement, and evaluate technology innovations in schools.
Effective: Summer 2005
Prerequisite: EDTEC 561

EDTEC 566 **Computers as Learning Tools** (3) Amplifying thinking or organizing mental functions with computers.
Effective: Fall 2006
Prerequisite: EDPSY 421, EDTEC 561

EDTEC 567 **Technology and Higher-Order Learning** (3) Research technology on higher-order skills.
Effective: Summer 2005
Prerequisite: EDTEC 561

EDTEC 594 **Research Topics** (1-9) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2010
Prerequisite: EDTEC 566 orEDTEC 567

EDTEC 594A **Data Collection for EDTEC 566 Research Studies** (1) Implement EDTEC 566 research study, collect data, and begin data analysis. IRB approval of research proposal is required.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: EDTEC 566 orEDTEC 567

EDTEC 594B **Data Analysis for EDTEC 566 Research Studies** (1) Complete data analysis of EDTEC 566 research study and begin writing research reports.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: EDTEC 566 orEDTEC 567

EDTEC 594C **Research Reports for EDTEC 566 Research Studies** (1) Complete research report for EDTEC 566 research study.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

Prerequisite: EDTEC 566 orEDTEC 567

EDTEC 594D **Data Collection for EDTEC 567 Research Studies** (1) Implement EDTEC 567 research study, collect data, and begin data analysis. IRB approval of research proposal is required.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: EDTEC 566 orEDTEC 567

EDTEC 594E **Data Analysis for EDTEC 567 Research Studies** (1) Complete data analysis for EDTEC 567 research study and begin writing research reports.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: EDTEC 566 orEDTEC 567

EDTEC 594F **Research reports for EDTEC 567 Research Studies** (1) Complete research report for EDTEC 567 research study.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: EDTEC 566 orEDTEC 567

EDTEC 595 **Internship** (1-9) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships.
Effective: Summer 2010

EDTEC 596 **Independent Studies** (1-9) Creative projects, including nonthesis reseach, supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010

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Educational Theory and Policy (EDTHP)

EDTHP 401 (IL) (CI ED 401) **Introduction to Comparative Education** (3) Origins, nature, scope, basic literature, and methodology of comparative education. Study of sample topics.
Effective: Fall 2007
Prerequisite: 5th semester standing or higher

EDTHP 411 (US) **Ethnic Minorities and Schools in the United States** (3) Analysis of the social and cultural factors which affect educational outcomes among minority pupils, especially Blacks, Hispanics, and Indians.
Effective: Spring 2006

EDTHP 412 (WMNST 412) **Education and the Status of Women** (3) An examination of the relationship of education to the status of women in American society.
Effective: Spring 2005

EDTHP 416 (US) (SOC 416) **Sociology of Education** (3) The theoretical, conceptual, and descriptive contributions of sociology to education.
Effective: Spring 2006

EDTHP 420 **Education and Public Policy** (3) Focus on the development and analysis of education policy, and policy's influence on schools.
Effective: Spring 2006
Prerequisite: EDTHP 115 or six credits in social/behavioral sciences.

EDTHP 425 **Anthropology of Education** (3) This course will review the origins and development of anthropology of education and its role in educational research and reform.
Effective: Summer 2007
Prerequisite: EDTHP 115 or 6 credits in the social or behavioral sciences

EDTHP 427 **Intelligence and Educational Policy** (3) This course explores the concept of intelligence and its assessment from historical, psychological, educational and policy perspectives.
Effective: Spring 2006
Prerequisite: EDTHP 115 or 6 credits in social/behavioral sciences

EDTHP 430 **History of Education in the United States** (3) American educational ideas and practice critically examined in terms of their historical development and contemporary significance.
Effective: Summer 1995

EDTHP 434H **Honors Teaching Experience in Leadership Jumpstart** (1) Guided instruction and practical experience for teaching assistants to the Honors Leadership Jumpstart course (EDTHP 234H).
Effective: Fall 2006
Prerequisite: EDTHP 234H and permission of program

EDTHP 440 (CI ED 440) **Introduction to Philosophy of Education** (3) Introduction to the examination of educational theory and practice from philosophical perspectives, classical and contemporary.
Effective: Fall 2007
Prerequisite: EDTHP 115

EDTHP 441 **Education, Schooling, and Values** (3) Studies in education and schooling as problems in value; axiological problems and positions; examination of practical applications, including moral education.
Effective: Summer 1995

EDTHP 496 **Individual Studies** (1-18) Creative projects supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1995

EDTHP 497 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1995

EDTHP 497A (CI ED 497A) **Immigration, Ethnicity and the Schools** (3) This class is an introduction to theories and empirical research on various immigrant and race/ethnic groups and their schooling.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 497A (EDLDR 497A) **Law and Policy for Teachers** (3) Students study and discuss legal and policy issues facing teachers and schools today.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDTHP 497B (EDLDR 497A) **Law and Policy for Teachers** (3) Students study and discuss legal issues facing teachers and schools today.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 497H **Child Labor and Education in the Global Economy** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 498 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1995

EDTHP 500 **Proseminar in Educational Theory and Policy** (3) An introduction to disciplinary and interdisciplinary studies in educational theory and policy.
Effective: Spring 2002

EDTHP 501 **Education in Developing Countries** (3) The meaning of development and the role of education in the development process: theories, agents, trends, and case studies.
Effective: Summer 1995

EDTHP 505 **Nationality Policy and Education** (3) Education and national integration; problems of cultural dominance in multinational states.
Effective: Summer 1995

EDTHP 507 (CI ED 503, HI ED 503) **Ethnicity, National Identity, and Education** (3) Surveys group-oriented education policies internationally, especially comparing those of Britain, Taiwan, India.
Effective: Summer 1995

EDTHP 511 **Education and Political Socialization** (3) An examination of the studies which examine the function of schools in socializing the young for adult political roles.
Effective: Summer 1995

EDTHP 512 **Education and the Social Structure** (3) An examination of the relationships between educational opportunities and social structure.
Effective: Summer 1995

EDTHP 514 **Social Change, Cultural Dynamics, and Education** (3) The role of the school in promoting either social change or stability.
Effective: Summer 1995

EDTHP 516 (CI ED 516) **Education and Demographic Change in the United State and Abroad** (3) Interrelationship between schooling and employment, marriage, fertility, and migration. Focus comparatively on the United States and developing countries.
Effective: Spring 1998

EDTHP 518 **Analysis of U. S. Educational Policy** (3) The interaction between educational theory and social structure, focusing on the role of practicing intellectuals in contemporary institutional settings.
Effective: Summer 1995

EDTHP 520 **Perspectives on Contemporary School Reform** (3) Examination of contemporary U.S. school reform, with a focus on contrasting theoretical perspectives and the application of policy analysis principles.
Effective: Spring 2006

EDTHP 525 **Alternative Assessment of National Educational and Health Policies** (3) Overview of alternative research strategies in education, nursing and health education studies used to study impact of national policies.
Effective: Spring 2006

EDTHP 527 **Testing and Educational Equity** (3) This course considers testing, the reasons that policymakers have widely adopted testing, and implications of testing for educational equity.
Effective: Spring 2006

EDTHP 530 **The Development of the American School** (3) American schooling critically examined institutionally from an historical perspective in social-cultural context. Emphasis on theories of interpretation and change.
Effective: Summer 1995

EDTHP 533 **Social History and Education Policy** (3) Historical study of social dimensions in the formation of education policy.
Effective: Summer 1995

EDTHP 536 **Studies in Educational Thought** (3) Studies in the historical development of educational theory.
Effective: Summer 1995

EDTHP 537 **History of American Indian Education Policy** (3) Focusing on the relationship between American Indians and the United States, this course examines historical and contemporary federal education policy.
Effective: Summer 1995

EDTHP 538 (SOC 538) **Sociology of Education** (3) Provides students with an overview of dominant sociological theoretical perspectives on schools, schooling, and education in modern society.
Effective: Spring 2008

EDTHP 540 **Dewey and the Pragmatic-Instrumentalist Educational Tradition** (3) Critical examination of John Dewey's educational thought in the context of pragmatic philosophy and progressivism in American education.
Effective: Summer 1995

EDTHP 541 (CI ED 541) **Contemporary Philosophies of Education** (3) Educational theory and practice in relation to contemporary movements in philosophy.
Effective: Spring 2008

EDTHP 553 (SOC 553, CI ED 553, HI ED 553) **Educational Mobility in Comparative Perspective** (3) Role of education in social mobility, using quantitative, qualitative, and historical methods; focuses comparatively on Britain, East Asia, and South America.
Effective: Spring 2003

EDTHP 557 (HI ED 557, SOC 557) **Sociology of Higher Education** (3) Reviews theory and current sociology research on student access, achievement, and governance in postsecondary education, with applications to policy analysis.
Effective: Fall 2000
Prerequisite: graduate students only except with permission of instructor; EDTHP/SOC 416 is recommended

EDTHP 580 **Improving Educational Writing** (3) Focus on components of high quality academic writing for educational research, with a special emphasis on improving the writing process.
Effective: Summer 2009

EDTHP 585 (HI ED 585, EDLDR 585) **Research Design: Implications for Decisions in Higher Education** (3) A capstone course on research design and analytical approaches to support decision-making in administration and policy-making.
Effective: Fall 2004
Prerequisite: EDPSY 400, EDPSY 406 ; orAG 400, R SOC 573

EDTHP 586 (EDLDR 586, HI ED 586) **Qualitative Methods in Educational Research** (3) Exploration of the theoretical framework undergirding qualitative research and its attendant practices and techniques.
Effective: Fall 2004

EDTHP 587 (EDLDR 587, HI ED 587) **Education Policy and Politics** (3) The political economy and bureaucratic politics of educational organizations, with special attention to the policy-making, implementation, and evaluation process.
Effective: Fall 2004

EDTHP 588 (EDLDR 588, HI ED 588) **Qualitative Methods in Educational Research II** (3) Advanced study of methods involved in executing and analyzing qualitative research in education.
Effective: Summer 2007
Prerequisite: EDTHP 586

EDTHP 596 **Individual Studies** (1-9) Creative projects including non-thesis research, supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1995

EDTHP 596A **Supervised Teaching Experience** (1) Course for teaching assistants in EDTHP 115.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 596A **Supervised Teaching Experience** (1) Course for teaching assistants in EDTHP 115.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDTHP 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1995

EDTHP 597A **Anthropology of Education** (3) Reviews the origins and development of anthropology of education and its current role in educational research and reform.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 597A **Civic Engagement and Democratic Practices in Schools** (3) Course examines ways in which schools engage in democratic practices. Topics will include student voice, service learning, civic education, and democratic decision making.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDTHP 597B (CI ED 597C) **Education of Immigrant's Children** (3) This course is designed to give students a broad familiarity with sociological perspectives and research on immigration and schooling for children.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 597B (SOC 597B, CI ED 597B) **Children and Childhood in Sociological Perspective** (3) The course objective is to investigate social, cultural, political and economic forces that shape childhood around the world, viewed through an educational lens.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDTHP 597C **Program Evaluation and Policy Analysis** (3) An introduction to commonly used quantitative methods and techniques of program evaluation and policy analysis in education.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 597C **Program Evaluation and Policy Analysis** (3) An introduction to commonly used quantitative methods and techniques of program evaluation and policy analysis in education.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDTHP 597D (CI ED 597D) **Education Effects on World Health** (3) Research literature and theory on education's massive effect on world health outcomes are explored in a seminar format.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 597E (HI ED 597E, EDLDR 597E) **Foundations of Research** (3) This course is designed to begin a reading of the history and philosophies of education research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 597F **Data Analysis for Education Research** (3) This course bridges applied statistics and practical work with real data. It emphasized hands-on data preparation and analysis using STATA.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDTHP 600 **Thesis Research** (1-15) No description.
Effective: Summer 1995

EDTHP 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1995

EDTHP 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Summer 2002

EDTHP 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1995

EDTHP 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1995

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Elct Engr Technology (EET)

EET 401 **Design of Automatic Control Systems** (4) Design of feedback control systems and selected components. Nyquist Criterion, Nichols Charts; compensation.
Effective: Fall 2007
Prerequisite: EET 433

EET 402 **High-Frequency Circuit Design** (4) Electromagnetic theory as applied to the design of antennas, waveguides, and high-frequency components.
Effective: Fall 2007
Prerequisite: senior standing in Electrical Engineering Technology

EET 408 **Communication System Design** (4) Communication system principles including modulation techniques, encoding and decoding, noise, and elementary probability.
Effective: Fall 2007
Prerequisite: senior standing in Electrical Engineering Technology

EET 409 **Power System Analysis I** (4) Analysis and applications study of power utility electrical equipment such as: synchronous machines, transformers, capacitors and transmission lines.
Effective: Fall 2007
Prerequisite: senior standing in Electrical Engineering Technology

EET 410 **Power System Analysis II** (4) Principles of load studies, fault analysis, stability and protection of the public electrical power system.
Effective: Fall 2007
Prerequisite: senior standing in Electrical Engineering Technology

EET 413 **Optoelectronics** (4) Principles and applications of optoelectronics including sources, detectors, imagers, transmitters, fiber optics, systems and integrated optics.
Effective: Fall 2007
Prerequisite: senior standing in Electrical Engineering Technology

EET 414 **Biomedical Instrumentation** (4) Introduction to transducers and circuits used to detect and process medical physiological data with focus on cardiovascular and respiratory systems.
Effective: Fall 2007
Prerequisite: EET 312, EET 331

EET 416 **Fluid and Thermal Design in Electrical Systems** (3) Introduction to basic electrical engineering technology concepts and applications of thermodynamics, heat transfer, and fluid power in electrical/ electronic systems.
Effective: Fall 2007
Prerequisite: EET 315;MATH 211 orMATH 231, MATH 250

EET 419 **Project Proposal Preparation** (1) Performing the initial research needed for the senior project course, and the preparation of the written project proposal.
Effective: Fall 2007
Prerequisite: senior standing

EET 420W **Electrical Design Project** (3) Design, construction, and testing of a project either selected by the students with approval or assigned by the instructor.
Effective: Spring 2008
Prerequisite: EET 312, EET 331, EET 419, ENGL 202C

EET 423 **Industrial Electronics** (4) Power electronics design, phase shift and trigger circuits for PNPN devices, sensors, motor controls, interfacing digital devices to power electronics.
Effective: Fall 2007
Prerequisite: EET 311, EET 331

EET 430 **Filter Theory** (3) Analysis and synthesis of active and passive filters, including both analog and digital filters.
Effective: Fall 2007
Prerequisite: EET 315;MATH 211 orMATH 231, MATH 250

EET 431 **Advanced Electronic Design** (4) Applications of analog and digital integrated circuits; introduction to analog and digital communication techniques.
Effective: Fall 2007
Prerequisite: EET 331

EET 433 **Control System Analysis and Design** (4) Classical and modern control analysis and design approaches, such as Laplace and state-space, aided by analog and digital computers.
Effective: Fall 2007
Prerequisite: EET 312

EET 437 **Advanced Communications, Telecommunications** (3) Telecommunication systems, telephone, television, data networks, computer networks, integrated voice and data.
Effective: Fall 2007
Prerequisite: EET 330, CMPET 355

EET 440 **Applied Feedback Controls** (3) Analysis and design of analog and digital feedback control systems.

Effective: Fall 2007
Prerequisite: EET 315

EET 450 **Manufacturing Related Topics in Electrical Systems** (3) Manufacturing methods, including reliability and quality control considera- tions as applied to electrical and electronic systems.
Effective: Fall 2007
Prerequisite: MATH 211 ; orMATH 231, MATH 250

EET 456 **Automation and Robotics** (4) Introduction to robotic systems and automation. Emphasis includes robot motion, control, and components, as well as programming PLCs.
Effective: Spring 2008
Prerequisite: EET 331, CMPET 403 ; Prerequisite or concurrent:MATH 220;EET 433

EET 458 **Digital Signal Processing** (3) Continuous and discrete time signals, Fourier series and transform, z-transform, sampling, FIR and IIR filters, FFT, DFT, and applications.
Effective: Fall 2007
Prerequisite: EET 315, CMPET 355

EET 459 **Automation and Robotic Systems** (3) Programmable logic controllers, robot dynamics, programming, control, sensing, vision, and intelligence.
Effective: Fall 2007
Prerequisite: EET 315, CMPET 355, EET 330 . Prerequisite or concurrent:EET 416, EET 440

EET 460 **Power Systems** (3) Building power distribution and systems, equipment power systems, power components, power devices, motor control, power system design.
Effective: Fall 2007
Prerequisite: EET 213W, EET 315;MATH 211 orMATH 231, MATH 250

EET 461 **Power Electronics** (3) Fundamentals of power electronic circuits, semiconductor power devices, power conversion equipment. Circuit topologies, closed-loop control strategies, equipment design consideration.
Effective: Fall 2007
Prerequisite: EET 213W, EET 216, EET 315

EET 475 **Intermediate Programmable Logic Controllers** (3) Application of programmable logic controllers (PLCs) to data acquisition, automation and process control.
Effective: Fall 2007
Prerequisite: EET 220 orEET 275 andEET 315

EET 478 **Digital Communication Systems** (4) Discrete signal analysis, A/D conversion, digital modulation techniques, encoding, decoding, data communication, noise.
Effective: Fall 2007
Prerequisite: CMPET 403

EET 480 **Electrical and Computer Systems Senior Seminar** (1) Concepts of career development; project management; engineering design documentation; industrial design examples.
Effective: Fall 2007
Prerequisite: EET 341, EET 330 orCMPET 333, CMPET 355, ENGL 202C . Prerequisite or concurrent:ECON 002 orECON 004

EET 490W **Electrical/Computer Senior Design Project** (3) Individual or group design projects in electrical and computer engineering technology.
Effective: Fall 2007
Prerequisite: EET 480 . Prerequisite or concurrent:EET 450

EET 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experience, practica or internships. Written and oral critique of activity required.
Effective: Fall 2007
Prerequisite: prior approval of proposed assignment by instructor

EET 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2007

EET 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2007

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Electrical Engineering (E E)

E E 400 **Engineering Design Concepts** (3) Engineering design and modelling, engineering economy, project planning, capstone project selection, and technical communication skills.
Effective: Spring 2008
Prerequisite: E E 313W;E E 316;E E 352;E E 380 ; seventh-semester standing

E E 401 **Electrical Design Projects** (3) Group design projects in the areas of electronics and electrical/computer systems.
Effective: Spring 2008
Prerequisite: E E 400 ; eighth-semester standing

E E 402W **Senior Project Design in Electromagnetics** (3) Project designs of antenna and microwave systems, with an emphasis on technical communications skills. Lab.
Effective: Spring 2001
Prerequisite: E E 330 . Prerequisite or concurrent:ENGL 202C

E E 403M **Senior Project Design** (3) Project designs of electrical engineering systems, encompassing various subdisciplines within Electrical Engineering, with an emphasis on technical communications skills.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: E E 330;E E 350;E E 316 ; and the completion of two Electrical Engineering technical electives Concurrent: ENGL 202C

E E 403M **Senior Project Design** (3) Project designs of electrical engineering systems, encompassing various subdisciplines within Electrical Engineering, with an emphasis on technical communications skills.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: E E 330;E E 350;E E 316 ; and the completion of two Electrical Engineering technical electives Concurrent: ENGL 202C

E E 403W **Senior Project Design** (3) Project designs of electrical engineering systems, encompassing various subdisciplines within Electrical Engineering, with an emphasis on technical communications skills.
Effective: Spring 2008
Prerequisite: E E 330;E E 350;E E 316 ; and the completion of two Electrical Engineering technical electives Concurrent: ENGL 202C

E E 405 **Capstone Proposal Preparation** (1) Performing the initial research needed for the capstone course, and the preparation of the written project proposal.
Effective: Spring 2008
Prerequisite: senior level standing

E E 406W **Electrical Engineering Capstone Design** (3) Project designs of analog and digital systems, interfacing, and relevant electronic circuits, with an emphasis on technical communications skills.
Effective: Spring 2008
Prerequisite: E E 311;E E 405;ENGL 202C

E E 410 **Linear Electronic Design** (3) Linear circuit design via integrated circuit processes; A/D converters, switched capacitor filters, phase lock loops, multipliers, and voltage- controlled oscillators.
Effective: Spring 2008
Prerequisite: E E 311

E E 413 **Power Electronics** (3) Switch-mode electrical power converters. Electrical characteristics and thermal limits of semiconductor switches.
Effective: Spring 2008
Prerequisite: E E 310;E E 350 orE E 312 orE E 314 orE E 315

E E 416 (CMPEN 416) **Digital Integrated Circuits** (3) Analyses and design of digital integrated circuit building blocks, including logic gates, flip-flops, memory elements, analog switches, multiplexers, and converters.
Effective: Spring 2008
Prerequisite: E E 310

E E 417 (CMPEN 417) **Digital Design Using Field Programmable Devices** (3) Field programmable device architectures and technologies; rapid prototyping using top down design techniques; quick response systems.
Effective: Spring 2008
Prerequisite: CMPEN 331

E E 420 **Electro-optics: Principles and Devices** (3) Spatially linear system and transform; diffraction theory, partial coherence theory, optical image detection, storage and display, holography.
Effective: Spring 1997
Prerequisite: E E 320

E E 421 **Optical Fiber Communications** (3) Operational principles of optical components, including sources, fibers and detectors, and the whole systems in optical fiber communications.
Effective: Spring 2008
Prerequisite: E E 320, E E 350, E SC 314

E E 422 **Optical Engineering Laboratory** (3) Hands-on experience covering areas of optical transforms, electro-optics devices, signal processing, fiber optics transmission, and holography.
Effective: Fall 1993

Prerequisite: E E 320

E E 424 **Principles and Applications of Lasers** (3) Principles of lasers--generation, propagation, detection and modulation; applications in fiber optics communication, remote sensing, holography, optical switching and processing.
Effective: Spring 2008
Prerequisite: E E 330, E SC 400H orPHYS 400

E E 430 **Principles of Electromagnetic Fields** (3) Laws of electrodynamics, boundary value problems, relativistic effects, waves in dielectrics and ferrites, diffraction and equivalence theorems.
Effective: Spring 2008
Prerequisite: E E 330

E E 432 **UHF and Microwave Engineering** (3) Transmission line and wave guide characteristics and components; design of UHF-microwave amplifiers, oscillators, and filters; measurement techniques; design projects.
Effective: Spring 1998
Prerequisite: E E 310, E E 330

E E 438 **Antenna Engineering** (3) Radiation from small antennas, linear antenna characteristics, arrays of antennas, impedance concepts and measurements, multifrequency antennas, and aperture antennas.
Effective: Spring 2001
Prerequisite: E E 330

E E 439 **Radiowave Propagation in Communications** (3) Radiowave propagation in mobile, terrestrial, and satellite communications; applications at microwave and lower frequencies.
Effective: Spring 2008
Prerequisite: E E 330

E E 441 **Semiconductor Integrated Circuit Technology** (3) An overview of fundamentals of processes involved in silicon integrated circuit fabrication through class lectures and hands-on laboratory.
Effective: Spring 2008
Prerequisite: E E 310, E SC 314

E E 442 **Solid State Devices** (3) The physics of semiconductors as related to the characteristics and design of solid state electronic devices.
Effective: Spring 2008
Prerequisite: E E 310, E SC 314

E E 450 **Signal and Image Processing** (3) Linear system analysis in one-dimension and two-dimensions, emphasis on filtering; multi-dimensional signal analysis; image enhancement and reconstruction; computer simulation applications.
Effective: Spring 2008
Prerequisite: E E 352

E E 453 **Fundamentals of Digital Signal Processing** (3) Design of FIR and IIR filters; DFT and its computation via FFT; applications of DFT; filter implementation; finite arithmetic effects.
Effective: Spring 2008
Prerequisite: E E 351 orE E 352 orE E 353

E E 454 (CMPEN 454) **Fundamentals of Computer Vision** (3) Introduction to topics such as image formation, segmentation, feature extraction, shape recovery, object recognition, and dynamic scene analysis.
Effective: Spring 2008
Prerequisite: MATH 230 orMATH 231;CMPSC 201 orCMPSC 121

E E 455 (CMPEN 455) **An Introduction to Digital Image Processing** (3) Overview of digital image processing techniques and their applications; image sampling, enhancement, restoration, and analysis; computer projects.
Effective: Spring 2008
Prerequisite: E E 350 orE E 353;CMPSC 201 orCMPSC 121

E E 456 (E SC 456, EGEE 456) **Introduction to Neural Networks** (3) Artificial Neural Networks as a solving tool for difficult problems for which conventional methods are not applicable.
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 202;MATH 220

E E 458 **Digital Image Processing and Computer Vision** (3) Principles of DSP and computer vision, including sensing preprocessing, segmentation, description, recognition, and interpretation.
Effective: Spring 2008
Prerequisite: E E 352

E E 460 **Communication Systems II** (3) Probability fundamentals, digital/analog modulation/demodulation, system noise analysis, SNR and BER calculations, optimal receiver design concepts, introductory information theory.
Effective: Spring 2008
Prerequisite: E E 360

E E 461 **Communications I** (4) Element of analog and digital communication systems, AM, FM, and digital modulation techniques, receivers, transmitters, and transmission systems, noise.
Effective: Spring 2008
Prerequisite: E E 352

E E 471 (AERSP 490, NUC E 490) **Introduction to Plasmas** (3) Plasma oscillations; collisional phenomena; transport properties; orbit theory; typical electric discharge phenomena.
Effective: Spring 2008
Prerequisite: E E 330

E E 472 (AERSP 492) **Space Astronomy and Introduction to Space Science** (3) The physical nature of the objects in the solar system; the earth's atmosphere, ionosphere, radiation belts, magnetosphere, and orbital mechanics.
Effective: Spring 2008
Prerequisite: E E 330 orPHYS 400

E E 474 **Satellite Communications Systems** (3) Overview of satellite communications systems, principles, space platforms, orbital mechanics, up/down links and link budgets, modulation techniques.
Effective: Spring 2008
Prerequisite: E E 330 andE E 360

E E 477 (METEO 477) **Fundamentals of Remote Sensing Systems** (3) The review of fundamental physical properties leads into discussions of various techniques, including imaging, spectroscopy, radiometry, and active sensing.
Effective: Spring 2008
Prerequisite: E E 330 orMETEO 436

E E 480 **Linear Systems: Time Domain and Transform Analysis** (3) Signals and systems representations, classifications, and analysis using; Difference and Differential equations, Laplace transform, z-transform, Fourier series, FT, FFT, DFT.
Effective: Spring 2008
Prerequisite: graduate standing

E E 481 **Control Systems** (4) Classical/modern approaches to system analysis/design; time/frequency domain modeling, stability, response, optimization, and compensation.
Effective: Spring 2008
Prerequisite: E MCH 211;PHYS 211;E E 352

E E 482 **Introduction to Digital Control Systems** (3) Sampling and hold operations; A/D and D/A conversions; modeling of digital systems; response evaluation; stability; basis of digital control; examples.
Effective: Spring 2008
Prerequisite: E E 380;E E 351 orE E 352

E E 483 **Introduction to Automation and Robotics Systems** (3) Introduction to robotics systems with emphasis on robotic motion and control, and robotic components such as actuators and sensors.
Effective: Summer 2008
Prerequisite: E E 481

E E 484 **Control System Design** (3) Analysis and design of automatic control systems using time, frequency domain and state variable methods.
Effective: Spring 2008
Prerequisite: E E 481

E E 485 **Energy Systems and Conversion** (3) Overview of energy alternatives available, and study of theory of operation and models of major energy conversion devices.
Effective: Spring 2008
Prerequisite: E E 314 orE E 315;MATH 250

E E 487 **Electric Machinery and Drives** (3) Analysis of variable-speed drives comprised of AC electric machines, power converters, and control systems.
Effective: Summer 2007
Prerequisite: E E 387

E E 488 **Power Systems Analysis I** (3) Fundamentals, power transformers, transmission lines, power flow, fault calculations, power system controls.
Effective: Spring 2008
Prerequisite: E E 387 orE E 485

E E 489 **Power Systems Analysis II** (3) Symmetrical components, unbalanced networks, unsymmetrical faults, unbalanced operation of rotating machines, transient transmission line modeling, system protection.
Effective: Spring 2008
Prerequisite: E E 488

E E 494 **Senior Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Fall 1993

E E 494H **Senior Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Spring 2008

E E 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2008
Prerequisite: prior approval of proposed assignment by instructor

E E 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1993

E E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

Effective: Fall 1993

E E 497A **Biomedical Signal Analysis** (3) Deals with the development of techniques to analyze biomedical signals, such as EKG, EEG, EMG, etc.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: E E 352

E E 497B **Electronic Design with ICs** (3) Design and application of electronic circuits and systems using operational amplifiers and analog integrated circuits.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: E E 310 or equivalent

E E 497B **Probability and Stochastic Processes for Electrical Engineers** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: E E 350, MATH 230

E E 497E **Space Systems Engineering Seminar** (1) This 1-credit seminar is for students completing the Space Systems Engineering certificate.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E E 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

E E 500 **Colloquium** (1) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 2008

E E 510 **Linear Integrated Circuits** (3) Design of monolithic, thin-film, and hybrid linear integrated circuits; D.C., video, tuned, r.f., and microwave applications. Emphasis on reliability.
Effective: Spring 2008
Prerequisite: E E 410;E E 441

E E 520 **Electro Optics--Systems and Computing** (3) Synthetic aperture radar, spatial light modulators, optical interconnection, optical computing, neural networks, and medical optics imaging.
Effective: Summer 1997
Prerequisite: E E 420

E E 521 **Fiber Optics and Integrated Optics** (3) Theories and applications of linear and nonlinear optical phenomena in optical fibers and integrated optical devices.
Effective: Spring 2008
Prerequisite: E E 421

E E 522 **Electro-Optics Laboratory** (3) Basic concepts and fundamentals of light diffraction, optical signal processing, and holography.
Effective: Fall 1993
Prerequisite: E E 420

E E 524 **Lasers and Optical Electronics** (3) Study of several advanced nonlinear optical phenomena, laser propagation, optical and optoelectronic devices, principles, and applications.
Effective: Spring 2008
Prerequisite: E E 424

E E 526 (MATSE 526) **Nonlinear Optical Materials** (3) Mechanisms of polarization nonlinearity, nonlinear optical processes and analyses, optoelectronic materials and their device application.
Effective: Spring 2006
Prerequisite: E E 420 orMATSE 435

E E 531 **Engineering Electromagnetics** (3) Electromagnetic field theory fundamentals with application to transmission lines, waveguides, cavities, antennas, radar, and radio propagation.
Effective: Spring 2008
Prerequisite: E E 430

E E 534 **Conformal Antennas** (3) Introduction to advanced analysis and design techniques as well as applications for conformal antennas mounted on planar and curved surfaces.
Effective: Spring 2008
Prerequisite: E E 538

E E 535 **Boundary Value Methods of Electromagnetics** (3) Theory and application of boundary value problems in engineering electromagnetics; topics include microwave and optical waveguides, radiation, and scattering.
Effective: Spring 2008
Prerequisite: E E 430 orE E 432 orE E 438 orE E 439

E E 537 **Numerical and Asymptotic Methods of Electromagnetics** (3) Finite difference time domain, geometric theory of diffraction and method of moments applied to antennas and scattering.
Effective: Summer 1995

E E 538 **Antenna Engineering** (3) In-depth studies of synthesis methods, aperture sources, broadband antennas, and signal-processing arrays.
Effective: Fall 1993
Prerequisite: E E 438

E E 541 **Manufacturing Methods in Microelectronics** (3) Methods, tools, and materials used to process advanced silicon integrated circuits.
Effective: Spring 2008
Prerequisite: E E 441

E E 542 **Semiconductor Devices** (3) Characteristics and limitations of bipolar transistors, diodes, transit time, and bulk-effect devices.
Effective: Spring 2008
Prerequisite: E E 442

E E 543 **Ferroelectric Devices** (3) Theoretical background of ferroelectric devices, practical materials, device designs, drive/control techniques, and typical applications.
Effective: Summer 2009

E E 544 **Micromechatronics** (3) Theoretical background of solid state actuators, practical materials, device designs, drive/control techniques and typical applications.
Effective: Summer 2009

E E 545 **Semiconductor Device Reliability** (3) Introduction to principles and methods of reliability engineering, application to modern semiconductor component design, and device reliability.
Effective: Spring 2008
Prerequisite: E E 441 orE E 442;STAT 418

E E 546 **Field-Effect Devices** (3) The physical background, characteristics, and limitations of surface field- effect and junction field-effect devices and related structures.
Effective: Spring 2008
Prerequisite: E E 442

E E 547 **Dielectric Devices** (3) Applications of insulator physics and devices based on insulator properties.
Effective: Spring 2008
Prerequisite: E E 442

E E 549 **Acoustic Wave Devices** (3) Examines materials commonly used for acoustic wave devices, fundamentals of acoustic waves and resonance modes, and characteristics of these devices.
Effective: Fall 2008
Prerequisite: E E 310 andE E 442

E E 551 **Wavelets, Filter Banks, and Multi-resolution Analysis** (3) Gram-Schmidt orthogonalization and orthonormal bases, filter banks, orthogonal wavelets and multiresolution analysis, fast wavelet tranforms, various applications.
Effective: Spring 2008
Prerequisite: E E 453, MATH 220

E E 552 (CSE 583) **Pattern Recognition--Principles and Applications** (3) Principles and applications decision-theoretic classification, discriminant functions, pattern processing and feature selection, syntactic pattern recognition, shape analysis and recognition.
Effective: Spring 2008

E E 553 **Topics in Digital Signal Processing** (3) Parametric modeling, spectral estimation, efficient transforms and convolution algorithms, multirate processing, and selected applications involving non-linear and time-variant filters.
Effective: Fall 1993
Prerequisite: E E 453

E E 554 (CSE 586) **Topics in Computer Vision** (3) Discussion of recent advances and current research trends in computer vision theory, algorithms, and their applications.
Effective: Spring 2008
Prerequisite: E E 454 orCMPEN 454

E E 555 (CSE 585) **Digital Image Processing II** (3) Advanced treatment of image processing techniques; image restoration, image segmentation, texture, and mathematical morphology.
Effective: Spring 2008
Prerequisite: E E 455 orCMPEN 455

E E 556 **Graphs, Algorithms, and Neural Networks** (3) Examine neural networks by exploiting graph theory for offering alternate solutions to classical problems in signal processing and control.
Effective: Spring 1996

E E 557 **Multidimensional Signal Processing** (3) Multidimensional sampling, weak causality, recursibility, multidimensional transforms, stability, global and local state-space models, multidimensional filters, and multidimensional spectrum estimation.
Effective: Fall 1993
Prerequisite: E E 453

E E 560 **Probability, Random Variables, and Stochastic Processes** (3) Review of probability theory and random variables; mathematical description of random signals; linear system response; Wiener, Kalman, and other filtering.
Effective: Spring 2008
Prerequisite: E E 350;STAT 418

E E 561 **Information Theory** (3) Mathematical measurement of information; information transfer in discrete systems; redundancy, efficiency, and channel capacity; encoding systems.
Effective: Spring 2008
Prerequisite: E E 460;STAT 418

E E 562 **Detection and Estimation Theory** (3) Detection decision theory, Bayes and Neyman-Pearson criteria, optimal receivers, classical estimation theory, signal-noise representations, optimum linear signal parameters estimation.
Effective: Summer 2000
Prerequisite: E E 560

E E 564 (CSE 554) **Error Correcting Codes for Computers and Communication** (3) Block, cyclic and convolutional codes; circuits and algorithms for decoding; application to reliable communication and fault-tolerant computing.
Effective: Spring 2008
Prerequisite: Communication Networks

E E 565 (CSE 515) **Reliable Data Communications** (3) Discussion of problems and solutions for ensuring reliable and efficient communication over wired and wireless links and data networks.
Effective: Spring 2008
Prerequisite: Communication Networks;STAT 418

E E 567 **Wireless and Mobile Communications** (3) Development of key wireless networks systems analysis and design tools utilizing telecommunications principles; current and emerging mobile wireless techniques.
Effective: Spring 2008
Prerequisite: E E 460;E E 560

E E 568 **Digital Communications I** (3) Linear and nonlinear digital modulation techniques; performance in additive Gaussian noise channel; continuous phase modulation; carrier acquisition and recovery.
Effective: Spring 2008
Prerequisite: E E 460 Concurrent: E E 560

E E 569 **Digital Communications II** (3) Baseband pulse transmission; baseband systems optimization; bandlimited channels performance in ISI; equalization; MLSE and ISI; fading channels; diversity; CDMA.
Effective: Spring 2008
Prerequisite: E E 560;E E 568

E E 571 (NUC E 540, AERSP 540) **Theory of Plasma Waves** (3) Solutions of the Boltzmann equation; waves in bounded and unbounded plasmas; radiation and scattering from plasmas.
Effective: Spring 2008
Prerequisite: E E 471

E E 572 (NUC E 541) **Plasma Theory** (3) Advanced topics in kinetic theory, fluctuation theory, microinstability, and turbulence.
Effective: Spring 2008
Prerequisite: E E 471 orNUC E 490

E E 573 **Constitution of the Ionosphere** (3) Properties of neutral and ionized atmosphere above 60 km; photochemical processes; solar, meteoric perturbations of the ionosphere; large-scale movements in ionization.
Effective: Spring 2008

E E 574 **Propagation Through Random Media** (3) RF/optical wave propagation through turbulent, turbid, and heterogeneous media (atmosphere/ionosphere/sea). Impacts and mitigation discussed for various scenarios.
Effective: Spring 2008
Prerequisite: E E 430 orE E 439 orE E 477 orPHYS 457

E E 576 **Inversion Techniques in Remote Sensing** (3) Introduce skills to address a wide variety of inverse problems such as found in atmospheric sensing, geosciences, and acoustics.
Effective: Spring 2008
Prerequisite: E E 430 orE E 439 orE E 477;STAT 418

E E 579 **Microwave Radar Remote Sensing** (3) Scientific and engineering principles of microwave radar remote sensing of land, sea, and the atmosphere.
Effective: Spring 2008
Prerequisite: E E 430 orE E 438 orE E 439 orE E 473

E E 580 **Linear Control Systems** (3) Continuous and discrete-time linear control systems; state variable models; analytical design for deterministic and random inputs; time-varying systems stability.
Effective: Spring 2008
Prerequisite: E E 380

E E 581 **Optimal Control** (3) Variational methods in control system design; classical calculus of variations, dynamic programming, maximum principle; optimal digital control systems; state estimation.
Effective: Spring 2008
Prerequisite: E E 580

E E 582 **Adaptive and Learning Systems** (3) Adaptive and learning control systems; system identification; performance indices; gradient, stochastic approximation, controlled random search methods; introduction to pattern recognition.
Effective: Spring 2008
Prerequisite: E E 580

E E 584 (M E 558) **Robust Control Theory** (3) Fundamentals of Robust Control Theory with emphasis on stability, performance analysis, and design.
Effective: Spring 2008
Prerequisite: E E 580 orM E 555

E E 587 (M E 559) **Nonlinear Control and Stability** (3) Design of nonlinear automatic control systems; phase-plane methods; describing functions; optimum switched systems; Liapunov stability; special topics in stability.
Effective: Spring 2008
Prerequisite: E E 380

E E 588 **Power System Control and Operation** (3) Steady-state and dynamic model of synchronous machines, excitation systems, unit commitment, control of generation, optimal power flow.
Effective: Spring 2008
Prerequisite: E E 488

E E 594 **Research Projects** (1-3) Supervision of individual research projects leading to M.S. or M.Eng. papers. Written and oral reports are required.
Effective: Summer 1998

E E 596 **Individual Studies** (1-9) Creative projects including non-thesis research which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1993

E E 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 1993

E E 597A **Application of Finite Element Methods to Smart Materials/Structures** (3) Practical applications of finite-element analysis to the design of piezoelectric and MEMS actuators, piezo-transformers, and underwater and medical transducers.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E E 597A **Stochastic Control** (3) Controlled Markov processes; nonlinear filtering and dynamic programming; linear quadratic Gaussian control; Fokker-Planck equation.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: E E 560, E E 580

E E 597B **Convex Optimization: Theory and Algorithms** (3) Introduces the theory and algorithms behind convex optimization, including least squares and linear programming.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: STAT 418 or equivalent

E E 597B **Radar Systems** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: E E 430 and one of the following:E E 432 orE E 438 orE E 439

E E 597C **Semiconductor Material Systems** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E E 597C **Transport in Nanoscale Devices** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

E E 597D **Continuous-time Stochastic Processes with Applications** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E E 597E **Spectroscopic Ellipsometry and the Optical Properties of Materials** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: intermediate course in optics

E E 597E **Current Issues in Geophysical Radar Scattering: Bragg and Beyond** (3) Geophysical radar scattering phenomena, including Polar Mesospheric Summer Echoes, meteor scattering, auroral and quasi-periodic echoes, and incoherent scattering.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: E E 430

E E 597I **Optical Communications Systems** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E E 597K **Introduction to Probability Theory and Stochastic Calculus** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E E 597K **Optical Communication Systems** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

E E 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2008

E E 600 **Thesis Research** (1-15) No description.
Effective: Fall 1993

E E 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1993

E E 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1993

E E 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1993

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Electro-Mechanical Engineering Technology (EMET)

EMET 401 **Engineering Technology Career Development** (1) Career planning, preparation, and decision making for students enrolled in an Engineering Technology baccalaureate degree program.
Effective: Spring 2008
Prerequisite: seventh semester standing

EMET 402 **Fundamentals of Engineering Review** (2) Overview of the topics covered on the Fundamentals of Engineering Exam administered by the NCEES for the purpose of earning a Professional Engineering license.
Effective: Spring 2008
Prerequisite: seventh semester standing

EMET 403 **Electromechanical Design Project Preparation** (1) This course involves the planning and preliminary design activities for the capstone electro-mechanical design project.
Effective: Spring 2008
Prerequisite: seventh semester standing

EMET 405 **Fluid Mechanics and Thermodynamics** (3) Introduction to the principles of fluid mechanics, thermodynamics, and heat tranfer with emphasis on the applications to practical problems.
Effective: Fall 2008
Prerequisite: EMET 326 andMATH 211 orMATH 250

EMET 410 **Automated Control Systems** (4) Introduction to analog feedback control theory and computer simulation and analysis using Matlab; laboratory study of feedback systems.
Effective: Fall 2008
Prerequisite: EMET 330

EMET 430 **Programmable Logic Controls II** (3) A second course in PLCs covering sequencing/shift instructions, program flow control, data and math instructions, PID loops, and machine communication.
Effective: Fall 2007
Prerequisite: EET 220

EMET 432 **Electromechanical Devices for Biomedical Instrumentation** (3) A study of electromechanical devices, transducers, and instrumentation used in the biomedical field.
Effective: Summer 2006
Prerequisite: EMET 330;PHYS 151 orPHYS 212 orPHYS 251 or equivalent

EMET 440 **Electro-Mechanical Project Design** (3) Planning, development, and implementation of electro-mechanical design project; includes formal report writing, project documentation, group presentations, project demonstrations.
Effective: Fall 2008
Prerequisite: EMET 325;EMET 326;EMET 410

EMET 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2002
Prerequisite: prior approval of proposed assignment by instructor

EMET 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2001

EMET 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2002

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Elementary Education in Multicultural Settings (ELEDM)

ELEDM 400 **Schools, Families and Communities** (3) Cultural and ethnic dimensions of family-school-community communications and the resultant impact on student-teacher relations.
Effective: Spring 2005
Prerequisite: C I 295, EDPSY 014, EDTHP 115 6 credits of social/behavioral sciences Concurrent: EDTHP 411 ELEDM 395W

ELEDM 401A **Teaching Reading in Multicultural Elementary Schools** (3) An exploration of current research, practices, strategies and materials in the development of reading skills in multicultural schools.
Effective: Summer 2005
Prerequisite: ELEDM 400 Concurrent: ELEDM 395W ELEDM 401B ELEDM 401C

ELEDM 401B **Teaching Language Arts in Multicultural Elementary Schools** (3) An exploration of current research, practices, strategies and materials in the development of language arts skills in multicultural schools.
Effective: Summer 2005
Prerequisite: ELEDM 400 Concurrent: ELEDM 395W ELEDM 401A ELEDM 401C

ELEDM 401C **Teaching Children's Literature in Multicultural Elementary Schools** (3) Survey of children's literature with an emphasis on multicultural literature and its application in multicultural elementary classrooms.
Effective: Summer 2005
Prerequisite: ELEDM 400 Concurrent: ELEDM 395W ELEDM 401A ELEDM 401B

ELEDM 402 **Teaching and Assessment in Multicultural Elementary Schools** (3) Multicultural education; elementary education; pluralistic pedagogical foundations, assessment, child's play, instrumental activites, State/Federal initiatives, and parent programs.
Effective: Spring 2006
Prerequisite: A ED 303;MUSIC 241, ELEDM 400 Concurrent: ELEDM 395W

ELEDM 403 **Using Science and Mathematics Knowledge and Assessment in Urban Settings** (6) Knowledge, skills, and assessment pertaining to science and mathematics education in urban schools.
Effective: Spring 2005
Prerequisite: CMPSC 101, MATH 200, ELEDM 400 and 9 credits of natural sciences Concurrent: ELEDM 395W

ELEDM 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2005

ELEDM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2005

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Energy & Mineral Eng (EME)

EME 432 (GEOG 432) **Energy Policy** (3) Analysis, formulation, implementation, and impacts of energy-related policies, regulations, and initiatives.
Effective: Summer 2010
Prerequisite: E B F 200, EGEE 120, PL SC 490

EME 444 **Global Energy Enterprise** (3) Industry perspective on the resources, technologies, engineering approaches and externalities involved in satisfying worldwide energy demand profitably and sustainably.
Effective: Summer 2010
Prerequisite: ECON 004 or equivalentEGEE 102, EGEE 120

EME 466 **Energy and Sustainability in Society** (3) Capstone course in energy technology and policy options for reduced-carbon communities. Covering agent/stakeholder relations, sustainability, communication and public engagement.
Effective: Summer 2010
Prerequisite: GEOG 030, METEO 469, EME 437

EME 500 **Energy and Mineral Project Investment Evaluation** (3) Emphasizes enterprise level cost review, estimation, and prediction methodology and investment evaluation as a means for project engineering management.
Effective: Spring 2009

EME 510 **Health and Safety Engineering** (3) Develop the ability to use scientific and engineering principles to evaluate and control health and safety hazards in the workplace.
Effective: Spring 2009

EME 525 **Theory and Practice of Policy Analysis for Engineers** (3) The course provides a broad introduction to analytical methods commonly used in science, technology, and energy policy analysis.
Effective: Summer 2008

EME 570 (MATSE 570) **Catalytic Materials** (3) Preparation and characterization of solid catalytic materials and the relationships between their surface, defect, and electronic properties and catalytic activity.
Effective: Summer 2008
Prerequisite: CHEM 452 or similar course in chemical materials or energy sciences and engineering

EME 580 **Integrative Design of EME Systems** (5) Problem-based, integrative, and collaborative learning to solve interdisciplinary problems on energy and mineral systems based on engineering and business principles.
Effective: Spring 2009
Prerequisite: Students must have completed required option courses in EME or be in the second semester

EME 590 (F SC 590, MNG 590, P N G 590) **Colloquium** (1-3) Continuing seminars that consist of individual lectures by faculty, students or outside speakers on energy and mineral engineering issues.
Effective: Spring 2009

EME 600 **Thesis Research** (1-12) Thesis research culminating into the doctoral degree in Energy and Mineral Engineering.
Effective: Summer 2008

EME 601 **Thesis Research** (1-12) Thesis research after successful comprehensive exam culminating into the doctoral degree in Energy and Mineral Engineering.
Effective: Summer 2008

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Energy Bus & Finance (E B F)

E B F 401 **Strategic Corporate Finance for the Earth, Energy, and Materials Industries** (3) Financial decisions corporations in the earth science area make and the tools and analyses used to make these decisions.
Effective: Fall 2009 Ending: Summer 2010
Prerequisite: ENNEC 100, E B F 301 and junior or senior standing

E B F 401 **Strategic Corporate Finance for the Earth, Energy, and Materials Industries** (3) Financial decisions corporations in the earth science area make and the tools and analyses used to make these decisions.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: E B F 200, E B F 301 and junior or senior standing

E B F 472 **Quantitative Analysis in Earth Sciences** (3) Quantitative analysis of decision making in atmospheric/geophysical sciences: exploratory data analysis, quantification of uncertainty, parametric/non- parametric testing, forecasting, time series analysis.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MATH 110 orMATH 140

E B F 473 **Risk Management in Energy Industries** (3) Analysis of strategies for mitigating business risk from market, atmospheric, geophysical uncertainties including the use of energy/mineral commodity futures/options, weather derivatives, and insurance.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MSIS 200 orSTAT 200 orE B F 472

E B F 484 **Energy Economics** (3) Economics of energy demand, production, storage, and pricing; advanced energy policy issues including regulation, climate change, new energy technology.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: ECON 002 orE B F 200;MATH 110 orMATH 140

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Energy and Geo-Environmental Engineering (EGEE)

EGEE 401 **Energy in a Changing World** (3) Energy is in transition, with increased international energy demand and increasing environmental pressures. Energy transitions, approaches, and outcomes are addressed.
Effective: Spring 2008
Prerequisite: EGEE 101 orEGEE 102 orCHEM 112

EGEE 411 **Energy Science and Engineering Lab** (3) A comprehensive introduction to classic and modern laboratory skills and experimentation of relevance to energy science and engineering practice.
Effective: Spring 2008
Prerequisite: F SC 401 orEGEE 302 or permission of program

EGEE 412 **Green Engineering & Environmental Compliance** (3) Material and energy flows as they relate to industrial systems, environmental concerns, pollution prevention, and the development of clean technologies.
Effective: Summer 2007
Prerequisite: EGEE 302

EGEE 420 **Hydrogen and Fuel Cells** (3) Course will cover the fundamental principles of electrochemical engineering, hydrogen production and storage, and the design and application of the main types of fuel cells.
Effective: Fall 2009
Prerequisite: EME 301

EGEE 430 (M E 430) **Introduction to Combustion** (3) Concepts related to laminar and turbulent premixed and nonpremixed combustion with applications to propulsion and stationary systems.
Effective: Fall 2009
Prerequisite: M E 201 orM E 300 orEME 301

EGEE 433 **Physical Processes in Energy Engineering** (3) Introduces fluid flow, heat transfer, phase equilibrium and mass transport phenomena in energy separation processes.
Effective: Summer 2007
Prerequisite: EGEE 304 or concurrent

EGEE 436 **Modern Thermodynamics for Energy Systems** (3) Thermodynamics of external fields, theory of stability and fluctuations, irreversible and non-linear thermodynamics, and bifurcation theory and their applications in energy and environmental processes are discussed.
Effective: Fall 2009
Prerequisite: EME 301, EGEE 302, MATH 231 andMATH 251

EGEE 437 **Design of Solar Energy Conversion Systems** (3) A review of fundamental concepts in solar energy conversion including photovoltaic (PV) and solar thermal conversion systems.
Effective: Spring 2010
Prerequisite: EGEE 304 or permission of program

EGEE 438 **Sustainable Energy Options** (3) Principles and operation of sustainable energy conversion units with emphasis on wind, water, and geothermal energy.
Effective: Fall 2009
Prerequisite: EME 301 andEGEE 302

EGEE 441 **Electrochemical Energy Conversion** (3) Course covers fundamental principles of electrochemistry, including electrochemical thermodynamics, kinetics, catalysis, and corrosion and focuses on applications such as fuel cells, batteries, and photovoltaics. Each application covers: principles of method, criteria determining performance, present state of development, and advantages/disadvantages. Laboratory demonstration of the performance (current-voltage) measurements of an electrochemical converter is scheduled in this course.
Effective: Fall 2009
Prerequisite: EME 301, EGEE 302

EGEE 451 **Energy Conversion Processes** (3) Emphasizes processes for conversion of fossil fuels, nuclear and biomass to other fuel forms as transportation fuels and electricity.
Effective: Summer 2007
Prerequisite: F SC 431

EGEE 455 **Materials for Energy Applications** (3) Overview of key principles and technologies for materials relevant to energy applications, including membranes, catalysis, supercapacitors, adsorbents, and semi-conductors.
Effective: Summer 2007
Prerequisite: EGEE 302, MATSE 201

EGEE 456 (E E 456, E SC 456) **Introduction to Neural Networks** (3) Artificial Neural Networks as a solving tool for difficult problems for which conventional methods are not applicable.
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 202;MATH 220

EGEE 464W **Energy Design Project** (3) A team and capstone design project on an industrial energy-related problem.
Effective: Spring 2008
Prerequisite: seventh-semester standing in energy engineering or chemical engineeringENGL 202C

EGEE 470 **Air Pollutants from Combustion Sources** (3) Generation of pollutants in combustion chambers; reduction by combustion control; pre- and post-combustion treatment of fuels and effluents.

Effective: Fall 2009
Prerequisite: EME 301

EGEE 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1999

EGEE 494A **Research Project** (2) Supervised research on a selected topic of energy science and engineering and preparation of written and oral presentation of the research results.
Effective: Summer 2007
Prerequisite: Seventh semester standing in energy engineering

EGEE 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

EGEE 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1999

EGEE 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 1999

EGEE 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1999

EGEE 497B **Geo-Resource Evaluation, Investment Decision Methods, and Financial Analysis** (3) Cost engineering methodology and engineering for Geo-resources including energy, mining, mineral processing, oil, and gas exploration and production. Industrial safety and health, and earth-system based environmental projects, and weather.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EGEE 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1999

EGEE 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

EGEE 500 **Engineering Physics of Engergy and Geo-Environmental Systems** (3) Momentum, heat and mass transport phenomena in fluids and solids, including phase equilibria.
Effective: Spring 2005
Prerequisite: consent of instructor

EGEE 510 **Engineering Chemistry of Energy and Geo-Environmental Systems** (3) Chemical and electrochemical equilibria, surface and interfacial phenomena and chemical kinetics, in natural and engineered systems.
Effective: Spring 2005
Prerequisite: consent of instructor

EGEE 520 **Mathematical Modeling of Energy and Geo-Environmental Systems** (3) Physical and reactive chemical modeling, model formulation and solution, validation and verification.
Effective: Spring 2005
Prerequisite: EGEE 500, EGEE 510

EGEE 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1999

EGEE 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1999

EGEE 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1999

EGEE 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1999

EGEE 597A **Theory and Practice of Science and Technology Policy Analysis** (3) Covers methods and applications relevant to public policy and decision-making with a focus on engineering, technology and scientific problems.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EGEE 597B **Solar Energy Conversion** (3) A review of fundamental concepts and systems dynamics simulatinos in solar energy conversion including photovoltaic and solar thermal systems.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EGEE 597C **Nanoscale Energy and Environmental Engineering** (3) It covers synthesis, characterization, and applications of nanomaterials to energy generation, storage, conversion, conservation, control, and environmental engineering.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EGEE 597C **The Transformation of Electricity Markets** (3) The electricity industry has undergone major transformations in structure, regulation and market design in the past decade. This course will introduce students to the structure of regulated and deregulated electricity markets; emerging environmental regulations shaping the electricity industry; and the potential impacts of the "smart grid" on electricity generation, transmission and utilization.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EGEE 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1999

EGEE 599 (IL) **Foreign Studies** (1-2 per semester, maximum of 24) Full-time graduate-level foreign study at overseas.
Effective: Summer 2005

EGEE 600 **Thesis Research** (1-15) No description.
Effective: Summer 2005

EGEE 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Summer 2004

EGEE 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 2006

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Energy, Environmental, and Mineral Economics (ENNEC)

ENNEC 401 **Case Studies of Industrial Ecology** (1-3) The objective of this course is to introduce life cycle analysis and design for the environment.
Effective: Fall 2001
Prerequisite: junior or senior standing with background in earth and environmental studies

ENNEC 420 **Economics of Natural Hazards** (3) Covers economic aspects of natural hazards: impacts, loss estimation, mitigation, recovery, modeling, policy analysis, risk, insurance, resiliency, and sustainability.
Effective: Spring 2002
Prerequisite: ECON 002

ENNEC 425 **Simulation Methods in Earth and Social Sciences** (3) This course will provide students with computer programming skills/ knowledge in statistics, stochastic process, and simulation applicable to earth/managerial sciences.
Effective: Fall 2001
Prerequisite: CMPSC 101, MATH 140

ENNEC 472 **Quantitative Analysis in Earth Sciences** (3) Quantitative analysis of decision making in atmospheric/geophysical sciences: exploratory data analysis, quantification of uncertainty, parametric/non- parametric testing, forecasting, time series analysis.
Effective: Fall 2004 Ending: Summer 2010
Prerequisite: MATH 110 orMATH 140

ENNEC 473 **Risk Management in Energy Industries** (3) Analysis of strategies for mitigating business risk from market, atmospheric, geophysical uncertainties including the use of energy/mineral commodity futures/options, weather derivatives, and insurance.
Effective: Fall 2004 Ending: Summer 2010
Prerequisite: MSIS 200 orSTAT 200 orENNEC 472

ENNEC 482 **Economic Analysis of Minerals in the Environment** (3) Economics of exploration and mining methods, future mineral availability, mineral and environmental law, mineral industries and the environment, current issues.
Effective: Spring 2002 Ending: Summer 2010
Prerequisite: ECON 002, ENNEC 100

ENNEC 482 **Economic Analysis of Minerals in the Environment** (3) Economics of exploration and mining methods, future mineral availability, mineral and environmental law, mineral industries and the environment, current issues.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: ECON 002, E B F 200

ENNEC 483 **Materials Policy and Markets** (3) Integrated economic and institutional analysis of policy issues facing material markets, including recycling, pollution control, advanced materials, and industrial policy.
Effective: Summer 2010
Prerequisite: ECON 002, E B F 200

ENNEC 484 **Energy Economics** (3) Economics of energy demand, production, storage, and pricing; advanced energy policy issues including regulation, climate change, new energy technology.
Effective: Spring 2010 Ending: Summer 2010
Prerequisite: ECON 002 orENNEC 100;MATH 110 orMATH 140

ENNEC 484 **Energy Economics** (3) Economics of energy demand, production, storage, and pricing; advanced energy policy issues including regulation, climate change, new energy technology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ECON 002 orE B F 200;MATH 110 orMATH 140

ENNEC 490 **Applied Financial and Investment Analysis** (3) Valuation/investment analysis of mineral properties; commodity market analysis; introduction to principles of financial/investment analysis applied to natural resources/environment.
Effective: Fall 2001

ENNEC 491 **Business and Public Policy Analysis** (3) Capstone course integrating theory and empirical methods in the analysis of business and public policy.
Effective: Fall 2001
Prerequisite: 12 credits in ENNEC ECON AG EC or BUS

ENNEC 492 **Econometric Applications to Mineral Markets** (3) Statistical tools as used by mineral economists, econometric models of mineral, material, and energy markets.
Effective: Spring 2002
Prerequisite: ECON 002, MATH 220, ECON 490 orSTAT 451 ; 3 additional credits in economics or mineral economics

ENNEC 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 2002
Prerequisite: prior approval of proposed assignment by instructor

ENNEC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

Effective: Spring 2002

ENNEC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2001

ENNEC 497A **The Transformation of Electricity Markets** (3) The electricity inudstry has undergone major transformations in structure, regulation and market design in the past decade. This course will introduce students to the structure of regulated and deregulated electricity markets; emerging environmental regulations shaping the electricity industry; and the potential impacts of the "smart grid" on electricity generation, transmission and utilization.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENNEC 499 (IL) **Foreign Study--Mineral Industries** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

ENNEC 500 **Mineral and Energy Economics** (3) This course introduces students to rigorous economic analysis of policy and planning issues in mineral resource economics.
Effective: Spring 2002

ENNEC 501 **Economics of Minerals and Environment** (3) Advanced principles of welfare economics, cost-benefit analysis, and non- renewable resource exhaustion with applications to mining and energy use.
Effective: Spring 2002
Prerequisite: ENNEC 500 orECON 502

ENNEC 520 **The Econometrics of Natural Resources** (3) Applies econometric analysis to contemporary planning and policy issues facing energy and materials industries.
Effective: Spring 2002
Prerequisite: ECON 501, ECON 502

ENNEC 530 **Mineral Commodity Prices** (3) Discussion of advanced models in natural resource economics.
Effective: Spring 2002
Prerequisite: ENNEC 520, ECON 501, ECON 502

ENNEC 531 **Applied General Equilibrium Analysis of Mineral Development** (3) Analysis of the role of natural resource in international trade and economic development by use of applied general equilibrium models (CGE, SAM, I-O).
Effective: Spring 2002
Prerequisite: approval of the department

ENNEC 540 **Economic Analysis of Energy Markets** (3) This course uses economic analysis to explain the history of world energy and its regulation since 1945.
Effective: Spring 2002
Prerequisite: ECON 502

ENNEC 541 **Economics of Energy and the Environment** (3) Economic analysis of topics such as global warming, alternative energy sources and new technologies, and resources and sustainable development.
Effective: Spring 2002
Prerequisite: approval of the department

ENNEC 542 **Geology and Economics of Industrial Minerals** (3) Occurrence, origin, and marketing of the industrial minerals and evaluation of deposits. Chemical and ceramic raw materials emphasized.
Effective: Spring 2003
Prerequisite: introductory courses in geology mineralogy and petrology

ENNEC 550 **Environmental Economics: Theory and Policy** (3) Theories and applied methods used in the economic analysis of resource and environmental issues.
Effective: Spring 2002
Prerequisite: ENNEC 500, ENNEC 501, ECON 502

ENNEC 551 **Environmental Economics: Application/Methods** (3) Introduction to methods for measuring environmental and natural resource values, including hedonic methods, travel cost, random utility models and contingent valuation.
Effective: Spring 2002 Ending: Fall 2010
Prerequisite: AG EC 519

ENNEC 551 **Environmental Economics: Application/Methods** (3) Introduction to methods for measuring environmental and natural resource values, including hedonic methods, travel cost, random utility models and contingent valuation.
Effective: Spring 2011 Future: Spring 2011

ENNEC 560 **Mineral and Energy Finance I** (3) Introduction to theory of finance and application of financial tools to commodity market analysis. Emphasis on mineral and energy markets.
Effective: Spring 2002
Prerequisite: approval of the department

ENNEC 561 **Theory and Methods in Mineral and Energy Finance** (3) Theory and contemporary methods in mineral and energy finance; particular emphasis on project evaluation, financing, and risk management in metals and energy markets.

Effective: Spring 2002
Prerequisite: ENNEC 560

ENNEC 585 **Seminar in Energy, Environmental, and Mineral Economics** (1-3) Research presented by faculty, visiting scholars, industry leaders, and students.
Effective: Spring 2002

ENNEC 590 (I H S 590) **Colloquium** (1-3) Continuing seminars which consist of individual lectures by faculty, students or outside speakers on energy and mineral engineering issues.
Effective: Spring 2009

ENNEC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2002

ENNEC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2002

ENNEC 600 **Thesis Research** (1-15) No description.
Effective: Spring 2002

ENNEC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 2002

ENNEC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised and graded teaching experience.
Effective: Spring 2002

ENNEC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 2002

ENNEC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 2002

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Engineering (ENGR)

ENGR 407 **Technology-Based Entrepreneurship** (3) Technology innovation coupled with business planning and development.
Effective: Spring 2003
Prerequisite: ECON 002 orECON 004

ENGR 408 (US) **Leadership Principles** (2) An introduction to an exploration of theories and principles of leadership, supplemented by presentations given by industry and government leaders.
Effective: Spring 2006

ENGR 409 (US) **Leadership in Organizations** (3) Development of leadership skills essential for engineers to guide colleagues or an organization in a productive direction.
Effective: Spring 2006

ENGR 411 **Entrepreneurship Business Basics** (3) Three critical entrepreneurship skills are covered for non-business majors: business finance, intellectual property, and marketing.
Effective: Summer 2002
Prerequisite: three credits in economics or economics-related course

ENGR 420Y (US;IL) **Design for Global Society** (3) An interdisciplinary study of the engineering design process and the influence of society and culture on design.
Effective: Spring 2008
Prerequisite: ENGL 202

ENGR 421 **Materials Properties Measurements II** (4) Materials powder characterization, compaction and densification techniques, density measurements, micro structural evaluation, thermal and electrical properties of materials.
Effective: Summer 2010
Prerequisite: ENGR 320, MATSE 201, MATSE 400

ENGR 425 (IST 425, MGMT 425) **New Venture Creation** (3) Via problem-based learning, teams define new business ventures to meet current market needs, develop business plans, and present to investors.
Effective: Spring 2007
Prerequisite: ECON 002 orECON 004 orECON 014;CAS 100

ENGR 426 (MGMT 426, IST 426) **Invention Commercialization** (3) Working with Penn State inventions selected by the Intellectual Property Office, student teams define an optimum commercialization path each technology.
Effective: Spring 2007
Prerequisite: ECON 002 orECON 004 orECON 014;CAS 100

ENGR 450 **Materials Design and Applications** (3) Engineering design considerations for materials selection, organization of property trends of materials families, materials design strategies and property compatibility.
Effective: Summer 2010
Prerequisite: ENGR 350, E MCH 407 orE MCH 461;ENGR 421

ENGR 490W **Senior Design I** (1) Analysis of environmental impacts on a design, designing products for the global environment and discussion on engineering ethics and professionalism.
Effective: Summer 2010
Prerequisite: ENGR 350, E MCH 407 orE MCH 461

ENGR 491W **Senior Design II** (3) Capstone of research projects from conception to prototype through industry sponsored collaboration on common technical interests between faculty and student.
Effective: Summer 2010
Prerequisite: ENGR 490W

ENGR 493 **Individual Leadership Experience** (1) Approved individual project or internship for students to practice the leadership skills developed in the Engineering Leadership Development Minor.
Effective: Fall 2007
Prerequisite: Prerequisite or concurrent:ENGR 408

ENGR 494 **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1994

ENGR 494H **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

ENGR 495 **Engineering Co-Op Work Experience III** (1-3) A supervised work experience where the student is employed in an engineering position in industry or government. (To be offered only for SA/Un grading.)
Effective: Fall 1987
Prerequisite: ENGR 395

ENGR 495A **Engineering Cooperative Education** (1-3 per semester) A supervised work experience in research, industry or government relevant to a student's major.
Effective: Summer 2003
Prerequisite: ENGR 395A orENGR 395I

ENGR 495I (IL) **Engineering International Cooperative Education** (1-3 per semester) A supervised work experience in research, industry or government relevant to a student's major.
Effective: Spring 2006
Prerequisite: ENGR 395A orENGR 395I

ENGR 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 1993

ENGR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1988

ENGR 497B **International Leadership Practicum - Hungary** (1) Hosted by Corvinus University in Budapest, students and presentations on Entrepreneurship/Leadership/Business by invited lecturers, tours of local businesses etc., and collaborative activities by PSU and Corvinus University students.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: ENGR 497C andENGR 497B

ENGR 497C **Global Engineering Teams** (1) Preparation for a career in international business. Prerequisite for students traveling internationally with the Engineering Leadership Development Program to Hungary/Morocco. Students must earn a B or better in this class to quality for travel.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ENGR 408 andENGR 493

ENGR 497E **Project Management Professionals** (3) This practical course for professionals covers the essential concepts and skills needed to make effective contributions and have an impact on the successful accomplishment of projects.
Effective: Summer 2010 Ending: Summer 2010

ENGR 497E **Project Management for Professionals** (3) This practical course covers the essential concepts and skills needed to make effective contributions.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGR 497E **Project Management for Professionals** (3) This practical course covers the essential concepts and skills needed to make effective contributions and have an impact on the successful accomplishments of projects.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGR 497F (SCIED 497F) **Fundamentals of Science, Technology & Engineering** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGR 497G **Career Development Seminar** (2) This Career Development Seminar offers upper-class engineering students information on the tools and current practices in industry. Topics range from communication skills, leadership strategies, teambuilding skills, personal management, etiquette and knowledge about the corporate culture. The seminar will cover a variety of topics and is designed to create a successful transition to the workplace and a successful career. Industry representatives will participate in the course as guest speakers. They will provide presentations in-person and through methods used in industry including telephone conference call and Skype.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGR 497I **Engineering Teaching Intern** (0.5) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGR 497K **Social Entrepreneurship** (3) Explore intriacies of social innovation. Work in teams to develop feasibility plans for social ventures in the US, Asia, and Africa.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGR 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

ENGR 594 **Master's Paper Research** (1-3) Investigation of a specific engineering problem and development of a scholarly written report in partial fulfillment of requirements for a master's degree in engineering.
Effective: Fall 1985

ENGR 595A **Engineering Internship** (1 per semester/maximum of 4) A supervised work experience in a professionally

relevant position in research, industry, or government.
Effective: Spring 2005

ENGR 595I **International Engineering Internship** (1 per semester/maximum of 4) A supervised work experience in a professionally relevant position in research, industry, or government.
Effective: Spring 2005

ENGR 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1993

ENGR 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2008

ENGR 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

ENGR 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Opportunity for supervised and graded experience for graduate students in the College of Engineering.
Effective: Fall 1983

ENGR 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

ENGR 888 **Seminar for Engineering Teaching Assistants** (1) Study of recently established knowledge and methodologies as applied to practice. Significant interaction among students and with instructor is expected.
Effective: Fall 2009

ENGR 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2008

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Engineering Design (EDSGN)

EDSGN 452 **Projects in Community Service Engineering** (1-2) Students engage in research and design of appropriate solutions to real-life community-based problems and project management of such projects.
Effective: Summer 2008
Prerequisite: EDSGN 352 ; 5th semester standing

EDSGN 479 (I E 479) **Human Centered Product Design and Innovation** (3) Consumer product design for a global market, incorporating human factors principles and user desires in a multicultural perspective.
Effective: Summer 2010
Prerequisite: I E 408 orI E 419 or equivalent

EDSGN 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2004

EDSGN 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

EDSGN 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, pracrica, or internships. Written and oral critique of activity required.
Effective: Summer 2004

EDSGN 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2004

EDSGN 496A **Solidworks Fundamentals** (3) Fundamentals of solid works.
Effective: Summer 2010 Ending: Summer 2010

EDSGN 496A **Solidworks Fundamentals** (3) Fundamentals of solidworks.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDSGN 496A **Solidworks Fundamentals** (3) Fundamentals of solidworks.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDSGN 496C **Catia Fundamentals & Applications** (3) Students will learn fundamentals of part, assemble, and shape design, digital mock up tooks and parametric design basics. Students will explore digital mock up workbench tools and learn building and optimizing various mechanisms. As reverse engineering exercises, each student will have to reconstruct a part from a 3D model and also construct and optimize a selected machine or mechanism.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDSGN 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2004

EDSGN 497D **Multidisciplinary Capstone Design Project** (3) The course focuses on multidisciplinary industry-sponsored and community service-based design projects offered in conjunction with the College of Engineering's Learning Factory.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: senior level standing in BIOE CMPEN EE IE or ME;BIOE 440 orE E 330 orE E 350 orE E 316 orI E 302 orI E 305 orI E 323 orI E 327 orI E 330 orI E 405

EDSGN 497E **Sensor and Controller System Integration** (3) Hands-on course covers the interfacing of various sensors and actuators to computers to build proof-of-concept prototypes of innovative products.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDSGN 497F **Sensor and Controller System Integration: Practicum** (1) Hands-on course covers the interfacing of various sensors and actuators to computers to build proof-of-concept prototypes of innovative products.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDSGN 497G **AutoCAD 2010 Tutorial** (3) Students will use the latest version of AutoCAD as a design tool for 2D and 3D applications in a variety of disciplines.
Effective: Summer 2010 Ending: Summer 2010

EDSGN 497G **Current CAD Applications** (3) Students will use the latest version of AutoCAD as a design tool for 2D and 3D applications in a variety of disciplines.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDSGN 497G **Current CAD Applications** (3) Students will use the latest version of AutoCAD as a design tool for 2D and 3D applications in a variety of disciplines.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

EDSGN 497K **Engineering Design and Analysis with CATIA** (3) The first part of the course covers the fundamentals of CATIA V5 in solid modeling, part design and assembly design prototyping, and design documentation. The second part of this course covers the basic FEA (finite element analysis) capabilitites in CATIA V5. Students will learn how to quickly generage a finite element model for surface and/or solid parts of how to perform analysis using the finite elements method with CATIA V5.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDSGN 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2008

EDSGN 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

EDSGN 547 (M E 547) **Designing for Human Variablility** (3) Statistics, optimization, and robust design methodologies to design products and environments that are robust to variability in users.
Effective: Summer 2009

EDSGN 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 2004

EDSGN 594 **Research Topics** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2004

EDSGN 595 **Internship** (1-9) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 2004

EDSGN 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2004

EDSGN 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2004

EDSGN 597K **Nanotechnology Research, Design and Development** (3) A design course that focuses on technology push rather than the usual market design of products, processes, systems and services.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDSGN 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2004

EDSGN 598A **Nano Design** (3) Trends in nanotechnology policy, research, product design and development, and social impacts. Design methods, ethical reflection, reports, for client researchers.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

EDSGN 599 (IL) **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Engineering Graphics Technology (EG T)

No courses for department code **EG T** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Engineering Mechanics (E MCH)

E MCH 400 **Advanced Strength of Materials and Design** (3) Combined stresses; energy methods; special problems in bending and torsion; plates; thin-walled structures; buckling and stability; design projects.
Effective: Spring 2008
Prerequisite: E MCH 213, E MCH 210H orE MCH 210

E MCH 402 **Applied and Experimental Stress Analysis** (3) Experimental design of structural and machine components; photoelasticity, electrical resistance strain gauge techniques, Moire techniques, interferometry, holography.
Effective: Spring 2008
Prerequisite: E MCH 213, E MCH 210H orE MCH 210

E MCH 403 **Strength Design in Materials and Structures** (4) Determination, interpretation, significance, and application of mechanical properties such as plastic flow, fatigue strength, creep resistance, and dynamic properties.
Effective: Spring 2008
Prerequisite: E MCH 315, E MCH 316

E MCH 407 **Computer Methods in Engineering Design** (3) Computer methods in mechanical design: solid modeling, graphics, surface smoothing/interpolation and underlying numerics: simultaneous equations, quadrature, eigen problems, discrete models.
Effective: Spring 2008
Prerequisite: CMPSC 201, CMPSC 202 orE SC 261M;E MCH 213, E MCH 210H orE MCH 210

E MCH 408 **Elasticity and Engineering Applications** (3) General equation of stress and strain in rectangular, cylindrical, and spherical coordinates; applications in structural and machine design.
Effective: Spring 2008
Prerequisite: E MCH 213, E MCH 210H orE MCH 210

E MCH 409 **Advanced Mechanics** (3) Continuation of E MCH 012; Euler's equations for the rotation of a rigid body, gyroscopic motion, impulsive motion, Lagrangian mechanics.
Effective: Spring 2008
Prerequisite: E MCH 212 orE MCH 212H;MATH 230

E MCH 412 **Experimental Methods in Vibrations** (3) Systems of one or more degrees of freedom, mechanical vibrations, vibration properties of materials, vibration techniques in nondestructive testing.
Effective: Fall 2007
Prerequisite: E MCH 470

E MCH 416H **Failure and Failure Analysis of Solids** (3) Examination and analysis of the various modes of failure of solid materials.
Effective: Spring 2008
Prerequisite: E MCH 213, E MCH 210 orE MCH 210H

E MCH 440 (MATSE 440) **Nondestructive Evaluation of Flaws** (3) Methods and limitations of nondestructive evaluation of mechanical flaws; optical, acoustical, electromagnetic, x-ray, radiography, thermography, and dye techniques.
Effective: Spring 2008
Prerequisite: E MCH 213, E MCH 210H orE MCH 210

E MCH 446 **Mechanics of Viscoelastic Materials** (3) Nature of viscoelastic materials, constitutive relations, thermorheological materials, viscoelastic stress analysis, rubber elasticity, viscoelastic liquids, experimental techniques for material characterization.
Effective: Spring 2008
Prerequisite: E MCH 315, E MCH 316

E MCH 461 (M E 461) **Finite Elements in Engineering** (3) Computer modeling and fundamental analysis of solid, fluid, and heat flow problems using existing computer codes.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: CMPSC 201, CMPSC 202 orE SC 261M;E MCH 213, E MCH 210H orE MCH 210

E MCH 461 (M E 461) **Finite Elements in Engineering** (3) Computer modeling and fundamental analysis of solid, fluid, and heat flow problems using existing computer codes.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: E MCH 213, E MCH 210H orE MCH 210;CMPSC 200, CMPSC 201 orCMPSC 202

E MCH 470 (M E 470) **Analysis and Design in Vibration Engineering** (3) Application of Lagrange's equations to mechanical system modeling, multiple- degree-of-freedom systems, experimental and computer methods; some emphasis on design applications.
Effective: Spring 2008
Prerequisite: E MCH 212 orE MCH 212H;M E 370 orE SC 407H

E MCH 471 **Engineering Composite Materials** (3) Properties, manufacture, forms of composites; micromechanics; orthotropic lamina properties; laminate analysis; theories; failure analysis; thermal, environmental effects.
Effective: Spring 2008
Prerequisite: E MCH 213, E MCH 210H orE MCH 210;E MCH 315, E SC 414M orMATSE 201

E MCH 473 (AERSP 473) **Composites Processing** (3) An introduction to the principles of mechanics governing manufacturing, computer-aided design, and testing of composite materials and structures.

Effective: Summer 1988
Prerequisite: E MCH 471

E MCH 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

E MCH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

E MCH 500 (M E 560) **Solid Mechanics** (3) Introduction to continuum mechanics, variational methods, and finite element formulations; application to bars, beams, cylinders, disks, and plates.
Effective: Fall 2007

E MCH 506 **Experimental Stress Analysis** (3) Experimental methods of stress determination, including photoelasticity, stress coat, and electric strain gauge techniques; stress analogies; strain rosettes for combined stress determinations.
Effective: Fall 1983
Prerequisite: E MCH 408 orE MCH 507

E MCH 507 **Theory of Elasticity and Applications** (3) Equations of equilibrium and compatibility; stresses and strains in beams, curved members, rotating discs, thick cylinders, torsion and structural members.
Effective: Spring 2008
Prerequisite: E MCH 213

E MCH 509 **Theory of Plates and Shells** (3) Bending and buckling of plates; elastic foundations; deformation of shells, multilayer shells, stress and stability analysis, weight optimization, application problems.
Effective: Spring 2008
Prerequisite: E MCH 213

E MCH 514 (E SC 514) **Engineering Science and Mechanics Seminar** (1 per semester) Current literature and special problems in engineering mechanics.
Effective: Spring 1999

E MCH 516 **Mathematical Theory of Elasticity** (3) Fundamental equations and problems of elasticity theory; uniqueness theorems and variational principles; methods of stress functions and displacement potential; applications.
Effective: Winter 1978
Prerequisite: E MCH 540

E MCH 520 **Advanced Dynamics** (3) Dynamics of a particle and of rigid bodies; Newtonian equations in moving coordinate systems; Lagrange's and Hamilton's equations of motion; special problems in vibrations and dynamics.
Effective: Spring 2008
Prerequisite: E MCH 212, MATH 250

E MCH 521 (ACS 521) **Stress Waves in Solids** (3) Recent advances in Ultrasonic Nondestructive Evaluation: waves; reflection and refraction; horizontal shear; multi-layer structures; stress; viscoelastic media; testing principles.
Effective: Spring 1998
Prerequisite: E MCH 524A, E MCH 524B

E MCH 523 **Ultrasonic Nondestructive Evaluation** (3) Methods, techniques, applications of Ultrasonic Nondestructive Evlauation wave propagation; signal processing and pattern recognition applied to UNDE; practical laboratory demonstrations.
Effective: Spring 1998

E MCH 524A **Mathematical Methods in Engineering** (3) Special functions, boundary value problems, eigenfunctions and eigenvalue problems; applications to engineering systems in mechanics, vibrations, and other fields.
Effective: Spring 1999
Prerequisite: MATH 250 orMATH 251

E MCH 524B **Mathematical Methods in Engineering** (3) Boundary-value problems in curvilinear coordinates, integral transforms; application to diffusion, vibration, Laplace and Helmholtz equations in engineering systems.
Effective: Spring 1999
Prerequisite: E MCH 524A, E SC 404 orMATH 411

E MCH 524C **Mathematical Methods in Engineering** (3) Green's functions applied to problems in potentials, vibration, wave propagation and diffusion with special emphasis on asymptotic methods.
Effective: Spring 1999
Prerequisite: E MCH 524B, E SC 406H orMATH 412

E MCH 525 **Structural Vibration and Radiation** (3) Vibration response, propagation, transmission, and reflection in elastic structures, internal and external damping; fluid loading; impedance discontinuities; acoustic radiation.
Effective: Fall 2007
Prerequisite: ACS 510 orE MCH 571 Concurrent: E MCH 524B

E MCH 527 **Structural Dynamics** (3) Dynamic behavior of structural systems; normal modes; input spectra; finite element representation of frameworks, plates, and shells; impedance; elastic- plastic response.

Effective: Fall 2007
Prerequisite: E MCH 470 orE MCH 571

E MCH 528 **Experimental Methods in Vibrations** (3) Investigation of one or more degrees of freedom, free and forced mechanical vibrations, vibration properties of materials, nondestructive testing.
Effective: Fall 2007
Prerequisite: E MCH 470 orE MCH 571

E MCH 530 **Mechanical Behavior of Materials** (3) Engineering materials mechanical responses; stress/strain in service context of temperature, time, chemical environment; mechanical testing characterization; design applications.
Effective: Spring 1989

E MCH 531 **Theory of Plasticity and Applications** (3) Yield condition; plastic stress-strain relations; theory of slip-line fields; applications to bending, torsion, axially symmetric bodies, metal processing.
Effective: Winter 1978
Prerequisite: E MCH 507

E MCH 532 **Fracture Mechanics** (3) Stress analysis of cracks; stable and unstable crack growth in structures and materials; materials fracture resistance.
Effective: Fall 1983
Prerequisite: E MCH 500

E MCH 533 **Scanned Image Microscopy** (3) Imaging principles, quantitative data acquisition techniques, and applications for scanned image microscopy are discussed.
Effective: Summer 2003
Prerequisite: E MCH 440

E MCH 534 (MATSE 563) **Micromechanisms of Fracture** (3) Mechanisms of fracture and their relationship to loading conditions, environment, flow behavior, processing history, and microstructure.
Effective: Spring 2003
Prerequisite: E SC 414M, MATSE 424

E MCH 535 (MATSE 564) **Deformation Mechanisms in Materials** (3) Deformation of crystalline/amorphous solids and relationship to structure; elastic, viscoelastic and plastic response over a range of temeratures and strain rates.
Effective: Fall 2004
Prerequisite: E SC 414M orMATSE 436

E MCH 540 **Introduction to Continuum Mechanics** (3) Algebra and analysis of tensors; balance equations of classical physics; the linear theories of continuum mechanics.
Effective: Winter 1978

E MCH 546 **Theory of Viscoelasticity and Applications** (3) Linear and nonlinear viscoelastic theories; generalized isotropic and anisotropic viscoelastic stress-strain relations.
Effective: Winter 1978
Prerequisite: E MCH 507

E MCH 550 **Variational and Energy Methods in Engineering** (3) Application of variational calculus and Hamilton's principle to various conservative and nonconservative systems; closed form and approximate technique.
Effective: Spring 1984
Prerequisite: MATH 251

E MCH 560 **Finite Element Analysis** (3) General theory; application to statics and dynamics of solids, structures, fluids, and heat flow; use of existing computer codes.
Effective: Spring 2008
Prerequisite: E MCH 213

E MCH 562 (A B E 562) **Boundary Element Analysis** (3) Numerical solution of boundary value problems using fundamental solutions; application to problems in potential theory, diffusion, and elastostatics.
Effective: Spring 1996
Prerequisite: A B E 513 orE MCH 461 orE MCH 560

E MCH 563 (M E 563) **Nonlinear Finite Elements** (3) Advanced theory of semidiscrete formulations for continua and structures; emphasizes dynamic and nonlinear problems.
Effective: Spring 1996
Prerequisite: A B E 513, E MCH 461 orE MCH 560

E MCH 570 **Random Vibrations in Structural Mechanics** (3) Probability theory applied to random vibrations of linear and nonlinear systems; excitation by ground motion, turbulence, and noise; acoustic damping.
Effective: Fall 2007
Prerequisite: AERSP 411 orE MCH 470 orE MCH 571

E MCH 571 (AERSP 571, M E 571) **Foundations of Structural Dynamics and Vibration** (3) Modeling approaches and analysis methods of structural dynamics and vibration.
Effective: Fall 2007
Prerequisite: AERSP 304, E MCH 470, M E 450 orM E 470

E MCH 581 **Micromechanics of Composites** (3) A rigorous application of mechanics to the understanding of relationships between microstructure and thermomechanical properties of composites.
Effective: Spring 1990

Prerequisite: CERSC 414 orCERSC 502 orE MCH 408 orE MCH 471 orE MCH 507

E MCH 582 **Metal Matrix Composites** (3) Processing and properties of metal matrix composites, with emphasis on fabrication techniques, interfaces, fatigue, fracture, and micromechanics.
Effective: Fall 1988
Prerequisite: E MCH 471

E MCH 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1996

E MCH 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

E MCH 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

E MCH 597A **Thermo-Mechanics of Shape Memory Alloys** (3) Shape memory alloy fundamentals including crystallography, hysteresis, constitutive modeling of phase transformations: current challenges in bio-medical and high-temperature applications.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E MCH 597B **Experimental Nonlinear Dynamics** (3) This course provides an introduction to the analysis of experimental data from nonlinear dynamical systems.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E MCH 597K **High-Power In-Vehicle Energy Storage** (3) Energy storage components used in hybrid electric and fuel cell vehicles including advanced battery chemistries, ultracapacitors, and flywheels.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E MCH 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

E MCH 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

E MCH 602 (E SC 602) **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) No description.
Effective: Fall 2003

E MCH 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

E MCH 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Engineering Science (E SC)

E SC 400H **Electromagnetic Fields** (3) Irrotational and solenoidal fields, potentials, vector and scalar field and wave equations, harmonic and wave functions in various coordinates, radiation.
Effective: Fall 2003
Prerequisite: E E 210, MATH 250

E SC 404H **Analysis in Engineering Science** (3) Unified application of coordinate transformations; Laplace's, heat, and wave equations to boundary value problems and problems of continua in engineering.
Effective: Spring 2001
Prerequisite: MATH 250 orMATH 251

E SC 405H **Engineering Applications of Field Theory, Honors** (3) Field concepts in engineering, derivation of field equations, mathematical solutions, applications stressing universality of approaches to all fields of engineering.
Effective: Fall 1988
Prerequisite: MATH 250

E SC 406H **Analysis in Engineering Science II, Honors** (3) Application of complex variable theory, integral equations, and the calculus of variations to engineering problems.
Effective: Fall 1983
Prerequisite: E SC 404H

E SC 407H **Computer Methods in Engineering Science, Honors** (3) Numerical solution of differential equations including fundamentals: roots of single nonlinear and simultaneous (Matrix) equations, least squares fitting and staistical goodness, interpolation, finite differences, differentiation, integration, eigensolutions.
Effective: Spring 2007
Prerequisite: CMPSC 201C orCMPSC 201F orE SC 261M Concurrent: MATH 220

E SC 410H **Senior Design Project, Honors** (3) Design and synthesis in the context of a specific design project undertaken during the senior year.
Effective: Summer 1998
Prerequisite: E SC 407H

E SC 411H **Senior Research and Design Project II, Honors** (3) Design and synthesis in the context of a specific design project undertaken during the senior year.
Effective: Spring 2007
Prerequisite: E SC 410H

E SC 414M **Elements of Material Engineering** (3) Structure and imperfections in engineered materials; their influence on properties, behavior, and processing. Applications of metals, ceramics, polymers, and composites.
Effective: Spring 2008
Prerequisite: E MCH 213, E MCH 210H orE MCH 210 . Prerequisite or concurrent:E SC 312 orPHYS 237

E SC 417 (MATSE 417) **Electrical and Magnetic Properties** (3) Electrical conductivity, dielectric properties, piezoelectric and ferroelectric phenomena; magnetic properties of ceramics.
Effective: Summer 2006
Prerequisite: MATSE 400, MATSE 402, PHYS 214

E SC 419 **Electronic Properties and Applications of Materials** (3) The course covers the electrical, optoelectronic, dielectric, and other electron-based properties of solids, semiconductors in particular, and their engineering/ device applications.
Effective: Summer 2006
Prerequisite: E SC 312

E SC 433H **Engineering Science Research Laboratory Experience** (1) Hands-on lab experience and exposure to campus-wide interdisciplinary experimental research. Experimental probability and statistics. Appplications across all Engineering Science disciplines.
Effective: Spring 2007
Prerequisite: MATH 251

E SC 445 **Semiconductor Optoelectronic Devices** (3) The course will present the basic engineering science and technology involved in modern semiconductor optoelectronic devices.
Effective: Spring 2007
Prerequisite: E SC 419 orE SC 314 orE E 368

E SC 450 (MATSE 450) **Synthesis and Processing of Electronic and Photonic Materials** (3) The materials science of applying thin film coatings, etching, and bulk crystal growth; includes materials transport, accumulation, epitaxy, and defects.
Effective: Fall 2005
Prerequisite: MATSE 201 orE SC 414H sixth semester standing

E SC 455 (MATSE 428) **Electrochemical Methods in Corrosion Science and Engineering** (3) The objective of the course is to give students hands-on experience in assessing environmental degradation of engineering materials.
Effective: Spring 2003
Prerequisite: E SC 414M orMATSE 259;MATSE 420 orMATSE 421

E SC 456 (E E 456, EGEE 456) **Introduction to Neural Networks** (3) Artificial Neural Networks as a solving tool for difficult

problems for which conventional methods are not available.
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 202;MATH 220

E SC 475 (MATSE 475) **Particulate Materials Processing** (3) Fundamentals of processing particulate materials including production, characterization, handling, compaction, and sintering of metal, carbide, intermetallic, and composite powders.
Effective: Spring 2008
Prerequisite: E MCH 315, E SC 414 orMATSE 259

E SC 481 **Elements of Nano/Micro-electromechanical Systems Processing and Design** (3) Interdisciplinary fundamentals of nano/microelectromechanical systems (NEMS/ MEMS), including design, fabrication and machining of miniature systems. Draws from mechanics, science and materials.
Effective: Spring 2008
Prerequisite: E MCH 213 orE MCH 315 orE SC 312

E SC 482 **Micro-Optoelectromechanical Systems (MOEMS) and Nanophotonics** (3) Principles and applications of Micro-Optoelectromechanical and Nanophotonic devices and systems.
Effective: Summer 2006
Prerequisite: PHYS 212, PHYS 214

E SC 483 (MATSE 483) **Simulation and Design of Nanostructures** (3) Introduction to computer simulation techniques and their applications at the physical/life sciences interface.
Effective: Fall 2007
Prerequisite: PHYS 214 orE SC 312, MATH 230

E SC 484 **Biologically Inspired Nanomaterials** (3) Advances in biomolecular-based Science and technology at the physical/life sciences interface.
Effective: Summer 2006
Prerequisite: PHYS 214, MATH 230

E SC 494 **Senior Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Summer 1986

E SC 494H **Senior Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Fall 2007

E SC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

E SC 496A **Independent Study: Business Opportunities in Engineering** (1) The principal goal of this course is to inform engineering students of business opportunities in Engineering.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

E SC 497A **Business Opportunities in Engineering** (2) The principal goal of this course is to inform engineering students of business opportunities in Engineering.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 501 **Solid State Energy Conversion** (3) Principles of solid state energy conversion and their utilization in engineering devices. Emphasis on current research and development efforts.
Effective: Spring 2008
Prerequisite: E E 442 orPHYS 412

E SC 502 **Semiconductor Heterojunctions and Applications** (3) Theory, fabrication techniques, and electronic applications of semiconductor heterojunctions, including metal-semiconductor and electrolyte-semiconductor junctions.
Effective: Fall 1989
Prerequisite: E SC 314 orE SC 414M

E SC 511 **Engineering Materials for Energy Conversion and Storage** (3) This course treats engineering materials and systems employed in conventional and unconventional direct energy conversion and energy storage.
Effective: Summer 1981

E SC 514 (E MCH 514) **Engineering Science and Mechanics Seminar** (1 per semester) Current literature and special problems in engineering mechanics.
Effective: Summer 1998

E SC 536 **Wave Propagation and Scattering** (4) Survey of analytical and numerical methods for solving acoustic, electro-magnetic and elastic wave propagation and scattering problems.

Effective: Spring 1988
Prerequisite: E MCH 524A orE MCH 524B

E SC 537 **Multiple Scattering Theories and Dynamic Properties of Composite Materials** (3) Acoustic, dielectric, elastic dynamic properties; periodic, random composites; wave propagation and scattering; attenuation, dispersion; super-viscous absorption; sonar, optical, ultrasonic applications.
Effective: Summer 1988

E SC 540 **Laser Optics Fundamentals** (3) Selected topics in optics and laser physics, and their application in laser-materials processing.
Effective: Spring 2005

E SC 541 **Laser-Materials Interactions** (3) Laser beam interactions with metallic, ceramic, polymeric and biological materials; effects of wavelength, power, spatial and temporal distributions of intensity.
Effective: Spring 2005

E SC 542 **Laser-Integrated Manufacturing** (3) Integration of lasers into manufacturing processes: laser-assisted surface modifications; laser joining; laser-based material shaping processes.
Effective: Spring 2005
Prerequisite: E SC 540, E SC 541

E SC 543 **Laser Microprocessing** (3) Laser microprocessing of engineered and biological materials for electronic, opto-electronic, MEMS and medical/therapeutic applications.
Effective: Spring 2005
Prerequisite: E SC 540, E SC 541

E SC 544 **Laser Laboratory** (3) Laser systems for materials processing, safety, critical processing parameters, diagnostic measurements, automation, sensing and control.
Effective: Spring 2005
Prerequisite: E SC 540, E SC 541

E SC 577 **Engineered Thin Films** (3) Broad overview of the preparation-characterization-porperty relations for thin films used in a wide range of industrial applications.
Effective: Spring 1993
Prerequisite: MATH 251, PHYS 237

E SC 578 (M E 578) **Theory and Applications of Wavelets** (3) Theory and physical interpretation of continuous and discrete wavelet transforms for applications in different engineering disciplines.
Effective: Summer 1999
Prerequisite: M E 550

E SC 581 **Microelectromechanical Systems/Smart Structures** (3) Methods of micromachining, smart structure fabrication. Design, modeling for physical, chemical, biomedical microsensors/actuators. Smart structures and microsystems packaging/integration.
Effective: Spring 1998
Prerequisite: E SC 414

E SC 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1996

E SC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

E SC 596C **Ultrasonic Symposia** (1) Optional 1-credit independent study for research for ultrasonics.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: E SC 597C

E SC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

E SC 597A (MATSE 597D) **Microwave Processing: Theory and Practice** (3) It is the new developments (and innovative ideas) in the area of materialsst processing which have had the most profound and wide-ranging impacts on satisfying the growing and challenging demands for better performing and cheaper products in various fields.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 597B **Brain Computer Interfaces (BCI)** (3) Students will record EEG (electroncephalagrams) and program real-time analysis to control computers, video games and robots.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 597C **Ultrasonic Symposia** (2) Seminars given from a large variety of topics in ultrasonics including theoretical,

computational, research, experimental and practical applications.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 597D **Neural Engineering: Fundamentals of Interfacing with the Brain** (3) This course will give an overview of the field of neural engineering with a focus on the fundamentals of neural interfaces and their applications.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 597E **Neural Control Engineering** (3) Explore the cutting edge of nonlinear state estimation of neuronal systems and the contruction of control algorithms based on state-estimation.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 597F **Biomedical Ultrasonics** (3) Designed for graduate students interested in understanding physical principles of advanced ultrasonic imaging and quantitative data acquisition techniques.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 597G **Neurophysics I: Transport and Mechanics in Brain** (3) Multiscale theoretical and computational modeling of physical processes in brain. I: Chemical reactions, Diffusion, transport, Solid and Fluid Mechanics.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: E SC 407H or equivalent;E SC 404 or equivalent

E SC 597I **Micro-Optoelectromechanical Systems (MOEMS)** (3) Students will learn the fundamental principles behind many novel micro devices and systems and their practical applications.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 597I **Meurophysics II: Electromagnetics and Composite Processes in Brain** (3) Multiscale theoretical and computational modeling of physical processes in brain. II: Electromagnetics, and coupled electromagnetic, transport and mechanical processes.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: E SC 400H, E SC 597G

E SC 597K **Nanotechnology Research, Design and Development** (3) A design course that focuses on technology push rather than the usual market designs of products, processes, systems and services.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E SC 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

E SC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

E SC 602 (E MCH 602) **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) No description.
Effective: Fall 2003

E SC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

E SC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

Last Import from UCM: July 10, 2010 3:00 AM

Engineering Tech (ET)

ET 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written or oral critique of activity required.
Effective: Fall 2007
Prerequisite: prior approval of proposed assignment by instructor

ET 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2007

ET 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2007

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Engineering/Laser Operation (ELOP)

No courses for department code **ELOP** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

English (ENGL)

ENGL 400 **Authors, Texts, Contexts** (3 per semester, maximum of 6) Styles, cultural milieus, critical perspectives toward particular English- language authors and/or movements they represent, and the idea of authorship. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 401 **Studies in Genre** (3 per semester, maximum of 6) English-language texts exemplifying particular genres, with attention to critical theories, historical development, rhetorical strategies, and social, cultural, and aesthetic values. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 401H **Studies in Genre** (3 per semester, maximum of 6) English-language texts exemplifying particular genres, with attention to critical theories, historical development, rhetorical strategies, and social, cultural, and aesthetic values. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ENGL 015 orENGL 030

ENGL 401W **Creative Writing Theory** (3) Theories of art and creativity which inform the making of literary works.
Effective: Fall 2007
Prerequisite: ENGL 200;ELISH 201, ELISH 209, ENGL 212 orENGL 213

ENGL 402 **Literature and Society** (3 per semester, maximum of 6) Texts confronting social, political, technological, or other issues in the English-speaking world. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 403 **Literature and Culture** (3 per semester, maximum of 6) Historical, theoretical, and practical issues within cultural studies in relation to English-speaking texts. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 404 **Mapping Identity, Difference, and Place** (3 per semester, maximum of 6) Ethnicity, gender, class, race with reference to theoretical inquiry into identity, difference, and place in English-language literatures. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 405 **Taking Shakespeare From Page to Stage** (3) Students experience a Shakespeare play as a text to be explicated and as a script to be performed.
Effective: Summer 2003
Prerequisite: permission of program

ENGL 407 **History of the English Language** (3) Historical and structural study of developments in English sounds, forms, inflections, syntax, derivations, and meanings.
Effective: Spring 1987
Prerequisite: ENGL 100;ENGL 202A, ENGL 202B, ENGL 202C orENGL 202D

ENGL 409 **Composition Theory and Practice for Teachers** (3) An overview of the theory and practice of writing for teachers, with emphasis on the writing process.
Effective: Summer 2000
Prerequisite: permission of the program Concurrent: EDUC 452

ENGL 410 **Postnuclear Literature** (3) Examines the impact of the bomb on the literature of the period.
Effective: Spring 2008
Prerequisite: ENGL 015 orENGL 030

ENGL 411 **Problems of Style** (3) Analysis and practice of English prose styles.
Effective: Spring 1987
Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C orENGL 202D;ENGL 212, ENGL 213 orENGL 215

ENGL 412 **Advanced Fiction Writing** (3 per semester/maximum of 6) Advanced study of the techniques of fiction writing; regular practice in writing the short story; group discussion of student work.
Effective: Spring 1992
Prerequisite: ENGL 212 and permission of the department

ENGL 413 **Advanced Poetry Writing** (3 per semester/maximum of 6) Advanced study of the techniques of poetic composition; regular practice in writing poetry; group discussion of student work.
Effective: Spring 1992
Prerequisite: ENGL 213 and permission of the department

ENGL 414 **Biographical Writing** (3) Writing of biography and autobiography, character sketches, "profiles," and literary portraits; analysis and interpretations of source materials.
Effective: Spring 1987
Prerequisite: ENGL 200, ENGL 202B, ENGL 210, ENGL 212 orENGL 215

ENGL 415 **Advanced Nonfiction Writing** (3 per semester/maximum of 6) Advanced study of the principles of nonfiction; substantial practice in writing and submitting magazine articles for publication.
Effective: Spring 1992
Prerequisite: ENGL 215 and permission of the department

ENGL 416 **Science Writing** (3 per semester/maximum of 6) Prepares scientists and writers to gather, interpret, and present scientific information to the layman with clarity and accuracy.
Effective: Spring 2001
Prerequisite: COMM 260W, ENGL 202C, ENGL 210, ENGL 215 orENGL 421

ENGL 417 **The Editorial Process** (3) The process of editing from typescript through final proof.
Effective: Fall 1987
Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, ENGL 202D, ENGL 210, ENGL 215 orENGL 410

ENGL 418 **Advanced Technical Writing and Editing** (3 per semester/maximum of 6) Preparing and editing professional papers for subject specialists and for others interested in careers as writers or editors.
Effective: Fall 1987
Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C, ENGL 202D orENGL 215

ENGL 419 **Advanced Business Writing** (3) Preparing and editing reports and presentations common to business, industry, and government.
Effective: Fall 1987
Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C orENGL 202D

ENGL 420 **Writing for the Web** (3) Analysis and composition of informative, persuasive, and "creative" Web texts, based on rhetorical principles; no prior Web writing experience required.
Effective: Spring 2002
Prerequisite: ENGL 015 orENGL 030

ENGL 421 **Advanced Expository Writing** (3) Develops skill in writing expository essays, with particular attention to style. Intended for liberal arts majors.
Effective: Spring 1987
Prerequisite: ENGL 202A, ENGL 202B, ENGL 202C orENGL 202D

ENGL 422 **Fiction Workshop** (3 per semester/maximum of 6) Practice and criticism in the composition of the short story and the novel.
Effective: Spring 1985
Prerequisite: ENGL 412

ENGL 423 **Poetry Writing Workshop** (3 per semester/maximum of 6) Extensive practice in writing poetry; consideration of contemporary poetic forms; selected readings.
Effective: Spring 1985
Prerequisite: ENGL 413

ENGL 425 **Nonfiction Workshop** (3 per semester/maximum of 6) Extensive writing of nonfiction for publication; an introduction to the principles of writing the nonfiction book.
Effective: Spring 1985
Prerequisite: ENGL 415

ENGL 426 (US) (LTNST 426) **Chicana and Chicano Cultural Production: Literature, Film, Music** (3) An in-depth study of Chicana/Chicano literature, film, and music from the inception of the Chicano Movement (1965-1975) to the present.
Effective: Spring 2007
Prerequisite: 3 credits in English

ENGL 427 (J ST 427) **Topics in Jewish American Literature** (3) An in-depth examination of important themes, writers, and/or historical developments in Jewish Literature of the United States.
Effective: Spring 2009
Prerequisite: ENGL 015 orENGL 030;J ST 132 orCMLIT 110

ENGL 428 (US) (AAS 428) **Asian American Literatures** (3 per semester/maximum of 6) A seminar on the literatures and cultures of Asian America, with attention to forms of geographic, historical, and ethnic diversity.
Effective: Summer 2010

ENGL 429 (CMLIT 429) **New Media and Literature** (3) New media literary genres; critical discussion of creative works in digital media.
Effective: Summer 2010

ENGL 430 **The American Renaissance** (3) Studies in the works and the interrelationships of writers such as Emerson, Hawthorne, Poe, Thoreau, Whitman, Melville, and Dickinson.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 430H **The American Renaissance** (3) Studies in the works and the interrelationships of writers such as Emerson, Hawthorne, Poe, Thoreau, Whitman, Melville, and Dickinson.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ENGL 015 orENGL 030

ENGL 431 (US) (AM ST 475) **Black American Writers** (3 per semester, maximum of 6) A particular genre or historical

period in the development of Black American literature.
Effective: Fall 2007
Prerequisite: ENGL 015 orENGL 030

ENGL 432 **The American Novel to 1900** (3) Such writers as Hawthorne, Melville, Stowe, Mark Twain, James, Crane, Chopin, and others.
Effective: Spring 1992
Prerequisite: ENGL 015 orENGL 030

ENGL 433 **The American Novel: 1900-1945** (3) Such writers as Wharton, Dreiser, Cather, Fitzgerald, Faulkner, Hemingway, Hurston, Wright, and others.
Effective: Spring 1992
Prerequisite: ENGL 015 orENGL 030

ENGL 434 (AM ST 472) **Topics in American Literature** (3 per semester) Focused study of a particular genre, theme, or problem in American literature. (May be repeated for credit.)
Effective: Fall 2007
Prerequisite: 6 credits of ENGL ENLSH or LIT

ENGL 435 **The American Short Story** (3) Development of the short story as a recognized art form, with emphasis on major writers.
Effective: Spring 1984
Prerequisite: ENGL 015 orENGL 030

ENGL 436 **American Fiction Since 1945** (3) Representative fiction by such writers as Barth, Bellow, Ellison, Heller, Mailer, Morrison, Nabokov, Oates, O'Connor, Pynchon, Updike, Walker.
Effective: Spring 1992
Prerequisite: ENGL 015 orENGL 030

ENGL 437 **The Poet in America** (3) American poets such as Bradstreet, Taylor, Poe, Emerson, Whitman, Dickinson, Frost, Eliot, Stevens, Hughes, Brooks, Moore, Williams, Plath, Rich, Lowell.
Effective: Spring 1992
Prerequisite: ENGL 015 orENGL 030

ENGL 438 **American Drama** (3) Development from the colonial period to playwrights such as O'Neill, Wilder, Hellman, Miller, Williams, Albee, Shepard, Norman, Wilson, and others.
Effective: Spring 1992
Prerequisite: ENGL 015 orENGL 030

ENGL 439 **American Nonfiction Prose** (3) Major prose writers such as Franklin, Emerson, Thoreau, Fuller, Henry Adams, Mailer, Baldwin, McCarthy, Dillard, Didion, Angelou, and others.
Effective: Spring 1992
Prerequisite: ENGL 015 orENGL 030

ENGL 440 **Studies in Shakespeare** (3) Intensive study of a single genre, topic, or critical approach to selected plays.
Effective: Summer 1991
Prerequisite: ENGL 015 orENGL 030

ENGL 441 **Chaucer** (3) The principal narrative poems and their background.
Effective: Spring 1984
Prerequisite: ENGL 015 orENGL 030

ENGL 442 **Medieval English Literature** (3) Study of major works and genres of medieval English literature, exclusive of Chaucer.
Effective: Spring 1992
Prerequisite: ENGL 015 orENGL 030

ENGL 443 **The English Renaissance** (3) Such writers as More, Sidney, Spenser, Shakespeare, Donne, Jonson, Bacon, and Marvell.
Effective: Spring 1984
Prerequisite: ENGL 015 orENGL 030

ENGL 444 **Shakespeare** (3) Selected tragedies, comedies, and histories.
Effective: Spring 1984
Prerequisite: ENGL 015 orENGL 030

ENGL 445 **Shakespeare's Contemporaries** (3) Selected plays by Shakespeare's major predecessors and contemporaries: Kyd, Marlowe, Jonson, Webster, Marston, Middleton, and others.
Effective: Spring 1984
Prerequisite: ENGL 015 orENGL 030

ENGL 446 **Milton** (3) Analysis of principal poems and their background.
Effective: Spring 1984
Prerequisite: ENGL 015 orENGL 030

ENGL 447 **The Restoration and the Eighteenth Century** (3) The neoclassical age (1660-1776). Such writers as Dryden, Congreve, Swift, Pope, Fielding, Goldsmith, Sheridan, Boswell, Johnson.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 448 **The English Novel to Jane Austen** (3) Novelists such as Defoe, Richardson, Fielding, Smollett, Sterne, and

Austen.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 449 (US;IL) **Women Poets** (3) Study of major writings by women poets; instructor chooses emphasis, language, and period.
Effective: Fall 2007
Prerequisite: ENGL 002 orENGL 003 orENGL 167 orENGL 194;ENGL 015 orENGL 030

ENGL 450 **The Romantics** (3) Poets such as Blake, Wordsworth, Coleridge, Keats, Shelley, and Byron; also prose by writers such as Hazlitt, Lamb, and DeQuincey.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 451 **Literary Modernism in English** (3) Survey of literary modernism in English and English translation in a variety of genres, including poetry, fiction, and drama.
Effective: Fall 2007
Prerequisite: ENGL 015 orENGL 030;ENGL 200, ELISH 300 orELISH 301

ENGL 452 **The Victorians** (3) Poets such as Tennyson, Browning, Arnold, and Hopkins; also prose by writers such as Carlyle, Mill, Ruskin, and Arnold.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 453 **Victorian Novel** (3) Novelists such as the Brontes, Thackeray, Dickens, George Eliot, Meredith, and Hardy.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 454 **Modern British and Irish Drama** (3) From Wilde and Shaw to the present season.
Effective: Fall 2004
Prerequisite: ENGL 015 orENGL 030

ENGL 455 **Topics in British Literature** (3) Focused study of a particular genre, theme, or problem in British literature. (May be repeated for credit.)
Effective: Fall 2001
Prerequisite: 6 credits of ENGL ENLSH or LIT

ENGL 456 **British Fiction, 1900-1945** (3) Major writers such as Conrad, Lawrence, Mansfield, Forster, Joyce, Woolf, Waugh, Greene, Bowen, Beckett, and others.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 457 **British Fiction Since 1945** (3) Readings in British fiction since World War II.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 458 **Twentieth-Century Poetry** (3) Poets writing in English such as Yeats, Pound, Eliot, Frost, Auden, Stevens, Plath, Bishop, Brooks, H.D., and others.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 461 (US) **The Vernacular Roots of African American Literature** (3) The relationship between oral tradition and literary texts and the double consciousness of African American voice in "print."
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

ENGL 462 (US) (WMNST 462) **Reading Black, Reading Feminist** (3) Female identity and its construction in textual representations of gender, class, color, and cultural difference in English-language literatures.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

ENGL 463 (US) **African American Autobiography** (3) The African American literary quest for identity and its adaptation to Euro-American culture and autobiographies.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

ENGL 466 (US) **African American Novel I** (3) Thematic, structural, and stylistic characteristics of the African American novel from residually oral forms to satiric realism.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

ENGL 467 (US) **African American Novel II** (3) Thematic, stylistic, and structural characteristics of the African American novel from naturalism to modernism and postmodernism.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

ENGL 468 (US) **African American Poetry** (3) African American poetry within the contexts of the black oral tradition and transformed European literary tradition.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

ENGL 469 (US) (AAA S 469) **Slavery and the Literary Imagination** (3) The impact of slavery on the petitions, poetry, slave narratives, autobiographies, and novels of African Americans.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

ENGL 470 **Rhetorical Theory and Practice** (3) Application of certain rhetorical principles to problems in composition. Writing exercise. Designed as preparation for the teaching of composition.
Effective: Spring 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 471 **Rhetorical Traditions** (3 per semester, maximum of 6) Introduces major traditions of rhetorical inquiry and their relevance for English studies. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 472 **Current Theories of Writing and Reading** (3 per semester, maximum of 6) Investigates models of textual production and reception current within English studies. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 473 **Rhetorical Approaches to Discourse** (3 per semester, maximum of 6) Practices the criticism of written texts from selected rhetorical perspectives. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 474 **Issues in Rhetoric and Composition** (3 per semester, maximum of 6) Examines selected topics in the field of rhetoric and composition. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 1997
Prerequisite: ENGL 015 orENGL 030

ENGL 474H **Issues in Rhetoric and Composition** (3 per semester, maximum of 6) Examines selected topics in the field of rhetoric and composition. (Section subtitles may appear in the Schedule of Courses.)
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ENGL 015 orENGL 030

ENGL 477 **Teaching Children's Literature** (3) Teaching Children's Literature in light of recent literary pedagogy, the history of childhood, and critical approaches to Children's Literature.
Effective: Fall 2007
Prerequisite: ENGL 202

ENGL 479 **Business or Technical Writing Practicum** (1-3) Practical experience applying business or technical writing principles, working with advanced business, science, or engineering students on classroom projects.
Effective: Fall 2007
Prerequisite: Prerequisite or concurrent:ENGL 418 orENGL 419

ENGL 480 **Communication Design for Writers** (3) This course explores visual design, non-verbal communication, and software packages used in professional settings to most effectively present written communications.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030;ENGL 202A, ENGL 202B, ENGL 202C orENGL 202D ; 7th semester standing or higher

ENGL 481 **Literary Theory: Historical Perspectives** (3) Selected topics in the history of literary criticism and theory within the English-language tradition.
Effective: Summer 1994
Prerequisite: ENGL 015 orENGL 030

ENGL 482 **Contemporary Literary Theory and Practice** (3 per semester, maximum of 6) Contemporary literary theories and their implication for critical practice as applied to British, American, and other English-language literary works.
Effective: Summer 1992
Prerequisite: ENGL 015 ORENGL 030

ENGL 482W **Contemporary Literary and Cultural Theory** (3) Contemporary literary and cultural theories and their implication for critical practice as applies to a variety of texts, e.g. literary, linguistic, visual, multimedia, and/or popular.
Effective: Fall 2007
Prerequisite: ENGL 015 orENGL 030H;ENGL 200

ENGL 483 **Problems in Critical Theory and Practice** (3) Intensive study of one or more recent theoretical approaches as applied to British, American, and other English-language literary works.
Effective: Summer 1994
Prerequisite: ENGL 015 orENGL 030

ENGL 484 **James Joyce** (3) Analysis of principal works and their background.
Effective: Fall 2007
Prerequisite: ENGL 002;ENGL 015 orENGL 030

ENGL 485 **Australian and New Zealand Literature and Culture** (3) Questions of nationality, identity, gender, race, class, colonialism, and postcolonialism in these literatures.
Effective: Summer 1995
Prerequisite: ENGL 015 orENGL 030

ENGL 486 (IL) **The World Novel in English** (3) Studies in the novel, written in English, by writers outside of the United States and Great Britain.

Effective: Fall 2007
Prerequisite: ENGL 002;ENGL 015 orENGL 030

ENGL 487W **Senior Seminar** (3) Issues, themes, periods, critical theories, etc., that invite students to use prior English studies, limited to seniors majoring in English.
Effective: Summer 1997
Prerequisite: six credits of 400-level courses in English

ENGL 488 (IL) (CMLIT 488) **Modern Continental Drama** (3) From Ibsen to the drama of today: Strindberg, Chekhov, Hauptmann, Pirandello, Ionesco, Beckett, Genet, and others.
Effective: Spring 2006
Prerequisite: ENGL 015 orENGL 030

ENGL 489 (WMNST 489) **British Women Writers** (3) A study of selected British women writers.
Effective: Spring 2008
Prerequisite: 6 credits of ENGL

ENGL 490 (US;IL) (WMNST 490) **Women Writers and Their Worlds** (3) American and British literature written from the perspective of women.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

ENGL 491 **The Capstone Course in Professional Writing** (3) This culminating course for Professional Writing majors concentrates on reflective analyses, design, and presentation of documents in the development of professional portfolios.
Effective: Summer 2004
Prerequisite: ENGL 015 orENGL 030;ENGL 202A, ENGL 202B, ENGL 202C orENGL 202D ;seventh-semester standing or higher; enrollment in Professional Writing major

ENGL 492 (AM ST 476, WMNST 491) **American Women Writers** (3) A study of selected American women writers.
Effective: Spring 2008
Prerequisite: 6 credits of ENGL

ENGL 493 (AM ST 493) **The Folktale in American Literature** (3) A survey of the literary uses of the folktale and legendary materials, with particular concentration on the literature of America.
Effective: Spring 1986
Prerequisite: ENGL 015 orENGL 030

ENGL 494 **Senior Thesis in English** (1-6) Senior English (ELISH) majors write a thesis arranged with in-charge person and submit it to a faculty committee for appraisal.
Effective: Fall 2007
Prerequisite: seventh-semester standing

ENGL 494H **Senior Thesis in English** (1-6) Senior English (ELISH) majors write a thesis arranged with in-charge person and submit it to a faculty committee for appraisal.
Effective: Fall 2007
Prerequisite: seventh-semester standing

ENGL 495 **Internship** (3-12) Supervised practicum in fields appropriate to the English major.
Effective: Spring 2001

ENGL 496 **Independent Studies** (1-18) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

ENGL 496A **American Nonfiction Prose** (1-6) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGL 496B **Naipaul and Joyce** (3) Opportunity to extend an essay written for a previous class, conducting additional research and expanding the analysis to include larger segments of the two short story collections considered.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGL 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

ENGL 497A **Radical Literary Innovation in the English Renaissance** (3) This course will explore a variety of startling developments in English Renaissance literature.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGL 497B **Mont Alto Film Project III** (3) Practicum in filmmaking, Part III of IV covers principle photography and production for a full-length feature film.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGL 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

ENGL 499 (IL) **Foreign Study--English** (3-6) Studies abroad in English language and/or literature.
Effective: Summer 2005

ENGL 501 **Materials and Methods of Research** (3) Materials and techniques of research in English and American literary history; form and content of these. Required of all graduate students with an English major.
Effective: Fall 1983

ENGL 502 **Theory and Teaching of Composition** (3) Study of grammar, logic, rhetoric, and style in their applicability to teaching composition.
Effective: Winter 1978

ENGL 503 (LL ED 503) **Research Methods in Composition** (3) Introduction to the issues and methods of empirical research in composition.
Effective: Fall 1993

ENGL 504 **Rhetoric and Poetics** (3) Historical relations between rhetorical theory and poetics; approaches to rhetorical criticism of poetic discourse.
Effective: Summer 1995

ENGL 506 **The English Language** (3) A problem-centered approach to literary and oral forms of English, utilizing historical and analytic perspectives.
Effective: Winter 1978

ENGL 507 **English Composition Studies** (3) An overview of composition studies, with particular attention to the schools of writing pedagogy.
Effective: Spring 2001
Prerequisite: EDUC 452, ENGL 409 Bachelor's degree permission of the program

ENGL 508 **Computer Applications for Writers and Humanities Scholars** (3) Computer applications for writers and humanities scholars: introduction to terminal-editing, retrieval, bibliographic, and textual analysis systems.
Effective: Fall 1983

ENGL 510 **Scholarly Editing: Theory and Practice** (3) Study of editorial theory from McKerrow and Greg to the present; experience in scholarly editing and manuscript study.
Effective: Fall 1989
Prerequisite: ENGL 501

ENGL 511 **Thesis Workshop and Professional Writing** (3) Professional writing for graduate students.
Effective: Summer 2008

ENGL 512 **The Writing of Fiction** (3 per semester/maximum of 15) Supervised workshop in advanced techniques of writing fiction.
Effective: Fall 1996

ENGL 513 **The Writing of Poetry** (3 per semester/maximum of 15) For the student with considerable experience in writing poetry; a workshop devoted to advanced poetic technique.
Effective: Fall 1996

ENGL 515 **The Writing of Nonfiction** (3 per semester/maximum of 15) Supervised workshop in advanced nonfiction techniques.
Effective: Fall 1996

ENGL 518 **Business and Technical Writing: Current Theory** (3) Intensive examination of current theories and practice in business and technical communication; written projects exploring specific theories and problems.
Effective: Fall 1982

ENGL 521 **Old English Language** (3) An introduction to the main features of the Old English language; readings in simple Old English prose and poetry.
Effective: Winter 1978

ENGL 522 **Beowulf** (3) Reading and critical analysis.
Effective: Winter 1978
Prerequisite: ENGL 521

ENGL 530 **The Literature of Biography and Autobiography** (1-3 per semester, maximum of 6) Study of biographical and autobiographical theory and practice through analysis of major English and American works in each genre.
Effective: Spring 1992

ENGL 540 **Studies in Elizabethan Prose and Poetry** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year. Writers studied might include figures such as Spenser and Sidney.
Effective: Summer 1997

ENGL 541 **Medieval Studies** (1-3 per semester, maximum of 12) Studies in medieval English literature. Topics studied might include medieval romances, drama, or major figures aside from Chaucer.
Effective: Summer 1997

ENGL 542 **Middle English Literature** (3) Introduction to Middle English and its dialects; study of the literature of the period exclusive of Chaucer.
Effective: Winter 1978

ENGL 543 **Studies in Early Seventeenth-Century Literature** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year. Writers studied might include Donne, Herbert, Jonson, Bacon.
Effective: Summer 1997

ENGL 545 **Chaucer** (1-3 per semester, maximum of 12) Major and minor works of Geoffrey Chaucer. The works studied will vary from year to year.
Effective: Summer 1997

ENGL 546 **Milton** (3) The poetry and prose of John Milton.
Effective: Winter 1978

ENGL 548 **Elizabethan and Jacobean Drama** (1-3 per semester, maximum of 12) English drama from 1558 to 1642, exclusive of Shakespeare.
Effective: Summer 1997

ENGL 549 **Shakespeare** (1-3 per semester, maximum of 12) Special problems of sources, chronology, text, characterization, and motivation in the drama.
Effective: Summer 1997

ENGL 550 **English Literature 1660-1800** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year. Writers studied might include Dryden, Swift, Pope, Johnson, Fielding, Gibbon.
Effective: Summer 1997

ENGL 551 **English Drama 1660-1800** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year. Writers studied might include Wycherley, Farquahar, Dryden, Congreve, Etherege.
Effective: Summer 1997

ENGL 553 **Literacy Studies** (3) An overview of current research on literacy, with particular attention to language, thought, and learning and their applications to writing.
Effective: Spring 2001
Prerequisite: EDUC 452 orENGL 409 ; Bachelor's Degree and permission of program

ENGL 554 **Studies in Early American Literature** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year. Writers studied might include Bradstreet, Taylor, Mather, Franklin, Edwards, Paine.
Effective: Summer 1997

ENGL 556 **Eighteenth-Century British Fiction** (1-3 per semester, maximum of 12) Major figures studied might include Defoe, Smollet, Fielding, Richardson, Sterne.
Effective: Summer 1997

ENGL 558 **Nineteenth-Century British Fiction** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year. Writers studied might include Dickens, Thackeray, the Brontes, George Eliot, Hardy.
Effective: Summer 1997

ENGL 559 **Studies in Twentieth-Century British Fiction** (1-3 per semester, maximum of 12) Major figures studies will vary from year to year. Writers studied might include Conrad, Lawrence, Woolf, Huxley, Green, Fowles.
Effective: Summer 1997

ENGL 560 **American Romanticism** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year.

Writers studied might include Hawthorne, Melville, Emerson, Thoreau, Whitman.
Effective: Summer 1997

ENGL 561 **Studies in the Romantic Movement** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year. Writers studied might include Blake, Wordsworth, Coleridge, Byron, Shelley, Keats.
Effective: Summer 1997

ENGL 562 **Studies in the Literature of Victorian England** (1-3 per semester, maximum of 12) Figures will vary from year to year. Writers studied might include Tennyson, Browning, Arnold, Newman, Ruskin, Trollope.
Effective: Summer 1997

ENGL 563 **Composition Research Methodology and Methods** (3) Current methodology and methods for composition research.
Effective: Spring 2001
Prerequisite: EDUC 452, ENGL 409, ENGL 507, ENGL 553 permission of the program

ENGL 564 **Studies in Nineteenth-Century American Literature** (1-3 per semester, maximum of 12) Writers will vary from year to year. Writers studied might include Cooper, Poe, Dickinson, Twain, James.
Effective: Summer 1997

ENGL 565 **Period Studies in African-American Literature** (3 per semester/maximum of 9) Studies of periods in African-American literature. Periods might include the Harlem Renaissance or the Black Arts Movement.
Effective: Spring 1998

ENGL 566 **Genre Studies in African-American Literature** (3 per semester/maximum of 9) Genre will vary from year to year, but will include categories such as poetry, fiction, essays, sermons, autobiographies, short stories.
Effective: Spring 1998

ENGL 567 **Thematic Studies in African-American Literature** (3 per semester/maximum of 9) Exploration of key concepts in African-American culture as manifested in various literary discourses.
Effective: Spring 1998

ENGL 568 **Gender Issues in African-American Literature** (3 per semester/maximum of 9) Gender issues in African-American literature and culture. Issues may include the Black woman writer or Gay and Lesbian writers.
Effective: Spring 1998

ENGL 570 **The Writer as Critic: Reviewing Contemporary Poetry, Fiction, and Non-Fiction** (3) Students will write and revise book reviews of poetry, fiction, and non-fiction for a variety of newspapers and literary magazines.
Effective: Summer 2002

ENGL 571 **Writer in the Community** (3) Students study the theory and practice of creative writing pedagogy in non-university settings.
Effective: Summer 2009

ENGL 573 **Studies in Twentieth-Century British Literature** (1-3 per semester, maximum of 12) Major figures studied will vary from year to year. Writers studied might include Yeats, Conrad, Joyce, Shaw, Lawrence, Auden.
Effective: Summer 1997

ENGL 574 **Studies in Twentieth-Century American Literature** (1-3 per semester, maximum of 12) Figures studied will vary from year to year. Writers studied might include Dreiser, Wharton, Eliot, Hemingway, Fitzgerald, Faulkner, O'Neill, Williams.
Effective: Summer 1997

ENGL 575 **Experimentation and Modernism in Twentieth-Century British and American Fiction** (1-3 per semester, maximum of 12) Figures studied will be drawn from the era of Joyce and Virginia Woolf to the present.
Effective: Summer 1997

ENGL 576 **Studies in Twentieth-Century American Fiction** (1-3 per semester, maximum of 12) Concentrated study in such major American writers as Hemingway, Faulkner, and Fitzgerald.
Effective: Summer 1997

ENGL 577 **Contemporary Fiction** (1-3 per semester, maximum of 12) Exploration of contemporary English language fiction.
Effective: Summer 1997

ENGL 578 **Studies in Modern British Drama** (1-3 per semester, maximum of 12) Figures studied will be drawn from the

era of Shaw and Wilde to the present.
Effective: Summer 1997

ENGL 581 **Modern American and British Criticism to 1965** (1-3 per semester, maximum of 12) Study of modern literary criticism to 1965, with emphasis on such figures as Winters, Richards, Eliot, and Frye.
Effective: Summer 1997

ENGL 582 **Survey of Contemporary Literary Theory** (3) Exploration of the dimensions of discourse as reflected in recent theories of rhetoric, poetics, and literary criticism.
Effective: Summer 1990

ENGL 583 **Studies in Critical Theory** (1-3 per semester/maximum of 12) Study of specific contemporary critical approaches to literature and application to English and/or American literary works.
Effective: Summer 1997

ENGL 584 **Studies in Rhetoric** (1-3 per semester/maximum of 12) Specific rhetorical problems, issues, or figures; topics will change from year to year.
Effective: Summer 1997

ENGL 585 **Studies in British Fiction** (1-3 per semester, maximum of 6) No description.
Effective: Spring 1988

ENGL 585 **Studies in British Fiction** (1-3 per semester, maximum of 12) No description.
Effective: Spring 1997

ENGL 586 **Readings in Literature** (1-12) Programs of readings designed to meet specific needs of individual students.
Effective: Winter 1978

ENGL 588 **Studies in American Fiction** (1-3 per semester, maximum of 12) No description.
Effective: Summer 1997

ENGL 589 **Studies in American Poetry** (1-3 per semester, maximum of 12) No description.
Effective: Summer 1997

ENGL 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1996

ENGL 596 **Individual Studies** (1-12) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2009

ENGL 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

ENGL 597A **Article Writing** (3) This seminar has two goals. One is serious revision of an article toward publication. That means at least one complete revision and probably two during a short period of time. For this you have to have a potentially publishable paper in hand. Part of the class time will be spend workshopping your writing. The second goal is increasing your professionalism. We will investigate such topics as grant writing, what you want your CV to look like by the time you go on the market, skills you should be acquiring, and the economics of publishing scholarly monographs.
Effective: Summer 2010 Ending: Summer 2010

ENGL 597A **Aristotle and Rhetorical Studies** (3) This graduate seminar will devote an entire semester to Aristotle's Rhetoric, arguably the most resilent and proliferating single work in rhetorical studies. Such a sustained study assumes 1) that The Rhetoric should not be read quickly, and 2) that it cannot be read in isolation, so we will read the treatise chapter by chapter and alongside other texts--Aristotelian and non-Aristotelian, ancient and contemporary. The aim of the course is to investigate the historical, cultural, and disciplinary conditions that have given Aristotle such a prominent place in rhetorical studies; how Aristotle's notions of rhetoric formed in relation to other theories of rehtoric in play and prior to the classical period; and how Aristotelian arguments and concepts have served to delimit and produce what scholars of rhetoric study and teach these days.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGL 597A **Rhetoric in Contact Zones** (3) Two decades ago, Mary Louise Pratt advanced the notion of contact zones as social spaces where cultures meet and clash.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 597B **The 1930's from Left to Right** (3) The course will introduce students to the literature, culture, and politics of this relevant decade.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGL 597B **Modernism and World War II in the UK** (3) About UK writing of the World War II era, including most important late work by modernists.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 597C (J ST 597C) **Avant-Jew: Jewish American Literature and the Theory of U.S. Identity** (3) This ocurse will examine key texts from the canon of Jewish American literature (mostly from the 20th century).
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGL 597C **The Ethics of Ghostliness in Contemporary Ethnic American Literatures** (3) Examine validity ghost stories by looking at the specters that haunt contemporary Ethnic American literary production and more.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 597D **Victorian Poetry** (3) This course will introduce students to the poetry and poetic theory of the Victorian period.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENGL 597D **The Human and Its Discontents in English Renaissance Literature** (3) Covers seeming clarity of species definition, the relationship between the human and other forms of life is vexed one.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 597E **Craft Studies: The Contempary Novel** (3) Focuses on studying issues of craft in contemporary novels, from first person coming of age stories to polyphonic, metafictional narratives.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 597F **Gothic and Goth** (3) Will explore the Gothic tradition since its inception in the second half eighteenth century and continuing into our own time.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 597G **Evolutionary Rhetorics of Science: Open Source Practices in Biosemiotics** (3) Seminar collectively investigates and test models from scientific discourse for the evolution of rhetorical faculties in a variety of forms.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 597I **Proseminar in African and American Literature** (3) Course will consider works by African American novelists, poets, dramatists, and essayists, among other topics.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 597K **Giorgio Agamben** (3) Examines eclectic philosphy of Giorgio Agamben to understand the broader theoretical milieu and political context of his work.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENGL 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

ENGL 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

ENGL 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Fall 1983

ENGL 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2000

ENGL 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

ENGL 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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English as a Second Language (ESL)

ESL 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2004

ESL 497A **Thesis/Dissertation Writing** (3) Students will develop language awareness through investigating dissertations to use the language and discourse structures approporiate for their field.
Effective: Summer 2010 Ending: Summer 2010

ESL 497B **Academic Presentations for Non-native English-Speakers** (3) This course is designed to help non-native English speaking graduate students in planning and conducting oral presentations within academic settings.
Effective: Summer 2010 Ending: Summer 2010

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Entomology (ENT)

ENT 402W (VB SC 402W) **Biology of Animal Parasites** (3) An introduction to animal parasitology. Emphasizes placed on host/parasite interactions, parasites of zoonotic importance, control programs and taxonomy.
Effective: Spring 2010
Prerequisite: BIOL 110

ENT 410 **Insect Structure and Function** (3) Integrated physiology and anatomy of insects; emphasis on unique adaptations, genetic regulation of development, insects as model systems, environmental physiology.
Effective: Summer 1994
Prerequisite: BIOL 110, BIOL 220W, BIOL 230W, BIOL 240W

ENT 412 **Insect Taxonomy** (3) Identification and classification of insects to family level; introduction to insect phylogeny, life history, and evolution.
Effective: Fall 2001
Prerequisite: BIOL 110, BIOL 220W

ENT 420 **Introduction to Population Dynamics** (3) Principles of population regulation, demographic analysis, modeling of dynamic processes are discussed; laboratories involve the exploration of population growth models.
Effective: Summer 1994
Prerequisite: BIOL 110, BIOL 220W

ENT 425 **Freshwater Entomology** (3) Collection and identification of insects and other arthropods in freshwater ecosystems; field study of habitats.
Effective: Fall 2000

ENT 430 (BIOL 430, B M B 430) **Developmental Biology** (3) Molecular and genetic analyses of mechanisms involved in differentiation and determination in biological systems.
Effective: Summer 1994
Prerequisite: BIOL 222;B M B 252 orBIOL 230W

ENT 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

ENT 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

ENT 497B **Insect Behavior and Neur** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENT 497D **Insection Connection Education** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENT 497E **Insect Natural History** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENT 539 **Chemical Ecology of Insects** (3) Interactions of insects with environmental chemicals, including natural and synthetic compounds; host finding and other behavior modifying cues.
Effective: Spring 1986

ENT 542 (BIOL 542, W F S 542) **Systematics** (3) Principles and methods of classification, phylogeny, and speciation; taxonomic techniques; analysis of species; causal interpretation of animal diversity.
Effective: Summer 1990

ENT 543 **Biological Control and Pathology of Insects** (3) Arthropod population control by entomogenous insects and microorganisms.
Effective: Spring 1986
Prerequisite: Consent of program

ENT 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

ENT 593 (ANTH 593, BIOL 593) **Tropical Field Studies (Organization for Tropical Studies)** (8) An intensive field course concentrating on field problems, experimental design, and data analysis in tropical habitats.
Effective: Summer 1993
Prerequisite: approval by the Committee on Tropical Studies

ENT 595 **Internship** (10-12) Supervised field experience and study related to the student's major professional interest. Written and oral critique of activity required. Limited to Master of Agriculture degree in entomology.
Effective: Spring 1987
Prerequisite: approval of proposed assignment by adviser prior to registration; cumulative GPA of 3.0 or higher; completion of entomology core courses

ENT 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses
Effective: Spring 1987

ENT 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

ENT 597A **Frontiers in Insect Science** (4) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENT 597A **Critical Thinking and Professional Development** (6) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENT 597B **Molecular Ecology** (4) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

ENT 597D **Debate Team** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENT 597E **Insect Natural History** (2) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENT 597G **Applied Statistic Technology** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENT 597K **Advanced Topics in Entomology** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

ENT 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

ENT 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

ENT 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in development of instructional materials, organizing and conducting lectures, laboratories, and evaluating students in Entomology courses (1-599).
Effective: Fall 1983

ENT 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 2008

ENT 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

ENT 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Entreprenuership (ENTR)

ENTR 400 **Financing Entrepreneurial Ventures** (3) Overview of alternative forms of financing including seed capital, valuing a company, going public, partnerships, and acquisitions.
Effective: Summer 2000
Prerequisite: B A 243 orB LAW 243;ENTR 320, FIN 301

ENTR 410 **Entrepreneurial Marketing** (3) Principles of Internet marketing and strategies for marketing new ventures on the Web.
Effective: Spring 2007
Prerequisite: ENTR 320, MIS 204, MKTG 301

ENTR 420 **Leadership and Growth of New Ventures** (3) Leadership of an entrepreneurial organization, including organizational effectiveness, stages of entrepreneurial growth, strategies for the future, and developing people.
Effective: Summer 2000
Prerequisite: ENTR 320;MGMT 100 orMGMT 301

ENTR 430 **Entrepreneurship and New Product Development** (3) Examines the process of designing, testing and launching new products, and developing a strategy for commercialization of the technology.
Effective: Summer 2000
Prerequisite: ENTR 300

ENTR 440 **Entrepreneurship and Franchising** (3) Overview of the entire franchising process with a focus on licensing and distributorship, trade marks, strategy, and growing the enterprise.
Effective: Summer 2000
Prerequisite: ENTR 300

ENTR 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2000

ENTR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2000

ENTR 500 **Innovation and Entrepreneurship** (1-3) Practical and theortical insights into analyzing a new business opportunity that you have created.
Effective: Summer 2008

ENTR 501 **Opportunity Creation and Launch** (2) Identify a new opportunity, quantify its potential, understand key competitive factors, and develop presentations to secure venture financing.
Effective: Summer 2002

ENTR 502 **Starting and Growing a New Business** (2) An overview of traditional entrepreneurship considerations including competition, management teams, financing, and exit plans.
Effective: Summer 2002

ENTR 503 **Garber Venture Capital Practicum** (1-2) Structure investment opportunities, conduct due diligence, and potentially invest funds from the Smeal College of Business Garber Venture Capital Fund.
Effective: Summer 2002

ENTR 504 **Essentials of Business Planning** (2) Create a concise and coherent business plan for a start-up or a new corporate initiative.
Effective: Summer 2002

ENTR 571 **Strategic Innovation in Corporate Networks** (2) Capstone course integrating themes related to innovation by exploring entrepreneurism as strategic force throughout a full range of corporate entities.
Effective: Spring 2010

ENTR 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2002

ENTR 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 2002

Environmental Engineering (ENVE)

ENVE 401 **Occupational Safety and Environmental Health** (1) Regulations, management practices, hazard identification, exposure assessment, monitoring, employee protection, and program management for occupational safety and health.
Effective: Summer 2007
Prerequisite: CHEM 110

ENVE 411 **Water Supply and Pollution Control** (3) Water supply, wastewater characteristics, design of unit processes for water and wastewater treatment, sludge processing, and related new technologies.
Effective: Summer 2007
Prerequisite: CHEM 301, ENVE 301W

ENVE 413W **Operation and Control of Treatment Systems** (3) Wastewater treatment, water treatment, solids handling, hazardous waste site control and operations, operator certification, report writing.
Effective: Spring 2002
Prerequisite: ENVE 411, ENVE 424 Concurrent: ENVE 416

ENVE 415 **Hydrology** (3) Watershed response to rainfall events; hydrologic systems, ground water flow.
Effective: Spring 2007
Prerequisite: ENVE 361, MATH 446

ENVE 416 **Treatment Plant Design** (3) Design of treatment facilities for water and waste water based on regulatory requirements and standards.
Effective: Spring 1999
Prerequisite: ENVE 411

ENVE 417 **Hydraulic Design** (3) Design of water and waste water conveyance systems and storage facilities.
Effective: Spring 1999
Prerequisite: ENVE 415

ENVE 424 **Solid Waste Management** (3) Solid waste collection and disposal techniques; recycling and design optimization; including content analysis, legislation, and planning.
Effective: Fall 1998
Prerequisite: seventh-semester standing

ENVE 425 **Hazardous Waste Management** (3) Overview of regulations, risk assessment, waste minimization and pollution prevention, treatment of hazardous waste, and remediation of contaminated sites.
Effective: Spring 2008
Prerequisite: CHEM 301

ENVE 430 **Sustainable Engineering** (3) A course on engineering which uses ecological principles to minimize waste and maximally use input materials.
Effective: Summer 2003
Prerequisite: Permission of program

ENVE 441 **Water Treatment Plant Design and Operation** (4) This course covers water supply, design, and operation of unit operations for water treatment, and related new technologies.
Effective: Summer 2007
Prerequisite: CHEM 301

ENVE 442 **Wastewater Treatment Plant Design and Operation** (4) Covers wastewater generation, design and operation of unit operations for wastewater treatment, sludge handling and disposal options, related new technologies.
Effective: Summer 2007
Prerequisite: CHEM 301, ENVE 301W

ENVE 451 **Environmental Sanitation** (3) Epidemiology, toxicology, radiation health and safety, vector control, food protection, air, water, and solid waste control, environmental interrelationships.
Effective: Fall 1997
Prerequisite: fifth-semester standing

ENVE 460 **Environmental Law** (3) This course provides a survey of Federal and State environmental laws, including statutory, common and administrative law. May not be taken for graduate credit by Dickinson School of Law students in the concurrent J.D./EPC programs.
Effective: Summer 2003
Prerequisite: senior standing graduate standing or permission of program.

ENVE 470 **Air Quality** (3) Overview of air quality issues with regard to the sources, measurements, effects, transport and control of potential air contaminants.
Effective: Fall 2007
Prerequisite: CHEM 301

ENVE 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2005

ENVE 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or

small-group basis.
Effective: Fall 2007

ENVE 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2005

ENVE 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1996

ENVE 550 **Chemical Fate and Transport** (3) Chemical fate and transport modeling of environmental systems as applied to ecological systems, treatment technologies, and human health exposure assessments.
Effective: Summer 2004

ENVE 551 **Environmental Modeling Applications** (3) Software applications for environmental engineers/scientists in: air quality; groundwater; soil (vadose zone); treatment processes; water/wastewater systems.
Effective: Summer 2005
Prerequisite: permission of program

ENVE 569 **Environmental Risk Assessment** (3) Overview of ecological and human risk, including hazard identification, dose response, exposure assessment, and risk characterization.
Effective: Fall 1996

ENVE 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2003

ENVE 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2003

ENVE 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2001

ENVE 597A **Special Topics in Urban Sediment Erosion and Control** (3) Erosion mechanisms related to rainfall energy; urban development and impacts on downstream landowners and waters; erosion control practices theory design.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ENVE 415

ENVE 599 (IL) **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2005

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Environmental Resource Management (E R M)

E R M 411 **Legal Aspects of Resource Management** (3) Legal systems and lawmaking processes; property rights in land, water, and wildlife resources; jurisdictional problems in planning resource use.
Effective: Summer 1996
Prerequisite: E R M 151

E R M 412 **Resource Systems Analysis** (3) The concept of systems; techniques of analysis, including input/output, mathematical programming, and simulation; application to resource systems.
Effective: Spring 2001
Prerequisite: BIOL 220W, E R M 151, E R M 300 andSTAT 240;MATH 111 orMATH 141

E R M 413W **Case Studies in Ecosystem Management** (3) Application of biological, physical, and social science principles to ecosystem management problems; introduction to environmental impact analysis and review.
Effective: Spring 2010
Prerequisite: BIOL 220W, SOILS 101W . Prerequisite or concurrent:E R M 412

E R M 430 (PPATH 430) **Air Pollution Impacts to Terrestrial Ecosystems** (3) Overview of the direct and indirect effects of air pollutants on terrestrial plants and ecosystems.
Effective: Summer 2004
Prerequisite: BIOL 220W orFOR 308

E R M 431 **Environmental Toxicology** (3) Effects of pollutants on animal health at the chemical, physical, and cellular level.
Effective: Summer 2007 Ending: Fall 2010
Prerequisite: BIOL 110, CHEM 110, CHEM 112

E R M 431 (VB SC 431) **Environmental Toxicology** (3) Effects of pollutants on animal health at the chemical, physical, and cellular level.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: BIOL 110, CHEM 110, CHEM 112

E R M 433 **Transformation of Pollutants in Soils** (3) Processes regulating fate and transport of metals, organics, nutrients, salts, pathogens, and radionuclides in soil systems.
Effective: Summer 2007
Prerequisite: CHEM 112, CHEM 111, SOILS 101

E R M 435 (W F S 435) **Limnology** (3) Biogeochemistry and natural history of freshwater ecosystems.
Effective: Summer 2007
Prerequisite: BIOL 110, BIOL 220W, CHEM 110

E R M 436 (W F S 436) **Limnological Methods** (3) Application of current methodologies to evaluate the biological, chemical, and physical characteristics of aquatic ecosystems.
Effective: Spring 2010
Prerequisite: BIOL 110 andCHEM 110

E R M 447 **Stream Restoration** (3) Stream restoration including fluvial geomorphology, stream classification, impairment, sediment transport, stable stream design, and watershed assessment.
Effective: Summer 2008
Prerequisite: A S M 327 orA B E 307 orC E 361

E R M 450 (W F S 450) **Wetland Conservation** (3) Wetland types, classification, functions and values; hydrology, soils, and plants; introduction to wetland identification and delineation; wetland regulations.
Effective: Spring 2002
Prerequisite: E R M 300 orW F S 209

E R M 494H **Honors Thesis** (1-6) Independent study directed by a faculty supervisor that culminates in the production of an ERM honors thesis.
Effective: Summer 2009
Prerequisite: Junior or senior status in the Schreyer Honors College and permission of the ERM honors advisor

E R M 495 **Internship** (1-12) A supervised practicum in the environmental field. To be offered only for SA/UN grading.
Effective: Summer 1996
Prerequisite: prior approval of assignment by instructor

E R M 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

E R M 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1996

E R M 497B (B A 497B) **Introduction to Sustainable Business** (3) An introduction to sustainable business strategies and practices.

Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

E R M 499 (IL) **Foreign Studies** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2005

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Environmental Studies (ENVST)

ENVST 400W **Senior Seminar in Environmental Studies** (3) Writing-intensive study of a specified topic in environmental studies integrating approaches and research from a variety of disciplines.
Effective: Spring 2000
Prerequisite: ENVST 200

ENVST 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2000

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Environmental and Renewable Resource Economics (E RRE)

E RRE 429 (AG EC 429) **Natural Resource Economics** (3) Optimal management of resources; roles of markets and other institutions; resources and economic development; public policy.
Effective: Spring 2003 Ending: Summer 2010
Prerequisite: ECON 302

E RRE 431W (AG EC 431W) **Economic Analysis of Environmental and Resource Policies** (3) Economic analysis of environmental and natural resource policies, benefit-cost analysis, non-market valuation techniques; resource damage assessment.
Effective: Spring 2003 Ending: Summer 2010
Prerequisite: ECON 302

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Finance (FIN)

FIN 405 **Advanced Financial Management** (3) An examination of the development and application of decision rules for major long-term financial and investment problems of the firm.
Effective: Summer 1993
Prerequisite: FIN 305W

FIN 406 **Security Analysis and Portfolio Management** (3) Advanced valuation theory; fundamentals of security analysis; portfolio construction and management.
Effective: Summer 1993 Ending: Fall 2010
Prerequisite: FIN 305W

FIN 406 **Security Analysis and Portfolio Management** (3) Advanced valuation theory; fundamentals of security analysis; portfolio construction and management.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: B A 301 orFIN 301

FIN 406H **Security Analysis and Portfolio Management** (3) Advanced valuation theory; fundamentals of security analysis; portfolio construction and management.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: B A 301 orFIN 301

FIN 407 **Multinational Financial Management** (3) Analysis of the international aspects of managerial finance; emphasis on the impact of the international financial environment on firm operations.
Effective: Spring 2005
Prerequisite: FIN 305W

FIN 408 **Financial Markets and Institutions** (3) Functional analysis of major credit institutions; sources and uses of funds; impact of government regulation.
Effective: Fall 1994
Prerequisite: B A 301 orFIN 301

FIN 408H **Financial Markets and Institutions** (3) Functional analysis of major credit institutions; sources and uses of funds; impact of government regulation.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: B A 301 orFIN 301

FIN 409 (R EST 409) **Real Estate Finance and Investment** (3) The sources and uses of credit; instruments and methods of financing; the theory and practice or real estate investment analysis.
Effective: Spring 2004
Prerequisite: B A 301 orFIN 301

FIN 410 **Speculative Markets** (3) Functions, techniques, and impact of speculation conducted through forward markets; the nature of speculative transactions, pricing, and methods of trading.
Effective: Summer 1993 Ending: Fall 2010
Prerequisite: FIN 406

FIN 410 **Derivative Markets** (3) Functions, techniques, and impact of speculation conducted through forward markets; the nature of speculative transactions, pricing, and methods of trading.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: FIN 406

FIN 412 **Commercial Bank Management** (3) Fundamental principles underlying management of a commercial bank; capital funds; asset and liability management; value maximization; legal and operational constraints.
Effective: Fall 1994
Prerequisite: FIN 305W, FIN 408

FIN 413 **Risk Management of Financial Institutions** (3) Measuring and managing risk faced by financial institutions.
Effective: Summer 2007
Prerequisite: B A 301 orFIN 301

FIN 414 **Financial Trading and Applications** (3) This course focuses on financial modeling and analysis of trading strategies. Bloomberg, Reuters, spreadsheets and trading simulations are used extensively.
Effective: Summer 2007
Prerequisite: FIN 305W, FIN 406 orFIN 301

FIN 420 **Investment and Portfolio Analysis** (3) Investment and risk, types of security investments, sources of investment information, the broker, the stock market, portfolio management.
Effective: Spring 2008
Prerequisite: FIN 301

FIN 427 **Derivative Securities** (3) Introduction to futures contracts and options, leading to a working understanding of their importance in financial management applications.
Effective: Spring 2008
Prerequisite: FIN 420 or approval of program

FIN 430 **Estate Planning** (3) Liquidity planning, titling and transfer of property, trusts, federal unified tax system, gifting,

incapacity planning, legal documents.
Effective: Spring 2008
Prerequisite: ACCTG 310 andFIN 340

FIN 450 **Retirement Planning** (3) Retirement planning: qualified and non-qualified plans, characteristics, provisions, regulations administration, application approach with case studies.
Effective: Spring 2008

FIN 451 **Intermediate Financial Management** (3) Case studies are used to develop skills in solving a variety of financial management problems.
Effective: Spring 2010
Prerequisite: FIN 301

FIN 456 (IL) **International Capital Markets** (3) This course develops understanding of international capital markets by striking a balance between institutional details, theoretical foundation and practical application.
Effective: Spring 2008
Prerequisite: FIN 301

FIN 460 (R EST 460) **Real Estate Financial Analysis** (3) Debt and equity financing, capital structure, "creative financing," risk analysis, corporate asset management.
Effective: Summer 2005
Prerequisite: FIN 305W

FIN 461 **Investments** (3) Analysis and valuation of equity, debt, and alternative investments.
Effective: Spring 2010
Prerequisite: FIN 301

FIN 470 (R EST 470) **Real Estate and Capital Markets** (3) Analysis of publicly-traded real estate of both the equity, (REITs) and debt (MBSs) sides. The course also provides international perspectives.
Effective: Summer 2005
Prerequisite: FIN 305W

FIN 471 **International Finance** (3) Financial decision making in an international environment. Emphasis on topics relevant to small businesses and entrepreneurs.
Effective: Spring 2010
Prerequisite: FIN 301

FIN 475 **Financial Decision Making** (3) Problems and cases in financial decision making for non-financial corporations and financial institutions.
Effective: Fall 2009
Prerequisite: FIN 302, FIN 420 and senior standing

FIN 481 **Advanced Financial Analysis** (3) Capstone course integrating financial analysis coursework. This course is based on the case study method which provides a challenging setting in which to apply business concepts.
Effective: Spring 2009
Prerequisite: ACCTG 426, FIN 405

FIN 489 **Seminar in Finance** (3) In-depth study of new trends, concepts, and practices in financial or portfolio management.
Effective: Spring 2008
Prerequisite: FIN 301 or equivalent; 3 additional credits of course work in Finance

FIN 494 **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2003

FIN 494H **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2008

FIN 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2008
Prerequisite: prior approval of proposed assignment by instructor

FIN 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

FIN 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

FIN 497D **Trading Room Intern** (1) Students work with financial databases in the Smeal Trading Room helping develop educational materials assisting users.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FIN 497D **Trading Room Intern** (1) Students work with financial databases in the Smeal Trading Room helping develop educational materials and assisting users.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

FIN 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2003

FIN 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

FIN 504 **Problems in Finance** (3-6) Planned individual projects involving library, laboratory, or field work.
Effective: Winter 1978

FIN 505 (I B 505) **Multinational Managerial Finance** (3) Analysis of the international aspects of managerial finance. Emphasis on the environmental and institutional factors influencing capital acquisition and allocation.
Effective: Winter 1978
Prerequisite: B A 531

FIN 506 **Portfolio Theory and Policy** (3) Rigorous examination and analysis of asset-holder behavior under conditions of risk and uncertainty.
Effective: Winter 1978

FIN 508 **Analysis of Financial Markets** (3) Analysis of factors affecting price determination in financial markets.
Effective: Winter 1978

FIN 510 **Contemporary Issues in Financial Institutions** (3) Critical investigation of problems of current interest in the market structure and internal operations of financial institutions.
Effective: Winter 1978

FIN 513 **Speculative Markets** (3) Analysis of derivative securities covering options, forwards, futures, OTC derivatives; topics include valuation, trading, hedging. Involves computer analysis.
Effective: Spring 1998
Prerequisite: B A 531

FIN 515 **Nittany Lion Fund Manager** (3) Focuses on applied issues and topics in the management of investments.
Effective: Summer 2008

FIN 531 **Financial Management** (3) An intensive examination of techniques available to aid the financial manager in decision making.
Effective: Spring 2006
Prerequisite: ACCTG 511 orACCTG 512;B A 533, SC&IS 535

FIN 532 **Financial Decision Processes** (3) Financial decision making under uncertainty; positive and normative models and current issues in financial management.
Effective: Winter 1978

FIN 541 **Security Analysis** (3) Discussion and application of analytical techniques in security valuation, including use of computers.
Effective: Winter 1978

FIN 550 **Financial Analysis and Valuation** (2) Builds upon and reinforces the theoretical and institutional finance frame-works learned in introductory business finance.
Effective: Summer 2002
Prerequisite: B A 531

FIN 553 **Financial Modeling** (1) Develops technical financial modeling skills applying spreadsheets and simulation modeling software.
Effective: Summer 2002
Prerequisite: B A 531, FIN 550

FIN 555 (I B 555) **Global Finance** (1-3) Analyze international business finance problems, impact of evolving inter- national payment systems on business, financial management in modern multi- national enterprise.
Effective: Fall 2008
Prerequisite: FIN 550

FIN 561 **Seminar in Finance** (3-6) Comparative analysis of research in the theories of finance; relationships to business management practices.
Effective: Winter 1978

FIN 563 **Financial Management Simulation and Corporate Interaction** (2) An immersion experience in financial decision-making through a simulation exercise and interaction with senior financial officers.
Effective: Summer 2002
Prerequisite: FIN 571

FIN 565 **Investment Management Portfolio Analysis Immersion** (2) An intensive familiarization with the Smeal College Trading Room in combina- tion with a visit to Wall Street trading rooms.
Effective: Summer 2002
Prerequisite: B A 550

FIN 570 **Financial Modeling** (2) Introduces and applies equity, debt, derivative models and computational techniques using Excel and Visual Basic for Applications.
Effective: Summer 2008

FIN 571 **Strategic Financial Management** (2) Comprehensive course in corporate finance and the strategic implications of various financial decisions.
Effective: Summer 2002
Prerequisite: B A 531, FIN 550

FIN 575 **Venture Capital and Private Equity** (2) An introduction to and an in-depth analysis of venture capital and private equity.
Effective: Summer 2002
Prerequisite: FIN 550

FIN 577 **Financial Engineering and Corporate Strategy** (2) Study and application of derivative strategies, financial innovation, and modern financial techniques to re-engineer risk exposure and enhance strategic opportunities.
Effective: Summer 2002
Prerequisite: FIN 571

FIN 581 **Fundamentals of Financial Markets** (2) Operation, structure of money, bond markets and concepts; and techniques used in evaluating and managing fixed income portfolios.
Effective: Summer 2002
Prerequisite: FIN 550

FIN 583 **Modern Portfolio Management: Theory and Practice** (2) Theoretical foundations and tools needed for structuring, managing, and monitoring the performance of an investment portfolio.
Effective: Summer 2002
Prerequisite: FIN 550, FIN 553, FIN 581

FIN 585 **Financial Innovation and Portfolio Risk Management** (2) Introduction to fundamental derivatives, standard valuation models, and practical applications to portfolio management; recognition, measurement, and management of portfolio risk.
Effective: Summer 2002
Prerequisite: FIN 550, FIN 553, FIN 581, FIN 583, FIN 587

FIN 587 **Investment Management I** (1) Applied issues and topics in the management of investments.
Effective: Summer 2002
Prerequisite: FIN 550

FIN 588 **Investment Management II** (1) Complex applied issues and topics in the management of investments.
Effective: Summer 2002
Prerequisite: FIN 550, FIN 587

FIN 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

FIN 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

FIN 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

FIN 597B **Corporate Finance I** (3) Doctoral seminar which will cover the fundamental topics in corporate finance, covering both theoretical and empirical work in corporate finance.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FIN 597D **Trading Room Intern** (1) Students work with financial databases in the Smeal Trading Room helping develop educational materials and assisting users.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FIN 597E **Corporate Finance II** (3) Doctoral seminar focused mostly on recent articles in empirical coporate finance.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: FIN 597B

FIN 597F **Strategic Financial Management and Analysis** (2) Designed to do a practical, comprehensive course in corporate finance and strategy. Draws together the various topics in managerial finance and presents a unified, integrated view of the overall subject areas. Requires students to deal with case applications and to consider recent empirical and theoretical findings in the field. This course also helps students develop skills in financial analysis and working capital management. They will also be able to forecast financial needs in a variety of economic circumstances. Finally they will be able to use their knowledge of financial statements to value securities using a variety of methodologies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FIN 599 (IL) **FOREIGN STUDY--FINANCE** (1-12) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in established exchange program

FIN 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

FIN 601 **PH.D. DISSERTATION FULL-TIME** (0) NO DESCRIPTION.
Effective: Summer 1993

FIN 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Graduate students will be assigned on a selective basis teaching responsibilities in FIN 301, 305, and 306.
Effective: Spring 1984

FIN 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

FIN 611 **PH.D. DISSERTATION PART-TIME** (0) NO DESCRIPTION.
Effective: Summer 1993

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Financial Services (FINSV)

FINSV 400 **Investment Valuation for the Financial Services Professional** (3) Approaches to investment strategies, investment decisions, and the valuation of corporate securities.
Effective: Summer 2002
Prerequisite: FIN 301

FINSV 411 **Federal Income Taxation for the Financial Services Professional** (3) Tax regulations, tax policy, tax determination, and tax planning applicable for personal/business decision making; emphasis on taxation of individuals.
Effective: Summer 2002
Prerequisite: ACCTG 211

FINSV 420 **Estate Planning for the Financial Services Professional** (3) Studies the processes relating to the use, conservation, and transfer of an individual's wealth; emphasizing investments, insurance and taxation.
Effective: Summer 2002
Prerequisite: FINSV 400, FINSV 411, INS 301

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First-Year Seminar (CAP)

No courses for department code **CAP** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Food Science (FD SC)

FD SC 400 **Food Chemistry** (4) Chemical properties of food constituents as influenced by processing and storage.
Effective: Fall 2009
Prerequisite: CHEM 202 . Prerequisite or concurrent:B M B 211, B M B 212

FD SC 404 **Sensory Evaluation of Foods** (3) Sensory evaluation of food, methods of test analyses, panel selection and training, taste sensation theory, consumer testing methods.
Effective: Spring 2001
Prerequisite: STAT 250 Junior standing

FD SC 405 **Food Engineering Principles** (3) Engineering principles of importance to food manufacturing, including units, dimensions, mass and energy balance, fluid flow, rheology, heat transfer, and psychrometrics.
Effective: Spring 2009
Prerequisite: MATH 110, PHYS 250

FD SC 406 **Physiology of Nutrition** (3) Physiological mechanisms involved in thirst and appetite, digestion, absorption, utilization of nutrients, respiration, and body temperature regulation.
Effective: Spring 2001
Prerequisite: B M B 211

FD SC 407 **Food Toxins** (2) Microbiological and chemical aspects of food poisoning; toxicological principles; case histories and prevention of problems.
Effective: Winter 1978
Prerequisite: senior standing in food science or related majors

FD SC 408 **Food Microbiology** (2) Significance of microorganisms in food commodities, microbial spoilage, food- borne infections, and intoxication; methods of preservation, processing, and control.
Effective: Fall 2009
Prerequisite: MICRB 201, MICRB 202

FD SC 409W **Laboratory in Food Microbiology** (3) Methods of isolation, detection of spoilage, pathogenic microorganisms in foods; effects of processing and preservation on survival of food microorganisms.
Effective: Fall 2009
Prerequisite: MICRB 202 . Prerequisite or concurrent:FD SC 408

FD SC 410 **Chemical Methods of Food Analysis** (3) Qualitative and quantitative determinations of food constituents.
Effective: Spring 2001
Prerequisite: B M B 212, FD SC 400

FD SC 411 **Managing Food Quality** (2) Principles and applications of Hazard Analysis Critical Control Points. Statistical tools for the control and improvement of food quality.
Effective: Summer 1999
Prerequisite: FD SC 408, STAT 250

FD SC 413 **Science and Technology of Plant Foods** (3) Physical and chemical behavior of plant-based raw materials and ingredients, with emphasis on parameters influencing finished product quality.
Effective: Fall 2009
Prerequisite: FD SC 405, FD SC 400, FD SC 408, FD SC 410

FD SC 414 **Science and Technology of Dairy Foods** (3) Physical and chemical behavior of dairy-based raw materials and ingredients, with emphasis on parameters influencing finished product specifications.
Effective: Fall 2009
Prerequisite: FD SC 405, FD SC 400, FD SC 408, FD SC 410

FD SC 415 **Science and Technology of Muscle Foods** (3) Physical and chemical properties of muscle food commodities, with emphasis on muscle-based ingredients in formulated foods.
Effective: Fall 2009
Prerequisite: FD SC 405, FD SC 400, FD SC 408, FD SC 410

FD SC 417 **Food Laws and Regulations** (2) Historic and current aspects of government control of doing business with food (emphasis on the Food, Drug, and Cosmetic Act).
Effective: Summer 1989
Prerequisite: FD SC 200

FD SC 423 **Pollutant Impacts on Foods** (1) Fate and flow of pollutants; case studies of human exposure to specific pollutants.
Effective: Summer 1989
Prerequisite: 6 credits in biology or chemistry

FD SC 430 **Unit Operations in Food Processing** (3) Thermal processing, refrigeration, freezing, dehydration, and concentration in the food industry, including effects on food quality; food packaging; waste management.
Effective: Fall 2009
Prerequisite: FD SC 405, FD SC 400, FD SC 408

FD SC 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of acitvity required.

Effective: Summer 1992
Prerequisite: prior approval of proposed assignment by instructor

FD SC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

FD SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

FD SC 497A **Bioactive Components in Foods** (2) Lecture course covering the occurrence, evidence for activity, potential uses, and safety of important classes of non-nutrient biologically-active food components.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FD SC 497G **Molecular Biology Methods for Food Microbiology** (3) Lecture and laboratory-based course cofering DNA-based methods for detecting and tracking microorganisms in food products.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FD SC 500 **Fundamentals of Food Science** (4) Intensive tutorial in the fundamental theories and concepts in food science, including: food chemistry, food microbiology, food engineering and nutrition.
Effective: Summer 2002

FD SC 501 **Research Methods in Food Science** (2) Planning and conducting research in food science including: problem definition, experimental design, collecting and recording data, and effective communication.
Effective: Summer 2002

FD SC 505 **Concepts of Product Development** (2) Procedures and problems encountered in the development of new and modified food products. Idea generation through development, testing, and commercialization.
Effective: Winter 1980

FD SC 506 **Flavor Chemistry** (3) Formation, analysis and release of flavors in food systems.
Effective: Fall 2003
Prerequisite: FD SC 400

FD SC 507 **Advanced Food Microbiology** (3) Roles of microorganisms in food preservation, spoilage, health and disease. Recent advances in detection, tracking and control of foodborne pathogens.
Effective: Spring 2004
Prerequisite: FD SC 408 orFD SC 500 and a 400-level course either biochemistry or molecular biology

FD SC 508 **Food Proteins** (3) Properties and uses of proteins in food systems.
Effective: Spring 1987
Prerequisite: BIOCH 401, FD SC 400

FD SC 510 **Carbohydrate Hydrocolloids** (3) Physicochemical behavior of edible carbohydrate hydrocolloids, with emphasis on starch and selected exudates, extracts, flours, and fermentation products.
Effective: Fall 1988
Prerequisite: BIOCH 401

FD SC 512 **Concepts in Food Microbiology** (3) In-depth analysis of the microbial response to environmental challenges including temperature, water activity, PH, atmosphere, and food preservatives.
Effective: Spring 1992
Prerequisite: FD SC 408

FD SC 514 **Food Physical Chemistry** (3) Physical principles underlying food structure and quality.
Effective: Summer 2004
Prerequisite: FD SC 400 orFD SC 500

FD SC 521 **Food Defense: Prevention Planning for Food Processors** (3) Course prepares current and aspiring professionals to learn, recognize and apply measures to prevent intentional contamination of the food supply.
Effective: Summer 2010
Prerequisite: AGBIO 520

FD SC 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students or outside speakers.
Effective: Spring 1987

FD SC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on individual basis and fall outside the scope of formal courses.
Effective: Spring 1987

FD SC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered

infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

FD SC 597A **Fundamentals of Food Science - Microbiology** (1) Intensive overview of the field of Food Science with the focus on microbiology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FD SC 597B **Fundamentals of Food Science - Food Engineering** (1) Intensive overview of the field of Food Science with the focus on Food Engineering.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FD SC 597C **Fundamentals of Food Science-Chemistry** (1) Intensive overview of the field of Food Science with the focus on chemistry.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

FD SC 597D **Fundamentals of Food Science-Nutrition** (1) Intensive overview of the field of Food Science with the focus on nutrition.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

FD SC 597G (NUTRN 597G) **Readings in Ingestive Behavior** (1) Students lead discussion of original research in the field of ingestive behavior with a focus on food intake in particular.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FD SC 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

FD SC 601 **Ph.D. Dissertation Full Time** (0) No description.
Effective: Fall 1983

FD SC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in the development of instructional materials, the organization and conduct of lectures/laboratories, the evaluation and counseling of students.
Effective: Fall 1983

FD SC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

FD SC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Forensic Science (FRNSC)

FRNSC 400 **Courtroom Proceedings and Testimony** (1) Introduction to courtroom proceedings and testimony as they related to forensic science.
Effective: Spring 2008
Prerequisite: FRNSC 201W andFRNSC 301 prerequisite or concurrent:FRNSC 401W

FRNSC 401W **Criminalistics III - Advanced Analysis and Crime Scene Investigation** (4) Advanced concepts in criminalistics as they apply to criminal and civil investigations.
Effective: Fall 2008
Prerequisite: FRNSC 302 andFRNSC 421W or prerequisite or concurrentFRNSC 427W

FRNSC 421W **Forensic Molecular Biology** (3) Concepts and application of serology of molecular biology techniques to analyze biological evidence collected at crime scenes.
Effective: Spring 2009
Prerequisite: B M B 442, B M B 400, B M B 401;FRNSC 302 or a 400-level biology or B M B course

FRNSC 427W (CHEM 427W) **Forensic Chemistry** (4) Analytical and instrumental methods used in the forensic sciences with special emphasis on the analysis and characterization of trace evidence.
Effective: Spring 2008
Prerequisite: CHEM 213 andCHEM 227

FRNSC 475 **Forensic Science Seminar** (1) Presentation and discussion of special issues in forensic science; extension and application of background knowledge to unusual topics and cases.
Effective: Spring 2008
Prerequisite: Prerequisite or concurrent:FRNSC 401W

FRNSC 494 **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

FRNSC 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2008

FRNSC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2006

FRNSC 500 **Principles of CSI and Criminalistics I** (6) Principles of crime scene investigation and processing evidence in the laboratory; lecture, hands-on training exercises, and courtroom testimony preparation.
Effective: Spring 2007
Prerequisite: Admission into the Master of Professional Studies (MPS) in Forensic Science program

FRNSC 501 **Criminalistics II** (4) CSI investigation, criminalistics, and scene reconstruction with mock courtroom testimony.
Effective: Spring 2007
Prerequisite: FRNSC 500

FRNSC 532 **Drug Chemistry and Toxicology** (3) Chemical and toxicological properties of therapeutic and non-therapeutic drugs and the analytical and instrumental methods of their identification and quantification.
Effective: Spring 2010

FRNSC 541 **Forensic Seminar Series** (1) Advanced concepts in forensic science through presentation of journal articles, case studies, and research findings.
Effective: Spring 2009

FRNSC 561 **Ethics in forensic Science** (1) The ethics of forensic science, including issues of evidence handling, data analysis, and courtroom testimony.
Effective: Spring 2009

FRNSC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2006

FRNSC 597A **Crim I-B** (3) This course is the Grad portion of FRNSC 302. Also, the course is on for SP10 as FRNSC 597A as well. All of the info will be the same.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FRNSC 801 **Criminalistics III** (4) Advanced CSI investigation, criminalistics, and scene reconstruction with mock courtroom testimony.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: FRNSC 501

FRNSC 801 **Criminalistics III** (4) Advanced CSI investigation, criminalistics, and scene reconstruction with mock courtroom testimony.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: FRNSC 500 andFRNSC 501 orFRNSC 500 andFRNSC 502

FRNSC 821 **Forensic Molecular Biology II** (4) Advanced concepts and application of molecular biology techniques to the analysis of biological evidence collected at crime scenes.
Effective: Spring 2008
Prerequisite: FRNSC 421W andFRNSC 500

FRNSC 831 **Forensic Chemistry II** (3) Advanced chemical techniques in forensic science, including examination of complex trace evidence and advanced instrumental analysis.
Effective: Spring 2008
Prerequisite: CHEM 427W andFRNSC 500

FRNSC 832 **Forensic Drug Chemistry** (3) Advanced chemical techniques in forensic science, including analytical and instrumental methods used in the analysis and characterization of drugs.
Effective: Spring 2007
Prerequisite: Prerequisite or concurrent:FRNSC 831

FRNSC 833 **Forensic Toxicology** (3) Advanced chemical techniques in forensic science, including the elements of industrial and environmental toxicology.
Effective: Spring 2007
Prerequisite: Prerequisite or concurrent:FRNSC 831

FRNSC 894 **Research Projects in Forensic Science** (1-12) Supervised student research projects identified on an individual or small-group basis.
Effective: Spring 2007

FRNSC 895 **Internship** (1-6) Supervised off-campus, non-group instruction, including field experiences, a practicum, or internships; written and oral critique of activity required.
Effective: Spring 2007

FRNSC 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2007

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Forest Technology (FORT)

No courses for department code **FORT** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Forestry (FOR)

FOR 401 **Urban Forest Management** (3) Uses and values of urban vegetation, open space, and wildlife; planning, financing, support, management, and administration of urban forestry programs.
Effective: Summer 1992
Prerequisite: three credits in business management or economics and six credits in biology forestry or plant materials

FOR 409 **Tree Physiology** (2) Fundamentals of the relationship of the basic physiological functions of forest trees to form.
Effective: Spring 1995
Prerequisite: BIOL 240W

FOR 410 **Elements of Forest Ecosystem Management** (3) Fundamentals of forest ecosystem management for goods and services.
Effective: Summer 1995
Prerequisite: 3 credits in both ecology and biology

FOR 416 **Forest Recreation** (3) The management and administration of multiple-use forest lands and wilderness for forest recreational experiences, with emphasis on public forests.
Effective: Spring 2001
Prerequisite: 3 credits in social or behavioral sciences

FOR 418 (US;IL) **Agroforestry: Science, Design, and Practice** (3) Agroforestry integrates trees in agricultural landscapes, and/or agriculture products into forested areas for multiple benefits.
Effective: Spring 2006

FOR 421 **Silviculture** (3) The application of the principles of forest ecology to control of establishment, composition, and growth of forest stands.
Effective: Fall 1984
Prerequisite: FOR 308, FOR 366

FOR 430 (W F S 430) **Conservation Biology** (3) The application of biological principles to issues in the conservation of biodiversity.
Effective: Spring 1995
Prerequisite: BIOL 220W orFOR 308

FOR 440 **Forest Economics and Finance** (3) The application of economic theory to forest resources systems, with emphasis on production and investment analyses.
Effective: Summer 2000
Prerequisite: ECON 002 orECON 004

FOR 451 (AG 451) **Artificial Intelligence and Expert Systems for Agriculture and Natural Resource Management** (3) Application of artificial intelligence in agriculture and natural resources, with emphasis on expert systems.
Effective: Spring 1992
Prerequisite: one course in computer science or computer applications

FOR 455 **Remote Sensing and Spatial Data Handling** (3) Remote sensing systems, with emphasis on application to forest ecosystem analysis. Includes introduction to computer systems for spatial data handling.
Effective: Summer 2000
Prerequisite: MATH 110 3 credits in computer science 6 credits in ecological and/or geological sciences

FOR 466W **Forest Resource Management** (3) Optimum use of forest's tangible and intangible resources by application of financial and administrative management principles and management science techniques.
Effective: Spring 2001
Prerequisite: FOR 421 . Prerequisite or concurrent:FOR 440

FOR 470 **Watershed Management** (3) Management of wild land watersheds for control of the amount and timing of water yield, water quality, erosion, and sedimentation.
Effective: Summer 2000
Prerequisite: 3 credits in Soils

FOR 471 **Watershed Management Laboratory** (1) Introduction to hydrologic and climatic measurements and computations useful in watershed management.
Effective: Spring 1992
Prerequisite: or concurrent:FOR 470

FOR 475 **Principles of Forest Soils Management** (3) Effect of current forest management practices on the properties and productive capacity of forest soils.
Effective: Spring 1985
Prerequisite: FOR 308 3 credits in soils

FOR 480 **Policy and Administration** (3) Forest resources policy objectives; criteria and goals of society; policy implementation by ownership classes; planning, administration, and evaluation of programs.
Effective: Spring 2001
Prerequisite: FOR 200W 3 credits of social or behavioral science

FOR 485 **Natural Resource Decisions** (3) Application of previous courses and experience to decision making on forest land management and natural resource policy issues. (Students should have completed or be taking concurrently W F S 447, 463; FOR 410, 421, or 466.)
Effective: Spring 2000
Prerequisite: sixth-semester or higher standing 12 credits in Forestry or Wildlife and Fisheries Sciences

FOR 488Y (IL) **International Forestry** (3) Forestry in global context, emphasizing developing countries: ecological, economic, technological, and political aspects.
Effective: Spring 2006
Prerequisite: E R M 413W, FOR 421 orINTAG 100

FOR 494 **Forestry Research** (3) Introduction to the theory, principles, and practices of forestry research; supervised research experience.
Effective: Summer 1995
Prerequisite: FOR 350, STAT 250

FOR 494H **Forestry Research** (3) Introduction to the theory, principles, and practices of forestry research; supervised research experience.
Effective: Fall 2007
Prerequisite: FOR 350, STAT 250

FOR 495 **Forestry Internship** (1-6) Supervised field experience related to the student's major.
Effective: Fall 1981
Prerequisite: approval of proposed assignment by instructor prior to registration.

FOR 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

FOR 496A **Natural Resources GIS - 1** (1-3) Special projects in natural resources GIS.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FOR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

FOR 497A **History of Logging Era in North Central Pennsylvania, Part I** (3) This course will focus on the rich history of the logging era in northcentral Pennsylvania from the 1850s to 1940.
Effective: Summer 2010 Ending: Summer 2010

FOR 497B **Herbaceous Forest Plants of Pennsylvania: Identification and Ecology** (3) Course will cover common herbaceous plant families and representative taxa occurring in the Pennsylvania region.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

FOR 497C **Environmental Science/Forestry** (3) This course will focus on skills used in the practice of forestry and will include hands-on activities in the field.
Effective: Summer 2010 Ending: Summer 2010

FOR 497D **History of Loggin Era in North Central Pennsylvania, Part II** (3) This follow up to the History of the Logging Era Part I covers the same time period, but the emphasis shifts to specific topics.
Effective: Summer 2010 Ending: Summer 2010

FOR 497F **Forestry Management II** (3) This course deals wtih basic chain saw safety and harvesting techniques.
Effective: Summer 2010 Ending: Summer 2010

FOR 497F **Invasive Forest Plants** (3) A survey of common nonnative (exotic) herbs, forbs, shrubs, trees and vines that invade forested habitats, including riparian forests, in Pennsylvania and the region. Field identification, life history traits, ecosystem related challenges and problems, and control/management options are reviewed.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FOR 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

FOR 508 **Forest Ecology** (3) The forest ecosystem, variations in space and time, classification, ordination techniques, dynamic aspects such as energy flow and nutrient cycling.
Effective: Winter 1978

FOR 512 **Forest Genetics** (3) Qualitative and quantitative genetic principles and research methods applied in tree breeding.
Effective: Winter 1978

FOR 517 **Forest Microclimatology** (3) A quantitative treatment of climate near the ground, with special reference to the role of forests and terrain.
Effective: Fall 2001
Prerequisite: three credits of physics

FOR 519 **Forest Hydrology** (3) Influence of forest cover on the disposition of precipitation and the application of hydrologic principles and techniques to forest watersheds.
Effective: Spring 1985
Prerequisite: FOR 308, C E 361

FOR 520 **Snow Hydrology** (2) Role of snow and ice in the hydrologic cycle, with special emphasis on effects of forests and land use.
Effective: Fall 1983
Prerequisite: FOR 470 or 3 credits of hydrology

FOR 521 **Advanced Silviculture** (3) Specific silvicultural practices for the establishment and manipulation of forest stands with respect to recent developments and research needs.
Effective: Fall 1984
Prerequisite: FOR 421

FOR 530 **Conservation Genetics** (3) Discussion of the use of genetic principles and technologies in the conservation and management of biological diversity.
Effective: Spring 2005
Prerequisite: FOR 430

FOR 550 **Multivariate Analysis in Forestry Research** (3) Analysis and interpretation of research data involving several response variables. Includes computational considerations for large data sets.
Effective: Fall 1983

FOR 555 **Multispectral Remote Sensing** (3) Computer analysis of data from nonimaging remote sensors as applied to mapping of natural resources and land use.
Effective: Fall 2001
Prerequisite: three credits of remote sensing

FOR 565 **GIS Based Socio-Ecological Landscape Analysis** (3) GIS-based socio-ecological analysis of landscape context for natural resources in relations to present and prospective patterns of land use.
Effective: Spring 2009
Prerequisite: one course each in intro GIS and statistics

FOR 570 **Watershed Stewardship Practicum I** (3) Application of integrated community-based watershed planning for water resources management.
Effective: Spring 2000
Prerequisite: enrollment in the Graduate Option in Watershed Stewardship

FOR 571 **Watershed Stewardship Practicum II** (3) Application of integrated community-based watershed planning for water resources management.
Effective: Spring 2000
Prerequisite: FOR 570 and enrollment in the Graduate Option in Watershed Stewardship

FOR 590 (W F S 590) **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2007

FOR 591A **Seminar in Watershed Stewardship Issues** (1) Exploration of watershed stewardship issues.
Effective: Spring 2000
Prerequisite: enrollment in the Graduate Option in Watershed Stewardship or by permission of the instructors

FOR 591B **Seminar in Watershed Stewardship Planning** (1) Exploration of watershed stewardship planning processes.
Effective: Spring 2000
Prerequisite: enrollment in the Graduate Option in Watershed Stewardship or by permission of the instructors

FOR 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

FOR 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

FOR 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

FOR 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

FOR 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Provides an opportunity for supervised and graded teaching experience in forestry courses.
Effective: Fall 1983

FOR 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

FOR 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

1 This course is offered only at the Mont Alto Campus as part of the two-year Forest Technology major.

2 This course is offered only at the DuBois and Mont Alto Campus as part of the two-year Forest Technology and Wildlife Technology majors.

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Fractnl Trans Cr (GMISC)

No courses for department code **GMISC** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

French (FR)

FR 401 (IL) **Advanced Oral Communication** (3) Emphasis on speaking and listening comprehension through discussion of current issues, using journalistic materials.
Effective: Spring 2006
Prerequisite: FR 201, FR 202

FR 402Y (IL) **Advanced Grammar and Writing** (3) Advanced study of the structure of the French language. Intensive essay writing.
Effective: Spring 2006
Prerequisite: FR 201, FR 202

FR 407 (IL) **Business Writing in French** (3) Common forms of business communication; writing of reports and abstracts.
Effective: Spring 2007
Prerequisite: FR 331 orFR 332

FR 408 (IL) **French-American Business Translation** (3) Translation from French to English of actual documents from the business world; theoretical consideration and systematic vocabulary building.
Effective: Spring 2007
Prerequisite: FR 407

FR 409 (IL) **Commercial and Technical Translation** (3) Translation from English to French of commercial and technical materials; vocabulary building; writing of abstracts and summaries.
Effective: Spring 2006
Prerequisite: FR 402Y

FR 410 (IL) **French Press** (3) Extensive readings of selected french daily and weekly newspapers and magazines, along with newscast viewings.
Effective: Spring 2007
Prerequisite: FR 331 orFR 332

FR 416 (IL) **Introduction to French Linguistics** (3) Introduction to the theory and methods of linguistics as they apply to the major subfields.
Effective: Spring 2006

FR 417 (IL) **French Phonology** (3) A formal study of the sound pattern of French.
Effective: Spring 2007
Prerequisite: FR 201, FR 202

FR 418 (IL) **French Syntax** (3) A formal theory of word order and related issues in French grammar.
Effective: Spring 2006
Prerequisite: FR 201 andFR 202

FR 422 (IL) **Old French Literature** (3) Medieval masterpieces in original and modern French versions.
Effective: Fall 2006
Prerequisite: FR 351 orFR 352

FR 426Y (IL) **French Literature of the Renaissance** (3) Survey of key texts from sixteenth century France, with attention to historical and philosophical currents of French social thought.
Effective: Fall 2006
Prerequisite: FR 351 orFR 352

FR 430 (IL) **Contemporary France** (3) Study of contemporary French society, politics, and culture from 1870 to the present.
Effective: Spring 2006
Prerequisite: FR 330

FR 434Y (IL) **Culture and Cuisine** (3) Interdisciplinary perspectives on the historical, political, and cultural dimensions of French food.
Effective: Spring 2006
Prerequisite: FR 330, FR 452, FR 460

FR 436Y (IL) **Readings in Seventeenth-Century French Literature** (3) Baroque and classicism: reappraisal of major and lesser-known 17th-century texts and theories.
Effective: Fall 2006
Prerequisite: FR 351 orFR 352

FR 440 (IL) **Teaching of Romance Languages** (3) Theories of second language acquisition. Current classroom practices in the teaching of Romance languages.
Effective: Spring 2006
Prerequisite: 15 credits beyond the elementary level

FR 445Y (IL) **Self and Society in Eighteenth-Century France** (3) The changing relationship of the individual to society in pre-Revolutionary France will be explored in texts by major writers.
Effective: Spring 2006
Prerequisite: FR 351 . Prerequisite or concurrent:FR 352

FR 452Y (IL) **Nineteenth-Century French Literature** (3) Selected readings in romanticism, realism, and symbolism, including Balzac, Stendhal, Sand, Baudelaire, and others, with emphasis on cultural issues.
Effective: Fall 2006
Prerequisite: FR 351 orFR 352

FR 453Y (IL) **La Belle Epoque: Politics, Society, and Culture in France, 1880-1914** (3) Interdisciplinary perspectives on the politics, society, and culture of France, 1880-1914.
Effective: Fall 2006
Prerequisite: FR 330 orFR 351 orFR 352

FR 458 (IL) **African Literature of French Expression** (3) Genesis of Franco-African literature in the 1930s; phases of the negritude movement; colonial and national literature.
Effective: Fall 2006
Prerequisite: FR 351 orFR 352

FR 460 (IL) **Contemporary French Literature** (3) Major authors and movements in French novel, drama, and poetry from Proust to the present.
Effective: Fall 2006
Prerequisite: FR 351 orFR 352

FR 470 (IL) **Race and Gender Issues in Literatures in French** (3) A critical presentation, taught in French, of changing ideas and values on race and gender in French and Francophone literatures.
Effective: Summer 2005
Prerequisite: FR 351 orFR 352

FR 471 (IL) **Francophone Women in Literature and Culture** (3) Women's issues in literatures and cultures of French-speaking countries in Europe, the mediterranean, Africa, the Caribbean, and Quebec.
Effective: Summer 2005
Prerequisite: FR 351 orFR 352

FR 487 (IL) **Topics in French Film History and Theory I: 1895-1945** (3) Provide background needed to understand the broad outlines of French film history and theory in their first fifty years (1895-1945).
Effective: Spring 2006
Prerequisite: FR 351 andFR 352 orCOMM 250

FR 488 (IL) **Topics in French Film History and Theory II: 1945-2002** (3) Provide background needed to understand the broad outlines of French film history and theory in their second half-century (1945-2002).
Effective: Spring 2006
Prerequisite: FR 351 andFR 352 orCOMM 250

FR 489 (IL) **French Literature and Film** (3) Comparison of artistic differences between selected pieces of French literature and their film adaptations.
Effective: Fall 2006
Prerequisite: FR 351 orFR 352

FR 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

FR 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

FR 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1998
Prerequisite: prior approval of proposed assignment by instructor

FR 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

FR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

FR 499 (IL) **Foreign Study--French** (3-12) Advanced studies in French language and literature.
Effective: Summer 2005
Prerequisite: FR 201, FR 202

FR 500 **History of the French Language** (3) Evolution of French from its origins to the present-day, with emphasis on Old French philology.
Effective: Fall 1984

FR 502 **Introduction to French Linguistics** (3) An overview of the major subfields of linguistics as they apply to the French language.

Effective: Spring 1997

FR 503 **French Phonology** (3) A theoretical approach to the sound structure of French.
Effective: Spring 2007

FR 504 **French Syntax** (3) An in-depth study of sentence structure in the French language.
Effective: Fall 2004

FR 505 **Semantics of French** (3) An in-depth study of how meaning is computed based on French data.
Effective: Spring 2007

FR 508 **French Business Communications** (3 per semester/maximum of 6) Written and oral elements of French commerce and industry.
Effective: Fall 1983
Prerequisite: FR 510

FR 510 **Stylistique Avancee** (3) An introduction to literary creativity through practice of textual analysis, interpretation, and to basic concepts of contemporary poetics.
Effective: Summer 1999

FR 511 **Readings in Old French** (3 per semester/maximum of 6) A survey of French literature to 1300, focusing in alternate semesters on either the twelfth or the thirteenth century.
Effective: Fall 1983

FR 518 **Medieval French Drama** (3) The development of French drama from its liturgical origins to the flourishing comic theatre of the late Middle Ages.
Effective: Winter 1978

FR 526 **Age of Rabelais** (3) Notions of literary creativity in the context of early sixteenth-century French Humanism; readings from Rabelais, Marguerite de Navarre, Sceve.
Effective: Fall 1983

FR 528 **Age of Montaigne** (3) Literary culture of Renaissance France in the context of social and political crisis; readings from Montaigne, DuBellay, Ronsard, and Sponde.
Effective: Winter 1978

FR 529 **Seminar in Renaissance Literature** (3 per semester/maximum of 6) Intensive study of various French Renaissance writers in relation to selected artistic issues of the period.
Effective: Fall 1983

FR 530 **La France Contemporaine** (3) A comprehensive cross-sectional view of French society and its institutions since World War II.
Effective: Winter 1980

FR 531 **Francophone Culture** (3 per semester/maximum of 6) Concept of francophone; French minorities in Europe and North America; role of French language in Africa, Middle East, Far East.
Effective: Fall 1983

FR 532 **French Regions and Regionalisms** (3) Interdisciplinary perspectives on the culture, history, and geography of the French regions and their regionalist identity movements.
Effective: Spring 1992

FR 533 **Baroque Aesthetics in Seventeenth-Century French Literature and Intellectual History** (3) Based on the Foucaldian notion of episteme, the course analyzes major literary texts and intellectual trends.
Effective: Fall 1999

FR 534 **Seventeenth-Century French Drama** (3) Theories and practice of theater through analysis of dramatic texts by Rotrou, Corneille, Moliere, Racine et les autres.
Effective: Summer 1999

FR 535 **Texts and Performances** (3) Based upon current theories of theater, the course focuses on problematics of French drama from the Seventeenth-Century to the present.
Effective: Summer 1999

FR 540 **Eighteenth-Century French Novel** (3) Examination of the rise of the genre including formal considerations of

narrative technique as well as historical context.
Effective: Summer 1999

FR 541 **The Encyclopedie and Knowledge in 18th-Century France** (3) Exploration of intellectual currents in epistemology, metaphysics, social and political thought, ethics, and aesthetics in eighteenth-century France.
Effective: Fall 1999

FR 543 **Seminar: Studies in the Enlightenment** (3 per semester/maximum of 6) Discourse and thematic analysis of selected works of French Enlightenment genres: essay, drama, fiction, poetry.
Effective: Fall 1983

FR 545 **Analysis of French Civilization** (3 per semester/maximum of 6) French cultural aspects, other than language and literature, conducted in French with the collaboration of specialists outside the French department.
Effective: Summer 1990

FR 547 **Modernism and Postmodernism** (3-6) Interdisciplinary approaches to these concepts, with a focus on artistic and literary objects in the French context.
Effective: Spring 1994
Prerequisite: FR 545 orFR 571 orFR 580

FR 558 **African Novel in French** (3) Development of novel in French from colonial era to independence; Africanization of genre with African verbal artforms.
Effective: Spring 1986

FR 559 **Issues in Francophone Literatures** (3) Diversity issues in Francophone literatures explored through various literary genres: variable focus may combine genre and topic.
Effective: Spring 1997

FR 562 **French Romanticism and Realism** (3) Romanticism, realism, and their variations in the context of social and political revolution.
Effective: Spring 1998

FR 564 **Figures of Alterity in Nineteenth-Century French Literature** (3) Representations of otherness in nineteenth-century French literature examined through race, gender, religion, and class paradigms.
Effective: Spring 1998

FR 565 **Seminar: Nineteenth-Century Studies** (1-6) Various nineteenth-century French writers considered in relation to selected esthetic and cultural problems raised during the period.
Effective: Fall 1983

FR 566 **Women Writers in Nineteenth-Century France** (3) Women's literary production in nineteenth-century France, including novels, poetry, travel narratives, children's literature, and essays.
Effective: Spring 1995

FR 569 **Major Texts of Twentieth-Century French Literature** (3-6) Established contemporary literary texts, figures, and aesthetic movements in various genres from Proust to Sartre and from Genet to Conde.
Effective: Summer 1999

FR 570 **Modern French Poetry** (3 per semester/maximum of 6) Exploration of the poetic genre and its diversification through poetic prose, free verse, and metaphorical narrative, from Baudelaire to Cixous.
Effective: Summer 1999

FR 571 **French Literary Theory and Criticism** (3) Major trends in contemporary theory and criticism from genre debates to socio-political approaches to literature, post-structuralism, deconstruction, and reception theories.
Effective: Summer 1999

FR 572 **Seminar: Twentieth-Century French Literature** (3 per semester/maximum of 6) Specialized consideration of contemporary writers; for advanced students.
Effective: Fall 1983

FR 574 **French Folklore and Popular Culture** (3) Historical survey of French folklore and popular culture, with an emphasis on the modern period.
Effective: Summer 1993

FR 580 **Approaches to French Civilization** (3) French interdisciplinary methods of cultural analysis and cultural history, with applications to French cultural artifacts.

Effective: Spring 1992

FR 581 **Theory and Techniques of Teaching French** (1-6) No description.
Effective: Fall 1983

FR 583 **Reading and Foreign Language Acquisition: Research and Practice** (3) Approaches to the study and teaching of reading in University departments of French; materials development practicum.
Effective: Spring 1992

FR 584 **Testing French as a Foreign Language: Research and Practice** (3) Theoretical and practical approaches to problems in the testing of undergraduate French as a foreign language.
Effective: Spring 1992

FR 585 **The Curriculum in the Pedagogy and Acquisition of French as a Foreign Language** (3) Approaches to the study and development of the undergraduate curriculum of French as a foreign language.
Effective: Spring 1992

FR 586 **Research Methods and Bibliography in French Civilization** (1) Introduction to research resources and skills in interdisciplinary French cultural studies and specific subfields of French and Francophone culture/ civilization.
Effective: Spring 1992

FR 587 **Research Techniques and Bibliography in French Language and Literature** (1-3) No description.
Effective: Fall 1983

FR 589 (CMLIT 589, GER 589, SPAN 589) **Technology in Foreign Language Education: An Overview** (3) Approaches to the uses and research applications of multimedia and other educational technologies applied to the teaching of foreign languages. (also crosslisted with APLNG 589)
Effective: Spring 2004

FR 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

FR 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

FR 597A **The Tristan Legend** (3) A literary and cultural study of the legend of Tristan and Iseut (Isolde).
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FR 597B **The Contemporary French City** (3) From a grounding in theories of the city and drawing on broader selected texts on the city and urban space, the course will derive its main themes.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

FR 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

FR 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

FR 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Activities to be included in the teaching assignment will be lecturing, leading discussions, conducting recitations, correcting and grading student papers and examinations.
Effective: Fall 1983

FR 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 1999

FR 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

FR 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Fuel Science (F SC)

F SC 401 **Introduction to Fuel Technology** (3) An introduction to the scientific and engineering principles of fuel technology. For non-fuel science majors; fuel science majors will not receive credit.
Effective: Summer 2007
Prerequisite: CHEM 112, PHYS 211

F SC 422 **Combustion Engineering** (3) Principles of industrial combustion engineering; structure and stability of industrial flames; heat transfer; examples drawn from industrial applications.
Effective: Spring 2008
Prerequisite: EGEE 401 orF SC 401

F SC 431 **The Chemistry of Fuels** (3) Nature and properties of fossil and other fuels, including aerospace, in relation to use; preparation of fuels; by-products; fuel analysis.
Effective: Spring 2008
Prerequisite: CHEM 210;EGEE 302 or equivalent

F SC 432 (CH E 432) **Petroleum Processing** (3) A study of physical and chemical processes to convert crude oil into desired products with an outlook from present to future.
Effective: Summer 2007
Prerequisite: CHEM 210

F SC 435 (CH E 435) **Industrial Organic Chemistry** (3) Chemistry and processes for producing organic chemicals and materials in existing and emerging new manufacturing sectors of organic chemical industry.
Effective: Summer 2007
Prerequisite: CHEM 210

F SC 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2000

F SC 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

F SC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

F SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1999

F SC 503 **Analytical Methods in Fuel Science** (3) Analytical and characterization methods used in fuel science and applied to fuel processing, combustion, and conversion are emphasized.
Effective: Spring 2009
Prerequisite: EGEE 430, F SC 431 or equivalent

F SC 504 **Problems in Fuels Engineering** (3) A problem-based, active learning course on the utilization of fossil fuels and renewable energy.
Effective: Fall 2009
Prerequisite: EGEE 430 andF SC 431

F SC 506 **Carbon Reactions** (3) Current approaches to heterogeneous reactions in combustion and gasification of carbonaceous solids, including those derived from coal and petroleum sources.
Effective: Spring 1999
Prerequisite: CHEM 452

F SC 590 (EME 590, MNG 590, P N G 590) **Colloquium** (1-3) Continuing seminars which consist of individual lectures by faculty, students or outside speakers on energy and mineral engineering issues.
Effective: Spring 2009

F SC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

F SC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1999

F SC 600 **Thesis Research** (1-15) No description.
Effective: Spring 1999

F SC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 1999

F SC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 1999

F SC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 1999

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Geo-Environmental Engineering (GEOEE)

GEOEE 402 **Introduction to Particle Systems** (1) Characteristics of particulate systems; particle modification processes; transport and flow in powders, dispersions and suspensions.
Effective: Spring 2001
Prerequisite: MATH 250 orMATH 251, PHYS 212

GEOEE 404W **Surface and Interfacial Phenomena in Geo-Environmental Systems** (3) Principles underlying surface and interfacial phenomena with application to mineral processing and geo-environmental systems.
Effective: Fall 2009
Prerequisite: or concurrent:EME 301 orMATSE 401;GEOEE 412

GEOEE 406 **Sampling and Monitoring of the Geo-Environment** (3) Issues of sampling, analysis, monitoring and control techniques for effective environmental management in the extractive industries.
Effective: Spring 1999
Prerequisite: MN PR 301, MNG 401, P N G 411

GEOEE 408 **Contaminant Hydrology** (3) Groundwater flow and transport; agents of contamination; aquifer characterization and remediation; case studies.
Effective: Spring 2002
Prerequisite: GEOSC 452

GEOEE 412 **Geo-Environmental Engineering Laboratory** (1) A laboratory study of the principles involved in the characterization and remediation of process wastes. Those students who are scheduled for MN PR 413 may not take this course.
Effective: Spring 1999
Prerequisite: or concurrent:MN PR 301

GEOEE 427 **Pollution Control in the Process Industries** (3) Development of multimedia pollution control strategies for the mineral, metallurgical processing, and fossil fuel industries.
Effective: Summer 2007
Prerequisite: or concurrent:CHEM 112, MATH 250 orMATH 251, MN PR 301

GEOEE 480 **GeoEnvironmental Engineering Process Design** (3) An integrated problem-based learning experience that utilizes fundamental concepts covered in the curriculum to design a geo-environmental system.
Effective: Fall 2004
Prerequisite: GEOEE 427 minimum of seventh-semester standing in Environmental Systems Engineering

GEOEE 494 **Senior Thesis** (1-6) Independent research and/or design projects under the supervision of the interdisciplinary Environmental Systems Engineering program.
Effective: Fall 2004
Prerequisite: seventh-semester standing in Environmental Systems Engineering

GEOEE 494H **Senior Thesis** (1-6) Independent research and/or design projects under the supervision of the interdisciplinary Environmental Systems Engineering program.
Effective: Fall 2007
Prerequisite: seventh-semester standing in Environmental Systems Engineering

GEOEE 557 (MNG 557) **Computational Geomechanics I** (3) Finite element and boundary element analysis of rock mechanics, groundwater flow, and mass transport.
Effective: Summer 2002

GEOEE 559 (MNG 559) **Consolidation of Porous Media** (2) Coupled fluid flow and deformation behavior of geologic media. Theory and applications in geological, environmental, and petroleum engineering.
Effective: Summer 2002
Prerequisite: MNG 557

GEOEE 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1999

GEOEE 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1999

GEOEE 597 **Special Topics** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1999

GEOEE 600 **Thesis Research** (1-15) No description.
Effective: Spring 2000

GEOEE 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 2000

GEOEE 610 **Thesis Research Off-Campus** (1-15) No description.
Effective: Spring 2000

GEOEE 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 2000

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Geography (GEOG)

GEOG 407 (HIST 453) **American Environmental History** (3) The history of the ways Americans have used and thought about the environment since 1500.
Effective: Spring 1998
Prerequisite: GEOG 030, LARCH 003 ; andHIST 020 orHIST 021 ; or 6 credits in the humanities or social sciences

GEOG 411 **Forest Geography** (3) This course studies processes that control spatial and temporal change in forests.
Effective: Fall 2007
Prerequisite: GEOG 010, GEOG 111 ; orBIOL 220W

GEOG 411W **Forest Geography** (3) This course studies processes that control spatial and temporal change in forests.
Effective: Fall 2007
Prerequisite: GEOG 010, GEOG 111 ; orBIOL 220W

GEOG 412W **Climatic Change and Variability** (3) Theories and observations of past, present, and future climatic change and variability; introduction to techniques used in climatic change research.
Effective: Spring 2007
Prerequisite: GEOG 110 orMETEO 003

GEOG 417 **Satellite Climatology** (3) A discussion of the application of satellite data to current and planned large-scale climate experiments.
Effective: Spring 2007
Prerequisite: GEOG 362

GEOG 420Y (US;IL) **Metropolitan Analysis** (3) Theory and practice of regional and metropolitan analysis.
Effective: Spring 2007
Prerequisite: GEOG 120, GEOG 160

GEOG 423Y (US) **Historical Geography of North America** (3) Exploration, settlement, and changing patterns of human occupance from the seventeenth century to the 1930's.
Effective: Spring 2007
Prerequisite: GEOG 122 3 additional credits in geography or 6 credits

GEOG 424 (US;IL) **Geography of the Global Economy** (3) Focus on industrial location theory, factors in industrial location, studies of selected industries and problems of industrial development.
Effective: Spring 2007
Prerequisite: ECON 002, ECON 004, GEOG 126

GEOG 425 **Geography of Race, Class, and Poverty in America** (3) This class will study the geography of race, class, and poverty in America today.
Effective: Spring 2007
Prerequisite: GEOG 126 andECON 002 andECON 004

GEOG 426Y (US;IL) (WMNST 426Y) **Gender and Geography** (3) Description and explanation of the links between gender relations and spatial structures.
Effective: Spring 2007
Prerequisite: GEOG 020, GEOG 126, GEOG 120, WMNST 001 orWMNST 187

GEOG 427 (US;IL) **Urban Historical Geography** (3) Study of the development and transformation of the historical urban built environment.
Effective: Spring 2007
Prerequisite: 6 credits in geography humanities or social sciences

GEOG 428 (US) **Political Geography** (3) Geographical foundations of political phemomena; significant geographic factors in growth and development of states, boundary problems, population distribution, colonies, and internal and international regional problems.
Effective: Spring 2007
Prerequisite: 6 credits in history or 6 credits in political science

GEOG 429 (US) **Global Urbanization** (3) This course reflects critically on a number of issues related to global urbanization, including the culture and political economy of urban space.
Effective: Spring 2007
Prerequisite: GEOG 020, GEOG 126 orGEOG 120

GEOG 430 **Human Use of Environment** (3) The human use of resources and ecosystems and social causes and consequences of environmental degradation in different parts of the world; development of environmental policy and management strategies.
Effective: Fall 2008
Prerequisite: GEOG 010 orGEOG 020 orGEOG 030 orGEOG 040 orGEOG 130 or permission of the program

GEOG 431 **Geography of Water Resources** (3) Perspectives on water as a resource and hazard for human society; water resource issues in environmental and regional planning.
Effective: Spring 2007
Prerequisite: 6 credits in geography or natural sciences

GEOG 432 (EME 432) **Energy Policy** (3) Analysis, formulation, implementation, and impacts of energy-related policies,

regulations, and initiatives.
Effective: Summer 2010
Prerequisite: E B F 200, EGEE 120, PL SC 490

GEOG 434 **Politics of the Environment** (3) This course explores politics related to the use, transformation, valuation, and representation of the environment.
Effective: Spring 2007
Prerequisite: 6 credits in social sciences or humanities

GEOG 435H (IL) **Global Change and Sustainability - Bulgaria** (3) Sustainability in the context of climate change, global socioeconomic change and regional transformation in Bulgaria; embedded foreign fieldwork (honors).
Effective: Summer 2008
Prerequisite: sophomore standing or above; departmental permission required

GEOG 436 **Ecology, Economy, and Society** (3) Analyses of major themes in ecology and economic development, poverty-alleviation, and sustainability.
Effective: Summer 2006
Prerequisite: upper-division standing

GEOG 438W **Human Dimensions of Global Warming** (3) Human dimensions of global environmental change: human causes; human adaptations; and policy implications of global warming.
Effective: Fall 2008
Prerequisite: EARTH 002, GEOG 010 orMETEO 003;GEOG 030

GEOG 439 **Property and the Global Environment** (3) This course reviews theoretical and empirical relationships between multiple legal, economic, and cultural approaches to property, and environmental quality and conflicts.
Effective: Summer 2006
Prerequisite: 6 credits in geography humanities or social sciences

GEOG 440 **Topics in Regional Geography** (3) Analysis of historical, contemporary and future environmental and societal issues in a specified world region from a geographical perspective.
Effective: Summer 2006
Prerequisite: 3 credits in physical geography 3 credits in human geography

GEOG 444 **African Resources and Development** (3) Ecological and cultural factors in the geography of Africa; natural resources and development.
Effective: Spring 2001
Prerequisite: GEOG 010, GEOG 020, GEOG 030 orGEOG 124

GEOG 459 **Digital Terrain Models** (3) Techniques for digital investigation of geomorphic landforms, including input and reformatting of source data.
Effective: Spring 2007
Prerequisite: GEOG 463

GEOG 461W **Dynamic Cartographic Representation** (3) Theory and practice of mapping and geo-representation in a hypermedia context. Applications in science, policy, travel, and education.
Effective: Fall 2007
Prerequisite: GEOG 361, GEOG 330, GEOG 362, GEOG 363

GEOG 463 **Geospatial Information Management** (3) This course examines geospatial data representations and algorithmic techniques that apply to spatially-organized data in digital form.
Effective: Spring 2007
Prerequisite: any earth science computer application course; familiarization with databases and information systems

GEOG 464 **Analysis and GIS** (3) Normative and probabilistic models of spatial behavior; adaptive systems in geographic space; interaction and system stability.
Effective: Spring 2007
Prerequisite: GEOG 364

GEOG 467 **Applied Cartographic Design** (3) Applied computer-assisted map production methods with emphasis on geographic information design and color use for multiple presentation media.
Effective: Spring 2007
Prerequisite: GEOG 361

GEOG 468 **Geographic Information Systems Design and Evaluation** (3) Design and evaluation of Geographic Information Systems and other forms of integrated spatial data systems.
Effective: Spring 2007
Prerequisite: GEOG 363

GEOG 469 **Energy Industry Applications of GIS** (3) Roles of geographic information systems in energy siting decisions focusing on electric energy transmission networks.
Effective: Summer 2010
Prerequisite: GEOG 030, EGEE 102, EME 444

GEOG 475H (LER 475H) **Labor in the Global Economy: U.S. and South African Perspectives** (3) This course focuses on how the nature of work is changing in the global economy, and the implications for economic opportunity and inequality in both.
Effective: Spring 2008
Prerequisite: a minimum of 12 GEOG or LER credits before taking the course (or permission of the program).

GEOG 482 **The Nature of Geographic Information** (2) Orientation to the properties of geographic data and the practice

of distance learning.
Effective: Summer 2004
Prerequisite: admission to the Master of GIS program or Certificate Program in GIS

GEOG 483 **Problem-Solving with GIS** (3) How geographic information systems facilitate data analysis and communication to address common geographic problems.
Effective: Summer 2004
Prerequisite: GEOG 482

GEOG 484 **GIS Database Development** (3) Database design, creation, maintenance, and data integration using desktop GIS software.
Effective: Summer 2004
Prerequisite: GEOG 483

GEOG 485 **GIS Programming and Customization** (3) Customizing GIS software to extend its built-in functionality and to automate repetitive tasks.
Effective: Fall 2007
Prerequisite: GEOG 363 orGEOG 484;CMPSC 101 or equivalent

GEOG 486 **Cartography and Visualization** (3) Theory and practice of cartographic design emphasizing effective visual thinking and visual communication with geographic information systems.
Effective: Summer 2004
Prerequisite: GEOG 484

GEOG 487 **Environmental Applications of GIS** (3) Real-world applications of GIS and spatial analysis to investigate a variety of current environmental issues.
Effective: Spring 2010
Prerequisite: GEOG 484

GEOG 488 **Acquiring and Integrating Geospatial Data** (3) Advanced technical, legal, ethical and institutaional problems related to data acquisition for geospatial information systems.
Effective: Summer 2004
Prerequisite: GEOG 484

GEOG 489 **GIS Application Development** (3) Advanced topics in GIS customization, including the Systems Development Life Cycle, packaging and deployment, and consuming Web services.
Effective: Summer 2004
Prerequisite: GEOG 485

GEOG 493 **Service Learning** (3-12) Classroom instruction with supervised student activity on a group community service project.
Effective: Summer 2006
Prerequisite: sophomore standing; 6 credits of social or environmental science

GEOG 494 **Research Project in Geography** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2006
Prerequisite: prior approval of program

GEOG 494H **Research Project in Geography** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007
Prerequisite: prior approval of program

GEOG 495 **Internship** (1-13) Supervised off-campus, non-group instruction including individual field experience, practicums, or internships. Written and oral critique of activity required.
Effective: Fall 1981
Prerequisite: prior approval of proposed assignment by instructor

GEOG 495B **Geography Teaching Internship** (1-10) Supervised undergraduate teaching experience in which students serve as peer tutors, laboratory assistants, or course material developers.
Effective: Summer 2004

GEOG 495C **Internship Supervision and Mentoring** (1) Candidates for the Master of GIS degree sponsor a GIS-related internship for students in Penn State's resident undergraduate program.
Effective: Summer 2004

GEOG 495G **Giscience Internship** (1-10) Supervised research experience within the Department of Geography's GeoVISTA Center, Gould Center, or an appropriate external agency.
Effective: Spring 2007
Prerequisite: GEOG 160

GEOG 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

GEOG 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

Effective: Fall 1983

GEOG 497A **Geography of the Cryosphere** (3) A survey of the world's snow and ice, including sea ice, glaciers, permafrost, and seasonal snow cover.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 497B **Geographies of Justice: Environment, Society and Development** (3) This course will examine the origins of social and environmental justice in the United States and their application globally.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 497C (IL) **Biological Diversity in Agriculture and Global Change** (3) Analysis of how biological diversity in agriculture is impacted by complex interactions with global land-use, climate, and social-environmental changes.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: 5th-semester standing or higher

GEOG 497D **Lidar Technology and Applications** (3) Understanding lidar systems' design, operation, data processing techniques, and product generation to address typical application scenarios faced by the geospatial professional.
Effective: Summer 2010 Ending: Summer 2010

GEOG 497D **Lidar Technology and Applications** (3) Understanding lidar systems' design, operation, data processing techniques, and product generation to address typical application scenarios faced by the geospatial professional.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 497E **Climate Change Adaptation and Resilience** (3) This course explores adaptation and resilience under climate change with emphasis on directions of social change, system transormation, and sustainability.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 497F **Conceptual Modeling and Programming in G.I.Science** (3) Project-based course introducing major modeling paradigms, design decisions, and object oriented programming from a Geographic Information Science perspective.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 497K **Advanced Web Mapping** (3) Cultivate a working knowledge of how geospatial professionals can develop web mapping applications that bring together data from multiple sources.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: GEOG 363

GEOG 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1998

GEOG 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2006
Prerequisite: prior approval of program

GEOG 500 **Introduction to Geographic Research** (1-3) No description.
Effective: Spring 1981

GEOG 501A **Research Perspectives in Physical Geography** (1) This course presents contemporary perspectives on Physical Geography, emphasizing the major issues and integrative themes of the sub-discipline.
Effective: Summer 2008

GEOG 501B **Research Perspectives in Human Geography** (1) This course presents contemporary perspectives on Human Geography, emphasizing the major issues and integrative themes of the sub-discipline.
Effective: Fall 2007

GEOG 501C **Research Perspectives in Human-Environment Geography** (1) Contemporary perspectives on Human-Environment Geography, emphasizing major issues and integrative themes of the sub-discipline.
Effective: Summer 2008

GEOG 501D **Research Perspectives in GIScience** (1) This course presents contemporary perspectives on Geographic Information Science, emphasizing the major issues and integrative themes of the sub- discipline.
Effective: Summer 2008

GEOG 502 **Research Scholarship in Geography** (3) Learning the craft of scholarly research in geography.
Effective: Summer 2008
Prerequisite: GEOG 500

GEOG 503 **Seminar in Climatology** (3-6) Selected topics in climatology, emphasizing global-scale and man-climate

interactions; individual and group projects.
Effective: Spring 1987
Prerequisite: GEOG 433

GEOG 505 **Economic Geography Seminar** (3-12) The examination of current problems and theories in economic geography through critical discussion of the literature and original student research.
Effective: Winter 1978

GEOG 506 **Seminar in Social Geography** (3) Graduate level research seminar examining theory and methods in social geography.
Effective: Spring 1993

GEOG 507 **Human-Environment Seminar** (3) Theory and method in human-environment interaction subfields; may be re-taken when topics vary; readings, discussions, research.
Effective: Spring 1998

GEOG 508 **Cultural Geography Seminar** (3-6) The exploration of current problems and theory in cultural geography through critical discussion of the literature and original student research.
Effective: Winter 1978

GEOG 509 **Population Geography Seminar** (3) Selected problems in population geography, with emphasis on analysis and presentation of data.
Effective: Fall 2006

GEOG 512 **Seminar in Cartography** (3-6) The exploration of current problems and theory in cartography through critical discussion of the literature and original student research.
Effective: Spring 1987
Prerequisite: 6 credits in cartography

GEOG 515 (WMNST 515) **Gender and Geography** (3) Explanations of the links between gender relations and spatial structures.
Effective: Spring 1995

GEOG 518 **Geographic Perspectives of Space and Time** (3) Examination of concepts and approaches for representing geographic space/ spatial processes through critical discussion of literature and original student research.
Effective: Spring 1995

GEOG 520 **Seminar in Urban Geography** (3) Analysis of current literature in urban geography focusing on theoretical and methodological debates.
Effective: Summer 1991

GEOG 521 **Map Symbolization and Design Theory** (3) Introduction to theoretical issues in map design and symbolization with emphasis on current research trends and practical application of research. Students who have passed GEOG 421 may not schedule this course for credit.
Effective: Spring 2007
Prerequisite: GEOG 361, GEOG 364

GEOG 557 **Geographic Information Systems** (3) Principles and use of geographic information systems; emphasis is on practical use of GIS as a research methodology for geographic data handling and geographic analysis.
Effective: Spring 1998

GEOG 580 **Spatial Data Structures and Algorithms** (3) In-depth examination of geographic information system components; representation and storage of spatial data, spatial algorithms, input-output considerations. Students who have passed GEOG 480 may not schedule this course for credit.
Effective: Summer 1987
Prerequisite: GEOG 456, GEOG 457

GEOG 581 **Geographic Information Systems Design and Evaluation** (3) Graduate-level examination of Geographic Information System and other forms of integrated spatial data system design.
Effective: Summer 1987
Prerequisite: GEOG 580

GEOG 583 **Geospatial System Analysis and Design** (3) Systematic approach to requirements acquisition, specification, design and implementation of geospatial information systems.
Effective: Summer 2004
Prerequisite: GEOG 484

GEOG 584 **Geospatial Technology Project Management** (3) Principles of effective project management applied to the design and implementation of geospatial information systems.
Effective: Summer 2004
Prerequisite: GEOG 583

GEOG 585 **Open Web Mapping** (3) Design, development, and implementation of web mapping applications using OGC standards and open source software.
Effective: Spring 2008
Prerequisite: GEOG 485

GEOG 586 **Geographical Information Analysis** (3) Choosing and applying analytical methods for geospatial data, including point pattern analysis, interpolation, surface analysis, overlay analysis, and spatial autocorrelation.
Effective: Summer 2004
Prerequisite: GEOG 485 orGEOG 486 orGEOG 487

GEOG 587 **Conservation GIS** (3) Conservation GIS applies geospatial problem solving to ecological research and resource management issues to enhance conservation planning.
Effective: Summer 2009
Prerequisite: GEOG 487

GEOG 588 **Planning GIS for Emergency Management** (3) Requirements analysis and proposal writing to plan and implement GIS solutions supporting emergency management activities of government agencies and contractors.
Effective: Summer 2008
Prerequisite: GEOG 583, GEOG 584 ; GEOG 488 recommended

GEOG 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

GEOG 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

GEOG 596A **Individual Studies--Peer Review** (3) Preparation and presentation of a proposal for an individual capstone project, and reviews of presentation by student peers.
Effective: Summer 2010 Ending: Summer 2010

GEOG 596A **Individual Studies -- Peer Review** (3) Preparation and presentation of a proposal for an individual capstone project, and reviews of presentation by student peers.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 596B **Individual Studies--Capstone Project** (3) Preparation and delivery of a formal professional presentation of the results of an individual capstone project.
Effective: Summer 2010 Ending: Summer 2010

GEOG 596B **Individual Studies -- Capstone Project** (3) Preparation and delivery of a formal professional presentation of the results of an individual capstone project.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 596C **Individual Studies** (3) Individual project work supervised vy a graduate faculty adviser.
Effective: Summer 2010 Ending: Summer 2010

GEOG 596C **Individual Studies** (3) Individual project work supervised by a graduate faculty adviser.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 596I **Independent Study in Geospatial Intelligence** (1-3) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

GEOG 596I **Independent Study in Geospatial Intelligence** (1-3) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

GEOG 597C **Human Causes and Impacts of Global Change** (3) Human activities and socioeconomic drivers causing global environmental change, and human vulnerabilities and impacts resulting from global environmental change.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: graduate standing

GEOG 597K **GIS for Analysis of Health** (3) The role of geographic information systems in understanding disease, including relevant spatial analysis and cartographic visualization techniques.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2006

GEOG 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

GEOG 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

GEOG 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Theoretical and practical aspects of undergraduate instruction in geography.
Effective: Fall 1983
Prerequisite: concurrent status as graduate teaching assistant

GEOG 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 2001

GEOG 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

GEOG 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

GEOG 860 **Comparative GIS** (3) Formal methodology for evaluating, comparing, and recommending geospatial software solutions for a variety of professional uses.
Effective: Summer 2009
Prerequisite: GEOG 484

GEOG 861 **Map Projections for Geospatial Professionals** (1) Cultivates a working knowledge of map projections that professionals need to process geospatial data effectively for mapping and anlaysis.
Effective: Spring 2008
Prerequisite: GEOG 484

GEOG 862 **GPS and GNSS for Geospatial Professionals** (3) Cultivates a working knowledge of current and future capabilities of GPS and the emerging Global Navigation Satellite System.
Effective: Spring 2010

GEOG 863 **GIS Mashups for Geospatial Professionals** (3) Cultivates a working knowledge of how and why geospatial professionals develop web mapping applications that combine data from multiple sources.
Effective: Spring 2010
Prerequisite: GEOG 485

GEOG 864 **Professionalism in Geographic Information Science and Technology** (2) Prepares current and aspiring professionals to recognize, analyze and address legal and ethical issues in the GIS&T (geospatial) field.
Effective: Summer 2009

GEOG 882 **Geographic Foundations of Geospatial Intelligence** (3) Orientation to the geographic foundations of geospatial intelligence and its applications in national security, international relief work, and disaster management.
Effective: Summer 2008

GEOG 883 **Remote Sensing for the Geospatial Intelligence Professional** (3) Understanding remote sensing systems' operation, data products, and processing techniques to address typical problem scenarios faced by the GEOINT professional.
Effective: Summer 2008
Prerequisite: GEOG 882

GEOG 884 **Geographic Information Systems for the Geospatial Intelligence Professional** (3) How geographic information systems facilitate data analysis and communication to address common geographic problems faced by the geospatial intelligence professional.
Effective: Summer 2008
Prerequisite: GEOG 882

GEOG 885 **Advanced Analytic Methods in Geospatial Intelligence** (3) Prepares current and aspiring geospatial intelligence professionals to apply and interpret results of non-quantitative analysis and modeling techniques.
Effective: Summer 2009
Prerequisite: GEOG 882

GEOG 889 **Seminar in Geospatial Intelligence** (2) Culminating experience that synthesizes topics addressed in earlier

classes and explores emerging topics and methods of geospatial intelligence analysis.
Effective: Spring 2010
Prerequisite: GEOG 882, GEOG 883, GEOG 884

GEOG 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject.
Effective: Summer 2009

GEOG 897A **Geography for Civil Security** (3) To interact with diverse cultures through cooperation, competition, and occasionally, conflict. This course introduces the diverse people and cultures.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOG 897G **Trends in Geospatial Technology** (3) Developing life-long learning skills to take advantage of the changing tools of geospatial technology.
Effective: Summer 2010 Ending: Summer 2010

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Geosciences (GEOSC)

GEOSC 402Y (IL) **Natural Disasters** (3) Case studies of the causes and consequences of natural disasters; analysis of disaster impact in different economic, cultural, and social conditions.
Effective: Summer 2005
Prerequisite: fourth-semester standing

GEOSC 405 (SOILS 405) **Hydropedology** (3) Soil and water interactions across scales, integrated studies of landscape-soil-water relationships, fundamental processes of water flow and chemical transport.
Effective: Spring 2008
Prerequisite: SOILS 101

GEOSC 409W **Geomicrobiology** (3) Investigation of modern and ancient microbial interactions with soils, sediments, the atmosphere, minerals, rocks, nutrients, and pollutants.
Effective: Summer 2008
Prerequisite: CHEM 112;GEOSC 001, GEOSC 020, GEOSC 040, EARTH 002, BIOL 110 orMICRB 201

GEOSC 410 **Marine Biogeochemistry** (3) Exploration of the ways in which life influences and is influenced by chemical, physical, and geological processes in the ocean.
Effective: Summer 2007
Prerequisite: CHEM 112;EARTH 002 orGEOSC 001, GEOSC 020, GEOSC 040 orMETEO 022

GEOSC 412 **Water Resources Geochemistry** (3) Aqueous geochemistry of silica, alumina, carbonate minerals, and selected metals; organic species in water; isotope geochemistry applied to water.
Effective: Summer 2007
Prerequisite: CHEM 110, CHEM 112

GEOSC 413W **Techniques in Environmental Geochemistry** (3) This course teaches techniques needed for the collection, chemical analysis, and data analysis of environmental geochemical measurements. This course has one or more required field trips for which a fee is charged to the student.
Effective: Spring 2002
Prerequisite: one of the following:C E 475, CHEM 402, GEOSC 202, GEOSC 412, SOILS 419

GEOSC 415 **Geochemistry** (3) Element abundance and genesis, application of chemical principles to earth materials, element fractionation in geologic processes.
Effective: Summer 2007
Prerequisite: CHEM 112, GEOSC 004 orGEOSC 201

GEOSC 416 **Stable and Radioactive Isotopes in Geosciences: Introduction** (3) Discussions on theories for natural isotopic and element variations and their applications to the solution of geologic and cosmologic problems.
Effective: Summer 2007
Prerequisite: CHEM 110, CHEM 112, CHEM 111, CHEM 113;GEOSC 001 orGEOSC 020

GEOSC 418 (SOILS 419) **Soil Environmental Chemistry** (3) Introduction to chemical constituents and processes occurring in soils. Topics include mineral weathering, soil solution chemistry and adsorption of solutes.
Effective: Summer 2007
Prerequisite: CHEM 112, SOILS 101

GEOSC 419 **The Organic Geochemistry of Natural Waters and Sediments** (3) Composition, sources, and fates of particulate and dissolved organic matter in natural environments; biogeochemical processes; organic geochemistry of anthropogenic contaminants.
Effective: Summer 2007
Prerequisite: CHEM 110, CHEM 112

GEOSC 420 (BIOL 420) **Paleobotany** (3) Classification, morphology, phylogeny, and stratigraphic occurrence of fossil plants; practicum includes field trips and study of paleobotanical techniques and specimens.
Effective: Spring 2005
Prerequisite: any 3-credit introductory course in historical geology or plant biology

GEOSC 422 **Vertebrate Paleontology** (3) Course covers scientific thinking and skills in scientific writing, the history of vertebrates, and modern evolutionary theory applied to vertebrates. **1**
Effective: Spring 2009
Prerequisite: GEOSC 001 andBIOL 110

GEOSC 424 **Paleontology and Fossils** (3) Concepts and precedures using fossils to solve problems in systematics, evolution, biostratigraphy, correlation, sedimentation, paleoecology, and global change.
Effective: Spring 2001
Prerequisite: GEOSC 001 orGEOSC 020

GEOSC 428 **Micropaleontology** (4) Biology and ecology of microfaunas and microfloras (e.g., foraminifera, coccolithophores, radiolaria, diatoms, dinoflagellates) and applications in biostratigraphy and paleoenvironmental reconstruction.
Effective: Summer 2004
Prerequisite: GEOSC 204

GEOSC 434 **Volcanology** (3) Phenomena and products of volcanic eruptions; physical characteristics of lava and pyroclastic material.

Effective: Spring 1996
Prerequisite: GEOSC 004 orGEOSC 201

GEOSC 439 **Principles of Stratigraphy** (3) An introduction to the description and genesis of sedimentary rock bodies, the determination of their stratal geometries, and their correlation. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.)**1**
Effective: Spring 2001
Prerequisite: GEOSC 201

GEOSC 440 **Marine Geology** (3) Chemical and physical processes affecting the topography and sediments of the sea floor.
Effective: Spring 2001
Prerequisite: fourth-semester standing

GEOSC 444 **Matlab Applications for Geoscience** (2) An introduction to Matlab: m-file development, descriptive statistics, bootstrapping, Fourier transforms, regression, interpolation, least-squares, differentiation, integration, differential equations, signal analysis, graphics.
Effective: Spring 2009
Prerequisite: MATH 110 orMATH 140

GEOSC 445 **Coastal Geology** (4) A field course dealing with the processes operative in the environmental systems of a segment of the mid-Atlantic coast.
Effective: Spring 2001
Prerequisite: fifth-semester standing

GEOSC 450 **Risk Analysis in the Earth Sciences** (3) An introduction to concepts and methods of quantitative risk anlaysis with focus on water, climate, and energy related risks.
Effective: Spring 2010
Prerequisite: MATH 140 orMATH 110 Introductory Earth Science or Geoscience class Introductory Statistics class (e.g. STATS 200 or STATS 301 or ENNEC 473) or permission of program

GEOSC 451 **Natural Resources: Origins, Economics and Environmental Impact** (3) Geologic, economic and environmental issues related to exploitation of non-renewable natural resources (metals, minerals, rocks, and fossil fuels).
Effective: Fall 2006
Prerequisite: GEOSC 001 orGEOSC 020

GEOSC 452 **Hydrogeology** (3) Hydrologic cycle: occurrence, movement, quality, and quantity of groundwater; solute transport; quantitative hydrogeologic methods; role of water in geologic processes. This course has one or more required field trips for which a fee may be charged to the student.
Effective: Spring 2008
Prerequisite: CHEM 112;GEOSC 001, GEOSC 020 orGEOSC 071;MATH 140 orMATH 110

GEOSC 454 **Geology of Oil and Gas** (3) Properties, origin, migration, and occurrence of oil and gas. This course has one or more required field trips for which a fee is charged to the student.
Effective: Spring 2002
Prerequisite: GEOSC 001

GEOSC 461 **Geology of North America** (3) Evolution of structural-stratigraphic framework of continent; interpretation of relevant data obtained from field, experimental, and geophysical observation.
Effective: Spring 2001
Prerequisite: GEOSC 001, GEOSC 020 orGEOSC 071

GEOSC 465 **Structural Geology** (4) Effects and mechanics of deformation of the earth's crust; practicum includes field trips and studies of maps and structural problems. This course has one or more field trips for which a fee is charged to the student.
Effective: Spring 2002
Prerequisite: or concurrent:GEOSC 203, GEOSC 310

GEOSC 466 **Mechanics of Geological Materials** (3) Stress and strain specification; fracture and flow in deformational environments; environmental rock deformation; anisotropy; shear and consolidation of particulate media.
Effective: Spring 2001
Prerequisite: GEOSC 465

GEOSC 470W **Introduction to Field Geology** (3) Field interpretation of geologic features; principles and techniques of geologic mapping; interpretation of geologic maps and diagrams. This course has one or more required field trips for which a fee is charged to the student.
Effective: Spring 2002
Prerequisite: GEOSC 001 ; fifth-semester standing

GEOSC 472A **Field Geology I (Introduction to Field Methods** (3) Introduction to geologic field methods and the 3-D characterization of earth structure and the reconstruction of geologic histories. This course includes travel outside the University for which an additional charge will be made to cover transportation, food, and lodging.
Effective: Summer 2005
Prerequisite: GEOSC 310

GEOSC 472B **Field Geology II (Advanced Field Methods)** (3) Advanced application of geologic field methods to the 3-D characterization of earth structure and the reconstruction of geologic histories. This course includes travel outside the University for which an additional charge will be made to cover transportation, food, and lodging.
Effective: Summer 2005
Prerequisite: GEOSC 310, GEOSC 465 . Prerequisite or concurrent:GEOSC 472A

GEOSC 474 (BIOL 474) **Astrobiology** (3) In depth treatment of principles/concepts of biochemical evolution, the

origin/evolution of life; evaluation of distribution of life in the universe.
Effective: Summer 2007
Prerequisite: BIOL 110, CHEM 110

GEOSC 475W (METEO 475W) **Global Biogeochemical Cycles** (3) The study of earth's major global biogeochemical cycles (carbon, oxygen, nitrogen, phosphorus, and sulfur) in the context of the climate system.
Effective: Summer 2007
Prerequisite: MATH 110 andMATH 111 orMATH 140 andMATH 141 andCHEM 110

GEOSC 479 **Advanced Stratigraphy** (3) Modern topics of sequence stratigraphy are addressed, with a heavy emphasis on field and laboratory data analysis and interpretation.
Effective: Spring 1999
Prerequisite: GEOSC 439

GEOSC 481 **Solid Earth and Planetary Geophysics** (3) Structure, composition, origin, and evolution of the Earth and Solar System.
Effective: Fall 2001
Prerequisite: PHYS 204 orPHYS 214

GEOSC 483 **Environmental Geophysics** (3) This course presents the principles and applications of the variety of techniques geophysicists use to address environmental problems.
Effective: Fall 2001
Prerequisite: PHYS 211, PHYS 212

GEOSC 484 **Geophysical Surveying** (3) Principles and interpretation of seismic, gravity, magnetic, electric, and electromagnetic methods; applications to geologic, mining, petroleum, and engineering problems.
Effective: Spring 2001
Prerequisite: PHYS 213 orPHYS 214

GEOSC 487 **Analysis of Time Series** (4) Nonstatistical approach to data analysis; spectral and correlation analysis; filter theory; signal-to-noise improvement applied to seismic problems.
Effective: Spring 2008 Ending: Summer 2010
Prerequisite: CMPSC 201 orCMPSC 202

GEOSC 487 **Analysis of Time Series** (3) Nonstatistical approach to data analysis; spectral and correlation analysis; filter theory; signal-to-noise improvement applied to geoscience data.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MATH 140 andMATH 141

GEOSC 488 **An Introduction to Seismology** (4) An overview of the observations, methods, and frameworks used in seismogram analysis for earthquake and earth-structure investigations (includes laboratory).
Effective: Spring 2003
Prerequisite: MATH 140, MATH 141

GEOSC 489 **Dynamics of the Earth** (4) Constitution and dynamics of the solid earth; mechanics and consequences of Plate Tectonic processes.
Effective: Fall 2001
Prerequisite: GEOSC 203, GEOSC 310, PHYS 211

GEOSC 494M **Senior Thesis** (1-4) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Fall 2007
Prerequisite: seventh-semester standing

GEOSC 494W **Senior Thesis** (1-4) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Spring 2001
Prerequisite: seventh-semester standing

GEOSC 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2001

GEOSC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

GEOSC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

GEOSC 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1997

GEOSC 498A **Hazardous Waster Operation** (3) This 40 hour training course is required by the Occupational Safety and Health Administration for personnel.

Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOSC 498A **Hazardous Waster Operation** (3) This 40 hour training course is required by the Occupational Safety and Health Administration for personnel.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

GEOSC 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

GEOSC 500 **Issues in Geosciences** (3) Introduction of first year graduate students to issues in geosciences.
Effective: Summer 2003
Prerequisite: admission to the Geosciences Graduate Program

GEOSC 501 **Frontiers in Geosciences** (1) Current research problems and activities in the geosciences. Pass/fail grades are used for evaluation.
Effective: Fall 1989

GEOSC 502 **Evolution of the Biosphere** (4) The geologic history of the co-evolution of life and the surface environment is examined from a systems perspective.
Effective: Spring 1999
Prerequisite: undergraduate-level coursework in biology and geology

GEOSC 505 **Quantitative Physical Sedimentology** (3) Principles of fluid mechanics and mathematical modeling; their use in describing sediment transport, sedimentary structures, and sedimentary environments.
Effective: Summer 1996

GEOSC 507A **Seismology** (3) Basic theory; seismic methods for inferring structure of planetary interiors; observational techniques; seismic event location, magnitude, and damage potential.
Effective: Fall 1989

GEOSC 507B **Seismology** (3) Advanced wave propagation theory; mathematical representation of seismic sources; inversion theory; computational methods.
Effective: Fall 1989

GEOSC 508 **Mechanics of Earthquakes and Faulting** (3) An in-depth treatment of fundamental concepts in brittle faulting and earthquake mechanics with emphasis on physical processes.
Effective: Spring 2005
Prerequisite: GEOSC 465, GEOSC 489, MATH 251

GEOSC 511A (MATSE 511A) **Powder X-Ray Diffraction** (1) Compound identification, lattice parameter measurement, and other applications of the powder diffraction method.
Effective: Spring 2005

GEOSC 511B (MATSE 511B) **Transmission Electron Microscopy** (1) Principles and practice of transmission electron microscope operation. Students undertake individual projects.
Effective: Spring 2005

GEOSC 511C (MATSE 511C) **Spectroscopy** (1) Emission spectrographic analysis of powders and atomic absorption analysis of solutions.
Effective: Spring 2005

GEOSC 511D (MATSE 511D) **Electron Microprobe Analysis** (1) Qualitative and quantitative elemental analysis of microvolumes within solids. Emphasis on individual student project.
Effective: Spring 2005

GEOSC 511E (MATSE 511E) **Scanning Electron Microscopy** (1) Principles and practice of scanning electron microscope operation. Students undertake individual projects.
Effective: Spring 2005

GEOSC 511G (MATSE 511G) **Analytical Electron Microscopy** (1) Modern analytical electron microscope techniques: scanning transmission electron microscopy; electron energy loss spectroscopy; energy dispersive analysis of x-rays.
Effective: Spring 2005
Prerequisite: GEOSC 511B

GEOSC 512 (MATSE 512) **Principles of Crystal Chemistry** (3) Relation of structure to ionic size and nature; influence of pressure and temperature on structure; chemical-structural defects, crystalline solutions, phase-transitions.
Effective: Spring 2003

GEOSC 513 (SOILS 506) **Soil Processes: Chemical and Biogeochemical** (3) Colloid chemistry of soils; (a)biotic aspects of mineral formation/dissolution and redox reactions in soils; biogeochemical processes affecting elemental cycles.
Effective: Summer 2007 Ending: Summer 2010
Prerequisite: CHEM 450, SOILS 419

GEOSC 513 (SOILS 513) **Soil Environmental Chemistry** (3) Chemical constituents and processes occurring in soils. Discussion of soil components, reactions at the solid-solution interface, and soil chemical processes.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CHEM 450

GEOSC 514 **Data Inversion in the Earth Sciences** (3) This course focuses on how one finds theoretical parameters to explain observed data using discrete inverse theory.
Effective: Spring 1999
Prerequisite: MATH 220

GEOSC 515 **Ore Petrology** (3) Optical and hardness measurements and phase equilibria as used in identification and interpretation of textures of ore minerals.
Effective: Fall 1989

GEOSC 518 **Stable Isotope Geochemistry** (3) Theory of isotope fractionation mechanisms; its application to a wide range of problems in the earth and planetary sciences.
Effective: Fall 1989

GEOSC 519 **Mineral Equilibria** (3) A thermodynamic treatment of minerals and their reactions under geochemically important conditions of temperature and pressure.
Effective: Summer 2007
Prerequisite: CHEM 450

GEOSC 521 **Thermal State of the Earth** (2-3) Analytical and numerical solutions to earth-related heat conduction and convection problems; geothermal energy; earth's heat flow and temperature.
Effective: Spring 1998

GEOSC 522 **Geochemistry of Aqueous Systems** (2-3) Ionic and molecular equilibria related to stabilities and solubilities of minerals, with applications to ground water, sea water, and hydrothermal fluids.
Effective: Summer 2007
Prerequisite: CHEM 450, CHEM 452

GEOSC 523 **Sedimentary Geochemistry** (2) Kinetics and thermodynamics of low-temperature processes in sediments. Applications to weathering processes, natural waters, deposition of sediments, and diagenesis.
Effective: Summer 1996

GEOSC 526 (BIOL 526) **Problems in Palynology** (1-6) Individual research projects in various aspects of palynology, especially palynostratigraphy and paleoecological palynology.
Effective: Fall 1989
Prerequisite: BIOL 423

GEOSC 527 **Advanced Mineralogy** (3) Detailed study of the crystal structures and crystal chemistry of minerals.
Effective: Fall 1989

GEOSC 528 **Coal Petrology** (1-6) Microscopy, source materials, coalification, constitution, classification of peats, lignites, bituminous coal, anthracite.
Effective: Fall 1989

GEOSC 529 **Paleontology** (1-6 per semester/maximum of 9) Morphology and distribution of significant fossil groups; sampling, preparation, and applications to biostatigraphy, evolution, paleoecology, sedimentation, and petrography.
Effective: Fall 1989

GEOSC 531 **Origin of the Earth and Moon** (3) This course will be part lecture, part seminar; each student is required to prepare and present one or two lecture topics during the course of the semester.
Effective: Spring 1995

GEOSC 532 **Crystal Structure Analysis** (2) Experimental techniques for, and the theory of crystal structure determination.
Effective: Fall 1989

GEOSC 533 **Principles of Geochemistry** (3) A comprehensive treatment of the principles of geochemistry applied to a wide variety of geologic settings and scales.
Effective: Summer 2007
Prerequisite: CHEM 450

GEOSC 540 **Ore Deposits I** (3) Geochemistry and geology of ore deposits formed by igneous and high- temperature hydrothermal processes.
Effective: Fall 1989

Prerequisite: GEOSC 451

GEOSC 541 **Ore Deposits II** (3) Geochemistry and geology of ore deposits formed by low-temperature hydrothermal, sedimentary, and metamorphic processes; continuation of GEOSC 540.
Effective: Fall 1989
Prerequisite: GEOSC 540

GEOSC 542 **Quantitative Methods in Hydrogeology** (1-4) Investigation of groundwater systems and resources, emphasizing both the practical use and limitations of modeling techniques.
Effective: Fall 1989
Prerequisite: GEOSC 452

GEOSC 543 **Environmental Geology** (1-3) A multidisciplinary study of the impact of man-induced stress on the environment.
Effective: Fall 1989
Prerequisite: GEOSC 452

GEOSC 545 **Glacial Geology** (3) Glaciers: their characteristics, causes, deposits, landforms, effects in periglacial regions.
Effective: Fall 1989

GEOSC 546 **Principles of Photogeology** (3) Use of aerial photographs and mosaics in structural, geomorphic, and rock distribution studies and in compilation of maps.
Effective: Fall 1989
Prerequisite: GEOSC 462, GEOSC 465

GEOSC 548 **Surface Processes** (3) Principles, application, and interpretation of Quaternary geochronology, surface process studies, and landscape evolution.
Effective: Spring 1999
Prerequisite: GEOSC 340

GEOSC 550 **Igneous and Metamorphic Petrology** (4) Analysis of controls of mineralogy, elemental, and isotopic compositions of igenous rock series and of metamorphic rocks.
Effective: Summer 1996

GEOSC 552 **Igneous Petrology** (3) Analysis of igneous rocks of the earth and other planetary bodies.
Effective: Fall 1989
Prerequisite: GEOSC 520, GEOSC 550

GEOSC 553 **Metamorphic Petrology** (3) Seminar with directed reading on controls and processes in the evolution of metamorphic rocks.
Effective: Fall 1989
Prerequisite: GEOSC 519, GEOSC 520

GEOSC 555 **Advanced Structure and Petrofabrics** (1-3) Macroscopic and mesoscopic recognition, measurement, and interpretation of small-scale rock structures and mineral orientation patterns in deformed rocks.
Effective: Fall 1989

GEOSC 558 **Multi-channel Seismic Processing and Interpretation** (4) This course covers the basics of seismic energy propagation, modern 2- and 3-D multi-channel seismic data acquisition methods, and data processing.
Effective: Spring 1999
Prerequisite: GEOSC 454

GEOSC 559 **Seismology II** (3) Rigorously covers the methods of computing wave fields for point and distributed seismic sources in vertically inhomogeneous elastic media.
Effective: Spring 2005
Prerequisite: E MCH 524A, E MCH 524B orMATH 405, MATH 406

GEOSC 560 **Kinetics of Geological Processes** (3) General development of the kinetic theory of crystal growth, diffusion, irreversible thermodynamics, and heterogeneous reactions needed for geosciences and related fields with applications to current problems.
Effective: Summer 2007
Prerequisite: CHEM 450, GEOSC 519

GEOSC 561 **Mathematical Modeling in the Geosciences** (4) The process of transforming a conceptual geoscience model into a numerical model is presented; students create and solve numerical models.
Effective: Spring 2000
Prerequisite: undergraduate-level calculus and geology coursework is required; experience in computer programming and coursework in differential equations is recommended; or consent of instructor

GEOSC 565 **Tectonic Geomorphology** (3) Tectonic geomorphology examines interactions between tectonic and surface processes, paleosceismology, geodesy, structure, active deformation, and landform evolution.
Effective: Summer 1998
Prerequisite: GEOSC 340, GEOSC 465

GEOSC 571 **Field Problems in Appalachian Geology** (3) Geologic history of the central Appalachians as deduced from field studies.
Effective: Fall 1989

GEOSC 572 **Field Stratigraphy** (1-2) This course introduces students to field techniques used by stratigraphers, with the capstone experience being a field trip during May.
Effective: Fall 2005
Prerequisite: GEOSC 439, GEOSC 472A, GEOSC 472B, GEOSC 479

GEOSC 584 **Clastic Depositional Environments** (3) Readings, group discussions, and field work on processes and sedimentary responses of common rock-forming environments.
Effective: Fall 1989
Prerequisite: GEOSC 439

GEOSC 585 **Sedimentary Geology** (3) An integrated approach to the study of modern and ancient sedimentary environments and their deposits.
Effective: Spring 2000
Prerequisite: undergraduate coursework in sedimentology or consent of instructor

GEOSC 587 **Preparing for an Academic Career in the Geosciences** (3) The course focuses on successful strategies for the academic job market and for launching an academic career.
Effective: Spring 2009
Prerequisite: Students must have passed their comprehensive exam and be within a year from receiving their Ph.D. degree.

GEOSC 588 (METEO 588) **Oceans and Climate Seminar** (2) A focussed discussion on some aspect of the ocean's role in the climate system. Theme to vary from semester to semester.
Effective: Summer 1998

GEOSC 589 **Seminar in Aqueous Geochemistry** (1) A seminar aimed at reading current articles in aqueous geochemistry and biogeochemistry.
Effective: Fall 2001
Prerequisite: GEOSC 522

GEOSC 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1989

GEOSC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1989

GEOSC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1988

GEOSC 597A **Bayesian Methods in Earth Sciences** (1) The What, How, and Why of Applied Data-Model Uncertainty Analysis.
Effective: Summer 2010 Ending: Summer 2010

GEOSC 597A **Earth Systems Science** (2) Issues in earth systems science.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOSC 597A **Earth System Science** (2) Topics in earth system science.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

GEOSC 597B **Multivariate Analysis in the Geosciences** (3) Topics in multivariate analysis in the Geosciences.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOSC 597C **Hydrogeology Seminar** (1) Topics in hydrogeology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOSC 597D **Microbial Geobiology Seminar** (1) Topics in microbial geobiology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOSC 597E (METEO 597E) **Climate Dynamics Seminar** (1) Topics in climate dynamics pertaining to the earth sciences are discussed.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOSC 597F **Ice & Climate** (3) Topics in ice and climate.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOSC 597G **Plant Paleobiology Seminar** (2) Topics in plant paleobiology.

Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GEOSC 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 1999

GEOSC 600 **Thesis Research** (1-15) No description.
Effective: Spring 1989

GEOSC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 1989

GEOSC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in teaching geosciences courses.
Effective: Fall 1983

GEOSC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 1989

GEOSC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 1989

GEOSC 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2008

GEOSC 897A **The Heat is On! Confronting Climate Change in the Classroom** (2) Workshop for In-Service teachers with content area focus on climate change.
Effective: Summer 2010 Ending: Summer 2010

1 This course contains from one to several field trips for which an additional charge will be made to cover transportation.

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German (GER)

GER 401Y (IL) **Advanced Composition** (3) Intensive practice in writing different text types in German.
Effective: Spring 2006
Prerequisite: GER 301

GER 408 (IL) **Advanced German Business Communications** (3) Study of German business organization, forms of business communications, business terminology; writing of reports and abstracts.
Effective: Spring 2006
Prerequisite: GER 308

GER 411 **The Teaching of German** (3) Theory, methods, techniques, materials, bibliography; use of inter-active media; contributions of linguistics or psychology to language learning.
Effective: Summer 1994
Prerequisite: or concurrent:GER 401

GER 412 (IL) **Contrastive Analysis of Modern German and English** (3) Structural comparison of the German and English grammatical systems: morphology, syntax, phonology.
Effective: Spring 2006
Prerequisite: or concurrent:GER 401

GER 420 (IL) **Genre** (3-9) Special studies in a particular literary genre in German literature, such as lyrical poetry, drama, or narrative prose.
Effective: Spring 2006
Prerequisite: GER 310, GER 401

GER 430 (IL) **History of the German Language** (3) Development of German from its earliest stages, including historical and cultural aspects.
Effective: Fall 2007
Prerequisite: or concurrent:GER 401Y

GER 431 (IL) **History of German Literature and Culture I** (3) Significant works of German literature before the mid-eighteenth century considered in their cultural context.
Effective: Spring 2006
Prerequisite: GER 310 . Prerequisite or concurrent:GER 401

GER 432 (IL) **History of German Literature and Culture II** (3) Significant works of German literature from the mid-eighteenth century to the present considered in their cultural context.
Effective: Spring 2006
Prerequisite: GER 310 . Prerequisite or concurrent:GER 401

GER 440 (IL) **Seminar in German Culture** (3-6) Seminar devoted to a special topic in the field of German culture and civilization.
Effective: Spring 2006
Prerequisite: or concurrent:GER 401

GER 452 (IL) **Literature of the Renaissance** (3) German literature of the late Middle Ages, Humanism and Reformation including such writers as Brant, Erasmus, Fischart, Luther, Sachs.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 460 (IL) **Literature of the Baroque** (3) The literature and literary movements of seventeenth-century Germany, including such writers as Opitz, Fleming, Gryphius, Hofmannswaldau, and Gunther.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 461 (IL) **Literature of the Enlightenment** (3) Lessing and his contemporaries; new currents in German literature of the eighteenth century.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 462 (IL) **Literature of the Late Eighteenth Century** (3) Literature of the period of Empfindsamkeit and Sturm und Drang, including Rococo and Anacreontic tendencies.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 470 (IL) **Goethe** (3) A study of Goethe's life and works especially his lyric poetry, novels, and dramas.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 471 (IL) **Schiller** (3) Schiller's life, his classical poetry, aesthetic essays, and major dramas.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 472 (IL) **Romanticism** (3) A study of both early and late romanticism, including such writers as Novalis, the Schlegels, E.T.A. Hoffmann, and Heine.
Effective: Spring 2006

Prerequisite: or concurrent:GER 431 orGER 432

GER 480 (IL) **Realism** (3) Literature of the nineteenth century from Biedermeier through Jenges Deutschland to realism: Grillparzer, Morike, Buchner, Heine, Hebbel, Keller, Storm, Fontane.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 481 (IL) **Early Twentieth Century** (3) Development of German literature from Naturalism through Jugendstil to Expressionism: George, Hauptmann, Hesse, Hofmannsthal, Holz, Kafka, Kaiser, Mann, Rilke, Toller.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 482 (IL) **German Literature from 1933 to the Present** (3) Literature from 1933 to the present including Exile and GDR literature.
Effective: Spring 2006
Prerequisite: or concurrent:GER 431 orGER 432

GER 489 **Introduction to German Film History and Theory in Context** (3) Introduces films in German since the 1960s and addresses issues relevant to German and European cultures and politics.
Effective: Spring 2005
Prerequisite: GER 310 orCOMM 250

GER 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

GER 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

GER 495 **Internship** (3-9) Supervised off-campus, non-group instruction including individual field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1981
Prerequisite: prior approval of proposed assignment by instructor

GER 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

GER 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1985

GER 497A (J ST 497A) **Yiddish Reading** (3) This course is an introduction to the Yiddish language, focusing on grammar, vocabulary, and reading skills.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GER 497B **Contemporary German Cinema** (1) Course will consits of viewing and discussing recent German films in the light of contemporary German culture.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GER 499 (IL) **Foreign Study--German** (3-12) Advanced studies in German language, literature, and culture.
Effective: Summer 2005
Prerequisite: any 300-level course in German

GER 500 **Bibliography and Research Techniques** (2) Introduction to tools and methods of research, designed for students preparing for independent investigation of problems in German literature and language.
Effective: Fall 1993

GER 501 **German Conversation and Composition** (1) Advanced study of German conversation and composition, with emphasis on syntax, style, and idiomatic constructions.
Effective: Fall 1997

GER 508 **German Business Communications** (3) Practices and problems in the administration of German business organizations. Writing letters, reports, and other types of business communications.
Effective: Fall 1997

GER 510 **Literary Theory: An Introduction** (3) Introduction to the major theoretical approaches to the contemporary study of culture (literature, film, art and politics).
Effective: Spring 2004

GER 511 **The Teaching of College German** (3) Theory, methods, techniques, materials, bibliography contributions of linguistics and psychology to language learning; methods of teaching post- secondary German.
Effective: Fall 2005

GER 512 **Introduction to German Linguistics** (3) An overview of the major subfields of linguistics as they apply to the German language.
Effective: Summer 2002

GER 513 **German Phonetics and Phonology** (3) This course examines German speech sounds and their organization into a linguistic system.
Effective: Spring 2009

GER 514 **German Syntax** (3) This course provides an overview of morphosyntactic processes in German.
Effective: Spring 2009

GER 515 **Introduction to German Applied Linguistics** (3) Introduction to the major areas of the broad field of Applied Linguistics as relevant to the study of German.
Effective: Spring 2003

GER 516 **The Acquisition of German and Dutch** (3) This course examines how children and adult learners acquire German and Dutch in naturalistic settings (i.e. non-classroom situations).
Effective: Spring 2009

GER 520 **Introduction to Middle High German** (3) Descriptive and historical grammar; readings in simple Middle High German texts.
Effective: Winter 1978

GER 521 **Readings in Middle High German** (3) Intensive reading in Middle High German literature, especially of the Blutezeit.
Effective: Winter 1978
Prerequisite: GER 520

GER 522 **Old High German** (3) Essentials of the grammar, with special treatment of the High German sound shift and of ablaut and umlaut; reading of works written before 1100 A.D.
Effective: Fall 1983

GER 523 **Gothic** (3) Introduction to the historical and comparative Germanic grammar; emphasis on the Gothic language and texts. Suitable for advanced students in English.
Effective: Winter 1978

GER 525 **Old Icelandic** (3) Introduction to Old Icelandic grammar; readings in Old Icelandic prose. Suitable for advanced students in English.
Effective: Winter 1978

GER 531 **German Literature of the Middle Ages--800 to 1400** (3) Intensive survey and review of medieval German literature.
Effective: Fall 1997

GER 540 **Seminar in German Culture and Civilization** (3-12) Examination of special problems in German culture and civilization.
Effective: Fall 1997

GER 541 **German Literature of the Renaissance and Baroque** (3) Intensive survey and review of German literature between 1450 and 1700.
Effective: Fall 1997

GER 551 **German Literature from the Early Enlightenment to Storm and Stress** (3) Advanced overview of major developments in German literature from the early to the late 18th century.
Effective: Fall 1997

GER 552 **German Classicism and Romanticism** (3) Intensive survey of German literature from the late 18th through the first third of the 19th centuries.
Effective: Spring 1997

GER 561 **German Literature of the 19th Century--From Beidermeier to Realism** (3) Survey of major developments in German literature from the mid- to the late-19th century.

Effective: Fall 1997

GER 571 **German Literature from the Turn of the Century to 1945** (3) Advanced survey of German literature from the era of Naturalism to that of Exile literature.
Effective: Fall 1997

GER 572 **Post-War and Contemporary German Literature** (3) Intensive survey of German literature from Gruppe 47 through the literature of the GDR and down to the present.
Effective: Spring 1997

GER 581 **Topics in Literary Genres** (3-12) Special studies in the German lyric, drama, short story, and novel.
Effective: Fall 1997

GER 582 **Topics in Germanic Philology and German Linguistics** (3 per semester, maximum of 12) Special studies of modern or older Germanic languages.
Effective: Summer 1997

GER 589 (CMLIT 589, FR 589, SPAN 589) **Technology in Foreign Language Education: An Overview** (3) Approaches to the uses and research applications of multimedia and other educational technologies applied to the teaching of foreign languages. (also crosslisted with APLNG 589)
Effective: Spring 2004

GER 591 **German Literary Theory and Criticism** (3-6) Examination of major movements in literary theory and criticism with special reference to German literary thought.
Effective: Fall 1997

GER 592 **Seminar in German Literature** (3 per semester, maximum of 12) Focused investigation of a major figure or theme in German literature.
Effective: Summer 1997

GER 593 **Seminar in German Philology and German Linguistics** (3 per semester, maximum of 12) Focused investigation of a major topic in Germanic philology or linguistics.
Effective: Summer 1997

GER 596 **Individual Studies** (1-9) Creative projects including nonthesis research, supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

GER 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

GER 597A (LING 597A) **Sound Change in Germanic Languages** (3) This course examines sound change by tracing the development of the sound systems of the Germanic languages from Proto-Indo-European to the present.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GER 597B **Mythopoiesis: Mapping Memory in Modern Mythology** (3) An exploration of (post) modern mythmaking and its continuation and innovation of ancient and medieval mythology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

GER 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

GER 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

GER 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Instruction of lower division German courses with observation by the supervisor and attendance at regular meetings to discuss classroom techniques.
Effective: Fall 1983

GER 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2000

GER 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

GER 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Graphic Design (GD)

GD 400 **Time and Sequence** (4) Development of visual sequence as replies to graphic design problems.
Effective: Fall 2006
Prerequisite: GD 302

GD 401 **Package Design** (3) Orientation to packaging designs as it relates to the consumer, client, and to societal and environmental concerns.
Effective: Fall 2006
Prerequisite: GD 302

GD 402 **Senior Problems** (4) Development of visual replies to graphic design problems.
Effective: Fall 2006
Prerequisite: GD 400, GD 401

GD 403W **Graphic Design Seminar** (3) A seminar on subjects which relate to the field of graphic design.
Effective: Fall 2007
Prerequisite: GD 302

GD 404 **Book Design** (3) Writing, designing, illustrating and production (printing) of a book.
Effective: Fall 2006
Prerequisite: GD 302

GD 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2006

GD 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

GD 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2006

GD 496 **Independent Study** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2006

GD 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2006

GD 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2006

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Greek (GREEK)

Knowledge of Greek or Latin not required. See also CLASSICS AND ANCIENT MEDITERRANEAN STUDIES and LATIN,

GREEK 400 **Greek Syntax and Stylistics** (3) Classical Greek syntax and stylistics as examined and appreciated through standard exercises in composition and parallel selected prose readings.
Effective: Summer 2004
Prerequisite: GREEK 102, GREEK 003 or equivalent

GREEK 401 **Introductory Reading in Greek Literature** (3-6) Analysis of selected passages of ancient Greek literature; attention will be paid to grammatical as well as literary details.
Effective: Spring 2002
Prerequisite: GREEK 003 orGREEK 102

GREEK 420 **Greek Prose Authors** (3-6) Readings in representative authors.
Effective: Fall 1983
Prerequisite: GREEK 003

GREEK 425 **Greek Historians** (3-6) Translation and study of one or more of the ancient Greek historians.
Effective: Fall 2001
Prerequisite: GREEK 003 orGREEK 102

GREEK 430 **Greek Poetry** (3-6) Translation and analysis of selected readings in Greek poetry.
Effective: Fall 2001
Prerequisite: GREEK 003 orGREEK 102

GREEK 440 **Greek Drama** (3-6) Translation and study of a selected play.
Effective: Spring 2002
Prerequisite: GREEK 003 orGREEK 102

GREEK 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

GREEK 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

GREEK 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

GREEK 497 **Special Topics** (1-9) Formal courses given infrequently to exlore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

GREEK 499 (IL) **Foreign Studies** (12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

GREEK 509 **Greek Seminar** (3-9) No description.
Effective: Fall 1983

GREEK 517 **Greek Research** (1-6) Prosecution of an assigned problem under the guidance of a member of the department.
Effective: Winter 1978

GREEK 520 **Greek Mythography** (3) This graduate seminar focuses on ancient Greek mythographic authors from the beginnings of the genre (6th C.B.C.E.) to the Roman period.
Effective: Fall 2008

GREEK 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2000

GREEK 599 (IL) **Foreign Studies** (1-12 per semester, maximum of 24) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005

Health (HLTH)

No courses for department code **HLTH** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Health Care Management (H C M)

H C M 462 **Health Care Administration** (3) Organizational perspectives, managerial techniques and political aspects of health care planning, administration and control.
Effective: Fall 1985
Prerequisite: H C M 361

H C M 463 **Legal Aspects of Health Care** (3) An examination of legal rights and liabilities of patients, professionals, and health care institutions. Emphasis is given to medical malpractice.
Effective: Fall 1983

H C M 464 **Health Care Finance and Economics** (3) Integration of financial and economic aspects of health care systems, including financing, mechanisms, economic theory, and regulatory constraints.
Effective: Spring 2008
Prerequisite: FIN 301 6 credits economics (micro and macro)

H C M 465 **Health Care Insurance** (3) A study of insurance as it relates to health care from the public and private sector viewpoints.
Effective: Fall 1983

H C M 467 **Methods of Health Care Planning and Evaluation** (3) Health care planning, epidemiological concepts, forecasting procedures, and methods of health care evaluation.
Effective: Fall 1988
Prerequisite: 3 credits in statistics

H C M 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1990
Prerequisite: prior approval of proposed assignment by instructor

H C M 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 1983

H C M 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1983

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Health Education (HL ED)

HL ED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

HL ED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

HL ED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1993

HL ED 530 **Research Techniques in Health Education** (3) Research techniques, including methods, research design, techniques for data collection, as applied to relevant problems in the health education field.
Effective: Fall 1991
Prerequisite: 3-credit 400-level statistics course

HL ED 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1992

HL ED 596 **Individual Studies** (1-9) Individual studies course.
Effective: Spring 1987

HL ED 597 **Special Topics** (1-9) Special topics course.
Effective: Spring 1987

HL ED 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

HL ED 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

HL ED 602 **Supervised Experience in College Teaching** (1-3 per semestermaximum of 6) Preparation and presentation of materials in lecture and laboratory classes under the supervision of a full-time faculty member.
Effective: Fall 1983
Prerequisite: Appointment as a graduate assistant in health education

HL ED 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

HL ED 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Health Education (HLHED)

HLHED 415 **Planning and Developing Health Education Programs** (3) Premises and strategies for planning, implementing, and evaluating wellness programs in corporate, hospital, and community agency settings.
Effective: Fall 1997
Prerequisite: permission of program

HLHED 420 **Development of Stress Management Programs for Health Education** (3) Planning, development, and implementing strategies for stress management programs for health education professionals in school, community, and corporate settings.
Effective: Fall 1997
Prerequisite: permission of program

HLHED 421 **Integrating Health Education into the School Program K-12** (3) Premises and strategies for integrating basic health education concepts into the school program K-12.
Effective: Fall 1997
Prerequisite: permission of program

HLHED 443 **Alcohol and Drug Education** (3) Principles of integration and coordination of alcohol and drug education programs for health education and other social service professions.
Effective: Fall 1997
Prerequisite: permission of program

HLHED 450 **Worksite Health Promotion** (3) Rationale and strategies for planning, implementing, and evaluating employee health promotion in programs in public and private worksite settings.
Effective: Fall 1997
Prerequisite: permission of program

HLHED 456 **Advanced Techniques in School and Community Health Education** (3) Public health, mental health, nutrition, dental school health, physical education, accident prevention, health teaching; projects, consultation, visitation, discussions, and resources.
Effective: Fall 1997
Prerequisite: permission of program

HLHED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1997

HLHED 501 **World Health Promotion** (3) Analysis of the various health problems that affect humans throughout the world; emphasis will be placed on personal health issues.
Effective: Fall 1997

HLHED 516 **Evaluation of Health Education and Promotion Programs** (3) Criteria and strategies to assess the impact of health education and health promotion programs in school, community, and corporate settings.
Effective: Fall 1997

HLHED 530 **Research Techniques in Health Education** (3) Research techniques, including methods, research design, techniques for data collection, as applied to relevant problems in the health education field.
Effective: Fall 1997

HLHED 552 **Current Health Education Issues** (3) Analysis of scientific and political foundations of current issues within health education tasks, with emphasis on research and action implications.
Effective: Fall 1997

HLHED 553 **Multicultural Health Issues** (3) This course is designed to explore cultural factors influencing the health status among racial/ethnic groups in the United States.
Effective: Summer 2002

HLHED 582 (EDUC 582) **Spirituality and Culture in Health and Education Professions** (3) This course focuses on the cultural aspects of spirituality and its place in the health and education professions.
Effective: Summer 2009

HLHED 587 **Master's Project** (3) The development of an original master's project (paper or production) supervised by an appropriate faculty member.
Effective: Fall 1997

HLHED 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1997

HLHED 591 **Capstone Seminar in Health Education** (3) Culminating or capstone experience for students in the M. Ed. program in Health Education.
Effective: Fall 1997
Prerequisite: completion of 15 credits in the program and permission of advisor

HLHED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1997

HLHED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 1997

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Health Policy and Administration (H P A)

H P A 401 (IL) **Comparative Health Systems** (3) Comparative analysis of health services in selected developed and developing countries.
Effective: Spring 2006
Prerequisite: H P A 301

H P A 410 **Principles of Public Health Administration** (3) The rationale for, and the patterns of, public health service at all levels of government in the United States.
Effective: Summer 1998
Prerequisite: H P A 301

H P A 420 **Principles of Managed Care** (3) Survey of managed health care, including history, typology, current issues, management challenges, and impacts on patients, providers, and special populations.
Effective: Spring 1998
Prerequisite: H P A 301

H P A 431 **Health Planning Methods** (3) Introduction to methods used in planning for health, services, facilities, and manpower.
Effective: Spring 1998
Prerequisite: H P A 301;STAT 200 orSTAT 250

H P A 433 **Administration of Hospital and Health Service Systems** (3) Analysis of administrative structures and interorganizational arrangements among hospitals and other health care organizations.
Effective: Spring 1998
Prerequisite: H P A 332

H P A 440 (US;IL) (BB H 440) **Principles of Epidemiology** (3) Theory of epidemiology and significant case studies. Potential application to health care.
Effective: Fall 2008
Prerequisite: BB H 101 orBIOL 110 orH P A 310;STAT 200 orSTAT 250

H P A 442 **Long-Term Care Management** (3) Management and policy issues for institutional, community, and home settings for chronic care services.
Effective: Spring 1998
Prerequisite: H P A 332

H P A 445 (ECON 445) **Health Economics** (3) Economic analysis of U.S. health care system; planning, organization, and financing; current public policy issues and alternatives.
Effective: Spring 1994
Prerequisite: ECON 302, ECON 315 orECON 323

H P A 445W (ECON 445W) **Health Economics** (3) Economic analysis of U.S. health care system; planning, organization, and financing; current public policy issues and alternatives.
Effective: Spring 2008
Prerequisite: ECON 302, ECON 315 orECON 323

H P A 447 **Financing Health Care** (3) Analysis of financial flows, third party payment programs, and reimbursement practices in the health services sector.
Effective: Spring 1998
Prerequisite: FIN 100 orINS 301;H P A 301 orH P A 332

H P A 450 **Healthcare Policies and Politics** (3) Survey of health care's political contexts: formulation, implementation, and modification stages of policy process; politics of private interests (associations) at national and state levels.
Effective: Summer 1997
Prerequisite: H P A 101, H P A 301, PL SC 001

H P A 455 **Strategic Planning and Marketing for Health Services** (3) Introduction to principles and methods of strategic planning and marketing.
Effective: Spring 1998
Prerequisite: H P A 332

H P A 457 **Consumer Health Education** (3) Orientation of school and community health education opportunities to the consumer task of selecting health products and services.
Effective: Spring 1998
Prerequisite: 9 credits of health science and/or psychology

H P A 460 **Human Resource Management in Health Care Organizations** (3) Foundations of human resource management applied to health care organizations, including hospitals, long-term care facilities, and community health organizations.
Effective: Spring 1998
Prerequisite: H P A 332

H P A 470 **Health Care Information Management** (3) This course introduces information systems terminology, data structures, software applications, and their management functions in health services organizations.
Effective: Summer 2000
Prerequisite: H P A 332, IST 210, IST 220

H P A 494H **Senior Honors Thesis** (1-6) Independent study related to student's interests directed by a faculty supervisor and culminating in the production of a thesis.
Effective: Summer 2006
Prerequisite: approval of honors thesis advisor

H P A 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

H P A 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

H P A 497A **Current Issues in Health Care Quality** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

H P A 497A **HealthCare Leadership I** (3) Identified as one of the core competencies needed to improve the U.S. health care system and one of the challenges to solving the problems of cost, quality and access. This course provides an opportunity to students to learn about the challenges of leadership in health care. Through experience, reflective reading and writing, and discussion, students will explore their own leadership capabilities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 497A **Physician Practice Management** (3) This course is a comprehensive examination of physician practice management topics and the role physicians play in the US health care industry past, present and the future.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

H P A 497B **Physician Practice Management** (3) This course is a comprehensive examination of physician practice management topics and the role physicians play in the US health care industry past, present and the future.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 497B **Health Care Leadership II** (3) Leadership has been identified as one of the core competencies needed to improve the U.S. health care system and one of the challenges to solving the problems.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

H P A 497C **Introduction to Health Insurance and Payment** (3) This course covers basic concepts and issues related to health insurance and payment for health care providers.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 497C **Hands-On Health Care** (3) Service-learning in a variety of health care settings.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

H P A 497D **Making the Difference: Raising Awareness of Careers in Health Care** (3) This course is designed for HPA students to assist other students interested in a career in health care. Central to this course is a major hands-on learning project that will enable students to explore career paths in the health care sector. After a systematic study of subjecft material for various occupations in the health care sector, the students will identify various health career paths and how each contributes to high quality patient care. While an important aspect of this class is the creation of student awareness, students will have the opportunity to raise the general public awareness of the range of health care careers contributing to client care by creating a public service video. A component of this course will take place off-campus.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 497D **Long Term Care Policy Analysis** (3) The goals of this course are to introduce students to (1) applied health policy analysis methods and (2) long term care policy issues and research.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

H P A 497E **Aging and Health Policy** (3) The goals of this course are to introduce students to public policy affecting long term care and related health care for older people with disabilities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 503 **Understanding Organizational Behavior** (3) A systematic application of the principles of organizational behavior to understanding professional roles in human service organizations.
Effective: Summer 1995 Ending: Fall 2010

H P A 503 **Health Services Organizational Behavior** (3) A systematic application of the principles of organizational behavior to understanding professional roles in health services organizations.
Effective: Spring 2011 Future: Spring 2011

H P A 504 **Interorganizational Relations** (3) Interorganizational concepts and their application to analysis of policies, programs, and service delivery concerns involving health and human service organizations.
Effective: Summer 1987 Ending: Fall 2010
Prerequisite: CSP D 503

H P A 504 **Interorganizational Relations** (3) Interorganizational concepts and their application to analysis of policies, programs, and service delivery concerns involving health and human service organizations.
Effective: Spring 2011 Future: Spring 2011

H P A 505 **Processes of Planned Change** (3) Exploration of diagnostic and intervention strategies employed in planned change in health and human services organizations and programs.
Effective: Summer 1987 Ending: Fall 2010

H P A 505 **Change Leadership in Health Services Organizations** (3) Exploration of diagnostic and intervention strategies employed in planned change in health services organizations and programs.
Effective: Spring 2011 Future: Spring 2011

H P A 510 **Health Services Administration I** (1) An overview of managerial roles and responsibilities in hospitals and health organizations.
Effective: Spring 2000 Ending: Fall 2010

H P A 510 **Health Services Financing and Policy** (3) Introduction to health policy focusing on health services financing, insurance and other current health policy topics.
Effective: Spring 2011 Future: Spring 2011

H P A 511 **Health Services Administration II** (1) A study of management problems and decision-making in selected hospitals and health organizations.
Effective: Spring 2000 Ending: Fall 2010
Prerequisite: H P A 510

H P A 511 **Research Seminar on Health Services Financing and Policy** (3) An examination of seminal and current research on health services financing, insurance and health policy.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: H P A 510 Concurrent: H P A 510

H P A 520 (CSP D 520) **Health Care Organization** (3) Examination of health systems, organization, financing, and evaluation; trends, problems, and issues.
Effective: Summer 1988 Ending: Fall 2010

H P A 520 **Introduction to Health Services Organizations and Delivery** (3) Introduction to health systems, health services organization and health care delivery focused on trends, problems and issues.
Effective: Spring 2011 Future: Spring 2011

H P A 521 **Introduction to Health Services** (2) An introduction to the organization and utilization of health services in the United States. The student may not receive credit toward graduation for both H P A 520 and 521.
Effective: Summer 1996 Ending: Fall 2010

H P A 521 **Research Seminar on Health Services Organization and Delivery** (3) An examination of seminal and current research on health services organization and delivery, emphasizing costs, access and quality.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: H P A 520 Concurrent: H P A 520

H P A 522A **Health Care Technology: Processes of Health and Disease** (1) A review of the processes of health and disease, measurements, diagnostic criteria, and intervention strategies.
Effective: Summer 1995 Ending: Fall 2010

H P A 523 **Managerial Epidemiology** (3) This course is intended to familiarize students with the principles and methods of managerial epidemiology and its applications to health care quality improvement.
Effective: Spring 2004 Ending: Fall 2010
Prerequisite: H P A 521, H P A 522

H P A 523 **Managerial Epidemiology** (3) Introduction to the principles and methods of managerial epidemiology and its application to health care.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: H P A 521

H P A 524 **Management of Health Services Organizations** (3) A systematic study of the roles of health services managers and the organizational and environmental context within which they work.
Effective: Summer 1987 Ending: Fall 2010
Prerequisite: H P A 503, H P A 504

H P A 524 **Management of Health Services Organizations** (3) A systematic study of the roles of health services managers and the organizational and environmental context within which they work.
Effective: Spring 2011 Future: Spring 2011

H P A 527 **Approaches to Health Planning** (3) A systematic exploration of approaches to health planning and an application of health planning techniques.
Effective: Summer 1987
Prerequisite: CSP D 531

H P A 528 **Health Data Analysis** (3) Foundations of secondary data analysis on health conditions, services, organizations, and finances.
Effective: Spring 1996 Ending: Fall 2010
Prerequisite: STAT 200 orSTAT 451

H P A 528 **Health Data Analysis for Research** (3) Introduction to data sources and use of software for data management and analysis in health services research.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: STAT 500 or equivalent preparation in probability and statistics

H P A 530 **Health Care Human Resources Management** (3) The scope and significance of human resource management roles, issues, and skills in health care delivery systems.
Effective: Summer 1992
Prerequisite: H P A 520, H P A 524

H P A 531 **Health Problem Analysis** (3) Logic of empirical inquiry in study of community problems in health; integration of theory and practice, technical data, and values.
Effective: Summer 1995

H P A 536 **Health Law** (3) The legal process as it applies to the health administrator, health organization, medical provider, and patient.
Effective: Summer 1987 Ending: Fall 2010
Prerequisite: H P A 520

H P A 540 **Epidemiological Applications in Health Services Research** (3) The course emphasizes theoretical as well as practical issues relating to applying advanced methods of epidemiology in health services research.
Effective: Fall 2001
Prerequisite: H P A 440, H P A 528

H P A 541 **Poverty, Race, Ethnicity and Child Health** (3) This graduate seminar focuses on disparities in infant, child, and adolescent health, and policies and programs impacting these disparities.
Effective: Summer 2004 Ending: Fall 2010

H P A 541 **Poverty, Race, Ethnicity and Child Health** (3) Seminar focusing on disparities in infant, child, and adolescent health, and policies and programs impacting these disparities.
Effective: Spring 2011 Future: Spring 2011

H P A 545 (CSP D 597) **Introduction to Health Economics** (3) Survey of the application of economics to the roles of markets and government in health care.
Effective: Summer 1999 Ending: Fall 2010
Prerequisite: ECON 302, ECON 490, STAT 501

H P A 545 **Introduction to Health Economics** (3) Survey of the application of economics to the roles of markets and government in health care.
Effective: Spring 2011 Future: Spring 2011

H P A 547 **Health Services Reimbursement** (3) Analysis of third party reimbursement of health care providers.
Effective: Summer 1992
Prerequisite: H P A 520

H P A 550 **Health Care Marketing** (3) Introduction to the theory, concepts, skills, and principles of marketing applied to health related organizations and networks.
Effective: Fall 2001 Ending: Fall 2010
Prerequisite: H P A 520 orH P A 521 or permission of professor in charge

H P A 551 **Quality Improvement in Healthcare** (3) Examination of major approaches to performance improvement in contemporary healthcare systems.
Effective: Summer 2010

H P A 556 **Strategy Development in Health Services Organization** (3) Integration of prior course work in the program to develop a strategic plan for a health services organization.
Effective: Fall 2009 Ending: Fall 2010
Prerequisite: H P A 440, H P A 835, H P A 855

H P A 556 **Strategy Development in Health Services Organization** (3) Integration of prior course work in the program to develop a strategic plan for a health services organization.

Effective: Spring 2011 Future: Spring 2011
Prerequisite: H P A 523, H P A 524, H P A 835

H P A 561 **Introduction to Research Design in Health Services Research** (3) Review and critical analysis of state-of-the-art health services research methods.
Effective: Summer 1999

H P A 562 **Economics Applications in Health Services Research** (3) Application of theoretical and empirical tools of microeconomics to issues in health services utilization and delivery.
Effective: Summer 2000 Ending: Fall 2010
Prerequisite: H P A 521, H P A 522, H P A 561

H P A 562 **Economics Applications in Health Services Research** (3) Application of theoretical and empirical tools of microeconomics to issues in health services utilization and delivery.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: H P A 445 orH P A 545

H P A 563 **Organizational Studies in Health Services Research** (3) Applications of theoretical and empirical tools of organizational studies in the delivery of health care.
Effective: Spring 1999 Ending: Fall 2010
Prerequisite: H P A 521, H P A 522, H P A 524, H P A 561

H P A 563 **Organizational Studies in Health Services Research** (3) Applications of theoretical and empirical tools of organizational studies in the delivery of health care.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: H P A 503

H P A 564 **Research Methods in Health Services Research** (3) Review and critical analysis of state-of-the-art health services research methods.
Effective: Summer 1999 Ending: Fall 2010
Prerequisite: H P A 561, H P A 562, H P A 563

H P A 564 **Research Methods in Health Services Research** (3) Introduction to regression models in health services research, including violations and tests of model assumptions and solutions for those violations.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: STAT 500

H P A 566 **Advanced Methods in Health Services Research I** (3) Advanced topics course focusing on extensions of the ordinary least squares regression model and nonlinear methods in health services research.
Effective: Summer 2010
Prerequisite: H P A 564

H P A 590 **Colloquium** (1-3) Introduction to the field of health services research.
Effective: Summer 1998

H P A 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1990
Prerequisite: prior approval of proposed assignment by instructor

H P A 596 (CSP D 596) **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1987

H P A 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1987

H P A 597A **Advanced Methods Health Services Research I** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 597B **Advanced Methods for Health Services Research II** (3) Advanced topics course focusing on causal inference in health services research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 597C **Research Seminar Health Services Organization and Delivery** (3) An examination of seminal and current research on health services organization and delivery, emphasizing costs, access, and quality issues.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 597D **Evaluating Community-Based Treatment for Youth** (3) This course will explore the current evidence base for community-based treatment for youth and strategies for advancing the field.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 597E **Health Policy Analysis** (3) The purpose of this course is to better understand health care policy issues and develop analytic skills by applying a structured analytic approach to health policy problems.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 597F **Cancer Disparities: Research and Policy Perspectives** (3) This seminar focuses on disparities in cancer incidence, screening, treatment and survivorship, and policies to improve care and reduce disparities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 600 **THESIS RESEARCH** (1-15) NO DESCRIPTION.
Effective: Summer 1992

H P A 601 **PH.D. DISSERTATION FULL-TIME** (0) NO DESCRIPTION.
Effective: Summer 1992

H P A 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) Supervised and graded teaching experience in selected undergraduate Health Policy and Administration courses.
Effective: Fall 1989
Prerequisite: completion of minimum of three semesters of graduate work in health policy and administration

H P A 610 **THESIS RESEARCH OFF-CAMPUS** (1-15) NO DESCRIPTION.
Effective: Summer 1992

H P A 611 **PH.D. DISSERTATION PART-TIME** (0) NO DESCRIPTION.
Effective: Summer 1992

H P A 822 **Clinical Issues for Health Services Management** (3) Introduction to current clinical issues in health services organizations focusing on the role of managers.
Effective: Spring 2011 Future: Spring 2011

H P A 835 **Financial Management in Health Institutions** (3) The financial environment of health institutions; financial aspects of management decision making; emphasis on revenue sources, budgeting, and cost control.
Effective: Fall 2009
Prerequisite: H P A 447

H P A 836 **Health Law** (3) The legal process as it applies to the health administrator, health organization, medical provider, and patient.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: H P A 520

H P A 850 **Health Care Marketing** (3) Introduction to the theory, concepts, skills, and principles of marketing applied to health related organizations and networks.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: H P A 520

H P A 855 **Information Systems in Health Services Administration** (3) Foundations of information systems for supporting clinical services, quality improvement, and administrative functions in health services management.
Effective: Summer 2010
Prerequisite: H P A 520

H P A 895 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 2010

H P A 896 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2009

H P A 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2008

H P A 897A **Health Care Marketing** (3) This course is geared toward the delineation of key concepts, strategies and tools for health industry marketing. It will provide the student with an understanding of all aspects of marketing and the ability to apply these concepts and strategies to current marketing problems. Various gues speakers will discuss their experiences with regard to course topics.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: MGMT 501, MKTG 500 andBUSAD 530 orH P A 520 or 3 years health industry experience.

H P A 897A **Change Leadership in Health Services Organizations** (3) Exploration of diagnostic and intervention strategies employed in planned change in health services organizations and programs.

Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 897B **Change Leadership in Health Services Organizations** (3) Introduction to the theory, concpet, skills and principles of marketing applied to health related organizations and networks.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H P A 897C **Clinical Issues for Health Services Management** (3) An introduction to current ethical issues in health services organizations focusing on the role of managers.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Health and Human Development (H&HD)

H&HD 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2006

H&HD 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2002

H&HD 497A **Women's Leadership Initiative** (2) Women's Leadership Initiative.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

H&HD 497H **Special Topics--Honors** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2002

H&HD 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

H&HD 499H (IL) **Foreign Studies-Honors** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Hebrew (HEBR)

HEBR 401 **Advanced Hebrew--Conversation Emphasis** (3 per semester, maximum of 6) Development of oral proficiency through discussions focusing on issues in contemporary Jewish culture.
Effective: Summer 1990
Prerequisite: HEBR 110

HEBR 402 **Advanced Hebrew--Reading Emphasis** (3 per semester, maximum of 6) Readings in representative works of traditional and modern literature; practice in composition; study of aspects of Jewish culture.
Effective: Summer 1990
Prerequisite: HEBR 110

HEBR 451 **Advanced Biblical Hebrew** (3) Translation and analysis of selected readings in Biblical Hebrew texts; attention will be paid to grammatical as well as literary details.
Effective: Spring 2007
Prerequisite: HEBR 152 or equivalent

HEBR 452 **Readings in Biblical Hebrew** (3) Translation and analysis of selected readings in Biblical Hebrew texts; attention will be paid to grammatical as well as literary details.
Effective: Spring 2007
Prerequisite: HEBR 451 or equivalent

HEBR 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

HEBR 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

HEBR 496 **Independent Studies** (1-18) Creative projects including research and design which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1982

HEBR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be taught in one year or semester.
Effective: Fall 1983

HEBR 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interent.
Effective: Fall 1992

HEBR 499 (IL) **Foreign Study--Advanced Hebrew** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

HEBR 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1997

HEBR 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2003

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Higher Education (HI ED)

HI ED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1995

HI ED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1995

HI ED 503 (CI ED 503, EDTHP 507) **Ethnicity, National Identity, and Education** (3) Surveys group-oriented education policies internationally, especially comparing those of Britain, Taiwan, India.
Effective: Summer 1995

HI ED 545 **Higher Education in the United States** (3) Introduction to the educational context and major organizational and academic characteristics of postsecondary education; analysis of issues and future trends.
Effective: Summer 1995

HI ED 546 **College Teaching** (2-3) Principles involved in teaching at the college level; effective use of teaching aids; criteria used in evaluation.
Effective: Summer 1995

HI ED 548 **Curriculums in Higher Education** (2-3) Various types of curriculums and philosophies underlying them; ways in which curriculums are developed; elective versus required courses; evaluation of achievement.
Effective: Summer 1995

HI ED 549 (ADTED 549) **Community Junior College and the Technical Institute** (2-3) Distinctive contributions to meeting the need for postsecondary education; development, functions, curriculum and instruction, government, administration, and finance.
Effective: Summer 1995

HI ED 552 **Administration in Higher Education** (3) Philosophy of administration; principles of scientific management and their application in colleges and universities; case studies of administrative problems.
Effective: Summer 1995
Prerequisite: courses or experience in higher education

HI ED 553 (CI ED 553, EDTHP 553, SOC 553) **Educational Mobility in Comparative Perspective** (3) Role of education in social mobility, using quantitative, qualitative, and historical methods; focuses comparatively on Britain, East Asia, and South America.
Effective: Spring 2003

HI ED 554 **The History of American Higher Education** (3) An examination of the development of American higher education against the background of influential social, political, economic, and intellectual issues.
Effective: Summer 1995

HI ED 556 **Higher Education Students and Clientele** (3) Characteristics of higher postsecondary education students and other clientele; changes during postsecondary education years and during college; educational challenges and responses.
Effective: Summer 1995

HI ED 557 (EDTHP 557, SOC 557) **Sociology of Higher Education** (3) Reviews theory and current sociology research on student access, achievement, and governance in postsecondary education, with applications to policy analysis.
Effective: Fall 2000
Prerequisite: graduate students only except with permission of instructor; EDTHP/SOC 416 is recommended.

HI ED 560 **Legal Issues in Higher Education** (3) A process for analyzing case law on issues of access, student rights, employment, collective bargaining, church/state, private sector, and liability.
Effective: Summer 1995

HI ED 562 **Organizational Theory and Higher Education** (3) Application of social science theory and research to postsecondary education organizations and administration; use of research in administrative practice.
Effective: Summer 1995
Prerequisite: HI ED 552

HI ED 571 (CI ED 571) **Comparative Higher Education** (3) Comparative methods of studying structural variations in systems of higher education in principal industrialized nations and other selected countries.
Effective: Spring 1995

HI ED 585 (EDLDR 585, EDTHP 585) **Research Design: Implications for Decisions in Higher Education** (3) A capstone course on research design and analytical approaches to support decision-making in administration and policy-making.
Effective: Fall 2004
Prerequisite: EDPSY 400, EDPSY 406 ; orAG 400, R SOC 573

HI ED 586 (EDLDR 586, EDTHP 586) **Qualitative Methods in Educational Research** (3) Exploration of the theoretical framework undergirding qualitative research and its attendant practices and techniques.
Effective: Fall 2004
Prerequisite: completion of core courses in higher education

HI ED 587 (EDLDR 587, EDTHP 587) **Education Policy and Politics** (3) The political economy and bureaucratic politics of educational organizations, with special attention to the policy-making, implementation, and evaluation processes.
Effective: Fall 2004

HI ED 588 (EDLDR 588, EDTHP 588) **Qualitative Methods in Educational Research II** (3) Advanced study of methods involved in executing and analyzing qualitative research in education.
Effective: Summer 2007
Prerequisite: EDTHP 586

HI ED 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1995

HI ED 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1995

HI ED 595 **Internship in Higher Education** (1-9) Supervised experience in administrative offices, in research, on instructional teams, and in college teaching.
Effective: Summer 1995

HI ED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and fall outside the scope of formal courses.
Effective: Summer 1995

HI ED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 1995

HI ED 597A **Planning, Budgeting and Strategic Management** (3) This course is intended to develop a working knowledge of strategic planning and resource management in colleges and universities.
Effective: Summer 2010 Ending: Summer 2010

HI ED 597A **Interdisciplinarity in Higher Education** (3) Seminar on the role and impact of interdisciplinary research, teaching, and outreach activities in colleges and universities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HI ED 597A **History of HI ED Since 1945** (3) This course describes history in higher education since 1945.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

HI ED 597B **Multidimensional Analysis** (1) This course will introduce students to the multidimensional qualitative data analysis method.
Effective: Summer 2010 Ending: Summer 2010

HI ED 597B **Economics of Higher Education** (3) This course will use economic principles and research to illuminate numerous aspects of higher education.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HI ED 597B **Technology in Higher Education** (3) Course will examine how technology affects faculty, staff, students, and institutions, and how it is helping to transform the higher education marketplace.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

HI ED 597C **The Use of NVivo 8** (1) This course is designed as a quick orientation to and training in the use of NVivo 8 analyzing qualitative data.
Effective: Summer 2010 Ending: Summer 2010

HI ED 597E (EDLDR 597E, EDTHP 597E) **Foundations of Research** (3) This course is designed to begin a reading of the history and philosophies of education research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HI ED 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2005

HI ED 600 **Thesis Research** (1-15) No description.
Effective: Summer 1995

HI ED 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1995

HI ED 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1995

HI ED 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1995

HI ED 801 **Foundations of Institutional Research** (3) Survey course explores fundamental methods and research on campus decisions, enrollment management, faculty work analysis, institutional effectiveness, accreditation, student outcomes.
Effective: Spring 2010

HI ED 810 **Planning and Resource Management in Higher Education** (3) Strategic planning and resource management in higher education through institutional research.
Effective: Spring 2010

HI ED 820 **Studying Students & Student Affairs Program** (3) Studying the relationship of college activities to academic success by students.
Effective: Spring 2010

HI ED 830 **Designing Institutional Research Studies** (3) Develop skills to design and execute IR studies using quantitative and qualitative research methods.
Effective: Spring 2010

HI ED 840 **Assessing Student Outcomes & Evaluating Academic Programs** (3) Academic program assessment/student outcomes in accountability and accreditation processes.
Effective: Spring 2010

HI ED 850 **Analyzing Faculty Workload, Performance, and Compensation** (3) Develop research skills to analyze faculty workload and performance in teaching, research, outreach, and compensation.
Effective: Spring 2010

HI ED 860 **Conducting Enrollment Management Studies** (3) Studies three stages of enrollment management: Pre-admission, initial student experience, and student success and completion.
Effective: Spring 2010

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Hindi (HINDI)

No courses for department code **HINDI** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

History (HIST)

HIST 400 **Research in Ancient Sources** (3) Guided research in the literature of ancient Mediterranean civilizations.
Effective: Spring 2008
Prerequisite: HIST 001

HIST 401 (IL) (J ST 401) **Ancient Technologies and Socio-cultural History in the Ancient Levant** (3) Social and intellectual development in the Ancient Levant as they affected and were affected by technological development.
Effective: Spring 2006
Prerequisite: RL ST 110

HIST 402 (IL) **The Rise of the Greek Polis** (3) Development of the Greek city-state from Homeric times to the fifth century B.C.; special references to Athenian society.
Effective: Spring 2006
Prerequisite: HIST 100

HIST 403 (IL) **Alexander the Great and the Hellenistic World** (3) The career of Alexander, his impact on his own time, and the Hellenistic legacy.
Effective: Spring 2006
Prerequisite: HIST 100

HIST 404Y (IL) **Rome and Hellenism** (3) The impact of traditional Greek culture on ancient Italian society in the age (ca. 300-30 B.C.) of Roman imperial expansion.
Effective: Spring 2006
Prerequisite: HIST 100, HIST 101 orCAMS 033

HIST 405Y (IL) **The Roman Empire** (3) The political and social history of the Roman empire; economic institutions and religious groups which influenced Roman administration.
Effective: Spring 2006
Prerequisite: HIST 001, HIST 101 or 3 credits in classical studies

HIST 406W **Research in Medieval Sources** (3) Guided research in the literature of medieval Europe.
Effective: Spring 2008
Prerequisite: HIST 001

HIST 407 (IL) **Early Medieval Society** (3) Rise of European nations and evolution of their social and political institutions from the time of Constantine to the Crusades.
Effective: Spring 2006
Prerequisite: HIST 107

HIST 408 (IL) **Church and State in the High Middle Ages** (3) European political, institutional, and social history in light of church- state tensions from the Crusades to the Renaissance.
Effective: Spring 2006
Prerequisite: HIST 107

HIST 409Y (IL) (J ST 409Y, RL ST 407Y) **European Anti-Semitism from Antiquity to the Present** (3) Surveys the history of anti-Semitism in Europe from antiquity through the Middle Ages to the present.
Effective: Summer 2005

HIST 410 (US;IL) (J ST 410, RL ST 410) **Jews in the Medieval World** (3) Trends in medieval Jewish society under Islam and Western Christendom.
Effective: Spring 2006

HIST 411 (IL) (MEDVL 411) **Medieval Britain** (3) Political, cultural, and economic history of Britain from circa 400 to 1485 with an emphasis on the kingdom of England.
Effective: Spring 2006
Prerequisite: 6 credits in European history or medieval studies

HIST 412 (IL) **Intellectual History of the Middle Ages** (3) Intensive study of selected topics, such as philosophy, mysticism, heresy, the church, literary and artistic expression, and science.
Effective: Spring 2006
Prerequisite: HIST 107

HIST 413 (IL) (MEDVL 413) **Medieval Celtic Studies** (3) Celtic civilization from antiquity to the end of the middle ages.
Effective: Spring 2006
Prerequisite: 3 credits in medieval studies or in language literature or European history of the medieval period

HIST 414 (IL) **Renaissance and Reformation** (3) The transformation of consciousness from medieval to modern times, with special emphasis on Renaissance Italy and Reformation Germany.
Effective: Spring 2006
Prerequisite: HIST 001

HIST 415 (US;IL) (AAA S 415) **Race, Gender, and Politics in the United States and South Africa** (3) This thematic course will compare key issues, figures, and events in the historical development of the United States and South Africa.
Effective: Summer 2005

Prerequisite: AAA S 100, AAA S 102, AAA S 110, AAA S 192 orHIST 152

HIST 416 (J ST 416) **Zionist History 1890-1948** (3) History of Zionist thought and politics to the foundation of Esrael 1948.
Effective: Summer 1997

HIST 417 (IL) **The Age of Absolutism** (3) Seventeenth- and eighteenth-century royal absolutism in France, Prussia, and Austria; concurrent economic, social, and scientific developments; the Enlightenment.
Effective: Spring 2006
Prerequisite: HIST 001

HIST 418 (IL) **The French Revolution and the Napoleonic Era** (3) Development of revolutionary France and the First French Empire and their impact on Europe from 1789 to the Vienna settlement.
Effective: Spring 2006
Prerequisite: HIST 002

HIST 418W (IL) **The French Revolution and the Napoleonic Era** (3) Developments of revolutionary France and the First French Empire and their impact on Europe from 1789 to the Vienna settlement.
Effective: Spring 2008
Prerequisite: HIST 002

HIST 419 (US;IL) (WMNST 419) **The History of Feminist Thought** (3) A critical analysis of European and United States feminist thought from the renaissance to the present.
Effective: Spring 2006
Prerequisite: HIST 116, HIST 117, WMNST 001 orWMNST 003

HIST 420 (IL) **Recent European History** (3) Impact of two World Wars in twentieth century; social conflict and economic catastrophe; political radicalism; post-1945 recovery and cooperation.
Effective: Spring 2006
Prerequisite: 3 credits in European history

HIST 420W (IL) **Recent European History** (3) Impact of two World Wars in twentieth century; social conflict and economic catastrophe; political radicalism; post-1945 recovery and cooperation.
Effective: Spring 2008
Prerequisite: 3 credits in European history

HIST 421 (IL) (WMNST 421) **The History of European Women** (3) European women's lives from the Middle Ages to the present.
Effective: Spring 2006
Prerequisite: HIST 116, HIST 117, WMNST 001 orWMNST 003

HIST 422 (IL) **Modernity and Its Critics: European Thought Since 1870** (3) Perceptions and critiques of modernity as seen in works of European cultural criticism, social theory, philosophy, and literature.
Effective: Spring 2006
Prerequisite: HIST 002, HIST 120 or 3 credits in modern literature or philosophy or political or social theory

HIST 423 (IL) **Economic History of Europe Since 1750** (3) Comparataive history of industrialization process; monetary financial systems; business cycles; public finance; welfare and warfare economics; planning; labor organization.
Effective: Spring 2006
Prerequisite: 3 credits in European history or economics

HIST 424H (J ST 424H, RL ST 424H, PHIL 434H) **Monotheism and the Birth of the West** (3) The birth of monotheism and its relation to social organization, the idea of individuality, and science.
Effective: Spring 2002
Prerequisite: CAMS 004, CAMS 110, CAMS 120 orHIST 102

HIST 425 (IL) **Work and Leisure in Industrial Europe** (3) Impact of industrialization on the workday and the changing role of leisure and family life, 1700-1960.
Effective: Spring 2006

HIST 426 (US) (ADM J 426, J ST 426) **Jewish/American Organized Crime in New York City** (3) History of Jewish/American organized crime in New York City from 1890 through the Great Depression.
Effective: Spring 2006

HIST 427 (IL) **Germany Since 1860** (3) Bismarckian power-state; rise to economic dominance; welfare and warfare under Weimar republic and Hitler; post-1945 reconstruction and democracy.
Effective: Spring 2006
Prerequisite: 3 credits in European history

HIST 428 (IL) (S T S 428) **The Darwinian Revolution** (3) The origins and implications of evolutionary theory.
Effective: Spring 2006
Prerequisite: an introductory science course and a history course

HIST 429 **Europe in the Age of Nationalism, 1789-1914** (3) Emphasizing the role of nationalism in European cultural, diplomatic and imperial developments; concurrent economic and social changes.
Effective: Spring 2008
Prerequisite: HIST 002

HIST 430 (IL) **Eastern Europe in Modern Times** (3) Influence of geography, economic conditions, and nationalism upon the Eastern European and Balkan peoples; Pan-Slavism, conflicting interests of the great powers.
Effective: Spring 2006
Prerequisite: HIST 001 orHIST 002

HIST 431 (US;IL) (AAA S 431) **Black Liberation and American Foreign Policy** (3) This course deals with American foreign policy and Black liberation in Africa since 1945.
Effective: Summer 2005
Prerequisite: 3 credits in African history; 3 credits in African political science; or 3 credits in American political science

HIST 432 (IL) (AAA S 432) **Between Nation and Empire: The Caribbean in the 20th Century** (3) An exploration of the political evolution of the Caribbean Region over the course of the 20th Century.
Effective: Summer 2005
Prerequisite: HIST 250

HIST 433 (IL) **Imperial Russia, 1700-1917** (3) Enlightened absolutism, mercantilism, westernization; economic progress, liberal reforms, and revolutionary movement; major intellectual and cultural trends; Russia as great power.
Effective: Spring 2006
Prerequisite: HIST 141

HIST 434 (IL) **History of the Soviet Union** (3) Revolution; social, political, economic, and cultural continuity and change in the U.S.S.R. since 1917.
Effective: Spring 2006
Prerequisite: HIST 141 orHIST 142

HIST 435 **Topics in European History** (3 per semester/maximum of 9) Study of a particular period or country in European history, its significance and relation to other areas and the present. (May be repeated for credit.)
Effective: Spring 2008
Prerequisite: HIST 001 orHIST 002

HIST 436 (IL) **Great Britain Under the Tudors and Stuarts, 1485-1688** (3) Religious, political, and constitutional developments in the British Isles.
Effective: Spring 2006
Prerequisite: HIST 001 orHIST 002

HIST 437 (IL) **Great Britain 1688-1867** (3) Social, economic, and political history of Great Britain from late Stuart times until the mid-Victorian era.
Effective: Spring 2006
Prerequisite: HIST 001 orHIST 002

HIST 438 (IL) **Great Britain 1867-Present** (3) Social, economic, and political history of Great Britain from the mid-Victorian era to the present.
Effective: Spring 2006
Prerequisite: HIST 001 orHIST 002

HIST 440 (US) **Colonial America to 1753** (3) Background, establishment, and growth of the American colonies, including economic, political, social, religious, and intellectual developments.
Effective: Spring 2006
Prerequisite: HIST 020 3 additional credits in history

HIST 441 (US) **Revolutionary America, 1753-1783** (3) Forces in Great Britain and America causing withdrawal of thirteen colonies from the British Empire and the Revolutionary War.
Effective: Spring 2006
Prerequisite: HIST 020 3 additional credits in history

HIST 442 (US) **The Early American Republic, 1783-1850** (3) Confederation and Constitution; the Federalist and Jeffersonian periods; "the Era of Good Feelings"; "the Age of Jackson."
Effective: Spring 2006
Prerequisite: 3 credits in American history

HIST 444 (US) **The United States in Civil War and Reconstruction--1850-1877** (3) Causes of the Civil War; conduct of the war, North and South; impact of the war; problems of Reconstruction.
Effective: Spring 2006
Prerequisite: HIST 130

HIST 444W (US) **The United States in Civil War and Reconstruction--1850-1877** (3) Causes of the Civil War; conduct of the war, North and South; impact of the war; problems of reconstruction.
Effective: Spring 2008
Prerequisite: HIST 130 orHIST 020

HIST 445 (US) **The Emergence of Modern America** (3) Economic, social, political history of the United States, 1877-1919, emphasizing growth of industrialism and development as a modern nation.
Effective: Spring 2006
Prerequisite: HIST 021 3 additional credits in history economics or political science

HIST 446 (US) **America Between the Wars** (3) The Roaring Twenties, the Great Crash, Depression, and New Deal; war debts, reparations, isolationism, and World War II.
Effective: Spring 2006

HIST 447 (US) **Recent American History** (3) Contemporary economic, social, and political aspects of the United States and

its role as a world power since 1945.
Effective: Spring 2006
Prerequisite: HIST 021 3 additional credits in history economics or political science

HIST 448 (US) **America in the 1960s** (3) Social, political, and cultural themes in the United States in the 1960s.
Effective: Spring 2006
Prerequisite: HIST 021

HIST 449 (US) **Constitutional History of the United States to 1877** (3) Colonial background; framing and adoption of the constitution; development of the court under Marshall and Taney; sectionalism, Civil War, Reconstruction.
Effective: Spring 2006
Prerequisite: HIST 020 orHIST 021 3 additional credits in history or political science

HIST 450 (US) **Constitutional History of the United States Since 1877** (3) Constitutional developments from laissez-faire to the welfare state; imperialism, war, internationalism; the contemporary court, civil liberties, and civil rights.
Effective: Spring 2006
Prerequisite: HIST 020 orHIST 021 3 additional credits in history or political science

HIST 451 (US) **The Consumer Revolution** (3) The origins and impact of American consumer society since 1870.
Effective: Spring 2006
Prerequisite: three credits in history marketing or advertising

HIST 452 (US;IL) **History of U.S. Foreign Relations** (3) History of U.S. foreign relations since 1789; emphasis on twentieth century.
Effective: Spring 2006
Prerequisite: HIST 020 orHIST 021

HIST 453 (GEOG 407) **American Environmental History** (3) The history of the ways Americans have used and thought about the environment since 1500.
Effective: Spring 1998
Prerequisite: GEOG 030, LARCH 003 ; andHIST 020, HIST 021 ; or 6 credits in the humanities or social sciences

HIST 454 (US) **American Military History** (3) Development of U.S. military policy, 1776 to the present, emphasizing the conduct of our wars, interrelationship of civil and military authority.
Effective: Spring 2006
Prerequisite: HIST 020 orHIST 021

HIST 456Y (US) **The Social History of American Vernacular Building, 1607-1980** (3) Social, historical, and cultural context of American building including settlements, housing, workplaces, stores, recreational facilities; changes over time.
Effective: Spring 2006
Prerequisite: 3 credits in American history

HIST 457 (US;IL) (S T S 457, WMNST 457) **The History of Women in Science** (3) Critical analysis of the roles women, gender, and minorities have played in natural sciences.
Effective: Spring 2006
Prerequisite: HIST 116, HIST 117, WMNST 001, WMNST 003 orWMNST 005

HIST 458Y (US) (LER 458Y) **History of Work in America** (3) A study of selected problems in the history of work in the United States, especially since 1877.
Effective: Spring 2008
Prerequisite: HIST 021, HIST 156 orLER 100

HIST 459Y (US) **Social and Cultural History of the United States Since 1783** (3) Role of immigration, social reform movements, religion, education, science, literature, and the arts in American history.
Effective: Spring 2006

HIST 460 (US;IL) **United States Foreign Intelligence** (3) Aims, methods, and organization of U.S. foreign intelligence from the American Revolution to the Cold War and beyond.
Effective: Spring 2006

HIST 461 (US;IL) **The Emergence of the American City: 1100-1880** (3) The growth of American cities from their urban origins in Europe and the Native-American Southwest to 1880.
Effective: Spring 2006

HIST 462 (US;IL) **The Twentieth Century City** (3) Political, economic, social, and cultural transformations in American cities from 1880 to 2000.
Effective: Spring 2006

HIST 463 (US) **American Thought to 1865** (3 Introduction to, scholarly commentary on, major documents of American Intellectual history, early colonial period to end of the Civil War.
Effective: Spring 2006
Prerequisite: any American history course at the college freshman level

HIST 464 (US) **American Thought from 1865** (3) Introduction to, scholarly commentary on, major documents of American Intellectual history from end of the Civil War to the present.
Effective: Spring 2006

Prerequisite: any American history course at the college freshman level

HIST 465 (US) (AAA S 465) **Civil Rights and American Politics 1933-1968** (3) The civil rights struggle and its impact upon American politics.
Effective: Summer 2005
Prerequisite: AAA S 100, HIST 021, HIST 152, PL SC 001 orPL SC 002

HIST 466 (US;IL) (WMNST 466) **Lesbian and Gay History** (3) Critical exploration of the history of sexuality, focusing especially on the emergence of modern lesbian and gay identities.
Effective: Summer 2005
Prerequisite: HIST 117, WMNST 001

HIST 467 (US;IL) (LTNST 467) **Latin America and the United States** (3) Historical development of policies of the United States with regard to Latin- American affairs from colonial times to the present.
Effective: Fall 2008

HIST 468 (IL) **Mexico and the Caribbean Nations in the Twentieth Century** (3) Political, economic, and social development in Mexico and the Caribbean since 1900. Emphasis on Mexican, Guatemalan, and Cuban revolutions.
Effective: Spring 2006

HIST 469 (CRIMJ 469) **Drugs and Drug Policy in the United States** (3) Examines the history and dimensions of drug use and analyzes the impact of drug policy.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orHIST 021

HIST 470 **Modern Bondage: Slavery in the Americas, 1492-1888** (3) The work, culture, ideology, and political economy of slavery in the Americas between 1500 and 1888.
Effective: Summer 2007
Prerequisite: HIST 011, HIST 020, HIST 152, HIST 178 orHIST 192

HIST 471Y (IL) (RL ST 471Y) **Classical Islamic Civilization, 600-1258** (3) Pre-Islamic Arabia; Muhammad; Arab conquests; Islamic beliefs and institutions; literary, artistic, and scientific achievements; relations with Europe; breakdown of unity.
Effective: Fall 2006

HIST 472 (IL) **The Ottoman Empire and Other Muslim States** (3) Turkish and Mongol invasions; Mamluks; Ottoman expansion and institutions; Safavid Persia; disintegration and reform; emergence of modern Turkey and Iran.
Effective: Spring 2006
Prerequisite: HIST 181

HIST 473 (IL) **The Contemporary Middle East** (3) Political, economic, and social changes in Turkey, Iran, Israel, and the Arab countries in the twentieth century; Arab-Israeli conflict.
Effective: Spring 2006

HIST 475Y (IL) **The Making and Emergence of Modern India** (3) India's transition to social, economic, and political modernity through the experience of British colonial rule and the nationalist struggle.
Effective: Spring 2006
Prerequisite: HIST 010, HIST 011, HIST 172, HIST 175, HIST 176, HIST 181 orHIST 191

HIST 477 **American Military History to 1900** (3) Development of United States military policy, 1776-1900, emphasizing conduct of wars, interrelationship of civil and military authority.
Effective: Spring 2008
Prerequisite: 3 credits in history

HIST 478 **American Military History Since 1900** (3) Development of United States military policy in the 20th and 21st centuries, emphasizing conduct of wars, interrelationship of civil and military authority.
Effective: Spring 2008
Prerequisite: 3 credits in history

HIST 479 (IL) **History of Imperialism and Nationalism in Africa** (3) Theories and types of imperialism; varied patterns of colonial administration; initial African responses; nationalism; decolonization and independence.
Effective: Spring 2006
Prerequisite: HIST 191

HIST 480 (IL) **Medieval Japan** (3) An overview of Japan between 1150-1550, a period of political decentralization, cultural efflorescence, and social change.
Effective: Spring 2006
Prerequisite: HIST 107, HIST 172, HIST 174 orHIST 407

HIST 481 (IL) **Modern Japan Since 1800** (3) The transformation of Japan from a pre-modern, isolated, and agricultural nation into a highly industrialized world power.
Effective: Spring 2006
Prerequisite: HIST 172, HIST 174 orHIST 175

HIST 483 (IL) **Chinese Society and Culture to 1800** (3) The social, political, and cultural issues and developments from ancient to the late-imperial times.
Effective: Spring 2006
Prerequisite: HIST 174

HIST 484Y (IL) **History of Chinese Thought** (3) A study of the dynamic historical development of Chinese thought with its diverse expressions from antiquity to the present.
Effective: Spring 2006
Prerequisite: HIST 174 orHIST 175

HIST 485Y (IL) **Nineteenth-Century China** (3) Ch'ing society and institutions; "opening" to the west; imperialism; domestic upheaval and its effect upon Chinese society; reform movements.
Effective: Spring 2006
Prerequisite: HIST 175 orHIST 300H (Honors in East Asian history)

HIST 486 (IL) **Twentieth-Century China** (3) China from the Republican Revolution of 1911 to the present; nationalism, cultural change; development of communism.
Effective: Spring 2006
Prerequisite: HIST 175 orHIST 300H (Honors in East Asian History)

HIST 487 **American Diplomacy, 1776-1914** (3) Developments in the foreign policy of the United States from independence to the eve of World War I.
Effective: Spring 2008
Prerequisite: HIST 002 orHIST 020

HIST 488 **American Diplomacy Since 1914** (3) Developments in the foreign policy of the United States since the eve of World War I.
Effective: Spring 2008
Prerequisite: HIST 002 orHIST 021

HIST 490 (L ST 490) **Archival Management** (1-3) Introduction to the principles and procedures in the management of archives and historical manuscripts.
Effective: Fall 1978

HIST 491 (IL) **British Civil Wars and Revolutions, 1639-1651** (3) This is an advanced course on the history of the general crisis in the British Isles, from the outbreak of war between England and Scotland in 1639 to the securing of the Commonwealth regime following the desstruction of the last major royalist army in 1651.
Effective: Fall 2009
Prerequisite: HIST 002, HIST 134 orHIST 436

HIST 492 (IL) **Witchcraft in Early Modern Europe** (3) Survey of the social, economic, political, and religious conditions of accusations and prosecutions of witchcraft in western Europe and north America, from 1500 to 1700.
Effective: Fall 2009
Prerequisite: HIST 002

HIST 493 **Preceptorship in Teaching** (3-6) Supervised experience in research of teaching under the guidance of an approved faclty member.
Effective: Summer 1997
Prerequisite: 3 credits in course-work related to the teaching or research subject

HIST 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

HIST 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

HIST 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships.
Effective: Summer 1986
Prerequisite: prior written approval of proposed assignment by instructor

HIST 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

HIST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

HIST 497A **The Spanish-Speaking Caribbean and Its Diaspora** (3) This course will examine the nineteenth and twentieth century history of Cuba, Santo Domingo, and Puerto Rico, including the emigration and founding of Spanish-Caribbean diasporas in the United States.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 497A **Colony, Nathion and Diaspora; The History of Modern Puerto Rico** (3) This course will investigate the political, economic, and cultural history of contemporary Puerto Rico in all its contradictions.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

HIST 497B **Ethnic Nationalism and Global Conflict** (3) This course examines the rise of ethnic nationalism in the twentieth century and explores its wide-ranging consequences.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 497C **Slavery in the Americas, 1492 - 1888** (3) This course examines the rise, expansion, and destruction of African slavery in the Americas.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 497D **The Arab World and the US: From Barbary Pirates to the Global War on Terror** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 497E **Chinese Society and Culture to 1600** (3) Exploration of Chinese history to 1600, including early civilizations, bureaucratic empire, phiosophy and religion, society and economy, and foreigh relations.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 497E (C I 497E, A ED 497E) **Consuming Child** (3) Explores linkages between new ideas about childhood and commerical/media culture since the Enlightenment through sponsored guest presentations and readings.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

HIST 497F **Global History of Medicine** (3) A crosscultural and comparative perspective on how society and culture have shaped the experience of the body, health, illness, and cure throughout human history.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 497G **US Relations with the Middle East** (3) Seminar on history of American diplomatic, military, political, and economic relations with Middle Eastern countries from 1776 to the present.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 499 (IL) **Foreign Study--History** (1-6) Study in selected foreign countries of various periods and topics in history.
Effective: Summer 2005
Prerequisite: 3 credits in the appropriate introductory history course for the geographic location specified

HIST 499C (IL) (CAMS 499C, J ST 499C) **Archaeological Field School** (3-6) This course introduces students to the basics of archaeological field methods.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: 3 credits in the appropriate introductory history course for the geographic location specified

HIST 499D (IL) (CAMS 499D, J ST 499D, ANTH 499D) **Conservation and Public Archaeology** (3) The conservation and public archaeology option will entail hands-on conservation of on-site architectural remains.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: 3 credits in the appropriate introductory history course for the geographic location specified

HIST 499E (IL) (RL ST 499E, CAMS 499E) **Petra, the Spice Route, and the Decapolis Cities in Roman Palestine** (3) Study tour of Roman Palestine and the Nabateans in Jordan and Israel.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: 3 credits in the appropriate introductory history course for the geographic location specified

HIST 501 **Historical Method** (3) No description.
Effective: Winter 1978

HIST 502 **Historiography** (3) No description.
Effective: Winter 1978

HIST 503 **Studies in Greek History** (3-6) No description.
Effective: Winter 1978

HIST 504 **Studies in Roman History** (3-6) No description.
Effective: Winter 1978

HIST 505 (J ST 505) **Biblical Historiography in its Ancient Setting** (3 per semester/maximum of 6) Methods of historical reconstruction in Biblical and other historiography from the earliest Mesopotamian records through those of the 6th century B.C.E.
Effective: Spring 1995
Prerequisite: HIST 102

HIST 508 (J ST 508) **Antisemitisms in Historical Context** (3) Historical and comparative analysis of occurrences of antisemitism from antiquity to the present.
Effective: Spring 1995

HIST 509 **Medieval Civilization** (3-9) No description.
Effective: Winter 1978

HIST 510 (RL ST 510) **Topics in Medieval Church History** (3 per semester, maximum of 6) Institutional and doctrinal development of the Christian Church in medieval Europe.
Effective: Spring 1995

HIST 511 **Topics in Medieval Britain** (3 per semester, maximum of 6) Readings and research in major themes of the history of medieval Britain.
Effective: Summer 1994

HIST 515 **Early Modern Europe** (3-6) A graduate seminar examining selected topics in early modern European history through readings, discussions, and research papers.
Effective: Spring 1987

HIST 516 (WMNST 516) **Topics in Gender History** (3) A critical analysis of gender and theories of gender in selected historical contexts.
Effective: Summer 1992

HIST 517 **Studies in Modern European Social History** (3-6) A graduate seminar examining the literature and methodologies of European social history since 1750 through readings, discussions, and research papers.
Effective: Spring 1987

HIST 518 **Topics in Modern German History** (3 per semester, maximum of 6) Readings and research in the history of Germany since 1740.
Effective: Summer 1994

HIST 520 **Studies in Twentieth-Century Europe** (3-6) No description.
Effective: Winter 1978

HIST 522 **Studies in Modern European Intellectual History** (3-6) A seminar examining developments in modern European intellecutal history through readings, class discussions, and research papers.
Effective: Summer 1986

HIST 523 **Twentieth Century Theories of History** (3) Studies in twentieth-century theories of history and historical methods.
Effective: Spring 1995

HIST 528 **Topics in Modern European Diplomatic History** (3 per semester, maximum of 6) Readings and research in European diplomatic history since the Congress of Vienna.
Effective: Summer 1994

HIST 529 **Methods in Modern Social History** (3 per semester, maximum of 6) Sources, interpretations, research methods, and current debates in modern social history.
Effective: Summer 1994

HIST 530 **Methods in the History of Science and Technology** (3 per semester, maximum of 6) Modern research methods and historiographical controversies in the history of science and technology.
Effective: Summer 1994

HIST 533 **Studies in Russian and Soviet History** (3-6) No description.
Effective: Winter 1978

HIST 537 **Studies in British History** (3-6) No description.
Effective: Winter 1978

HIST 538 **Topics in Rural History** (3 per semester, maximum of 9) Historical analysis of rural societies, including cultural patterns, agricultural practices, social structures, environmental issues; research methodologies.
Effective: Summer 1994

HIST 539 **Topics in Military History** (3 per semester, maximum of 9) Studies in the history of wars and of the political, social, economic, diplomatic, and theoretical foundations of warfare.
Effective: Summer 1994

HIST 540 **Studies in Colonial and Revolutionary America** (3-6) No description.
Effective: Fall 1983

HIST 543 **Topics in Antebellum America** (3 per semester, maximum of 6) Social, intellectual, and cultural developments from the period after the nation's founding until the start of the Civil War.
Effective: Summer 1994

HIST 544 **Topics in the Civil War and Reconstruction** (3 per semester, maximum of 6) Background and impact of the Civil War and the two succeeding decades, with emphasis on historiography and selected topics.
Effective: Summer 1994

HIST 545 **Topics in Gilded Age and Progressive Era America, 1877-1919** (3 per semester, maximum of 6) Social, political, economic, and cultural history of the United States from the Gilded Age through Progressivism and World War I.
Effective: Summer 1994

HIST 546 **Topics in United States History Since 1919** (3 per semester, maximum of 6) Readings and research in major themes of the history of the United States in the twentieth century.
Effective: Summer 1994

HIST 548 **Topics in United States South** (3 per semester, maximum of 6) Major themes of southern United States history.
Effective: Summer 1994

HIST 549 **Topics in African-American History** (3 per semester, maximum of 6) Readings, research, and methods in the study of African-American history.
Effective: Summer 1994

HIST 550 **Studies in Constitutional History** (3-9) A graduate seminar examining constitutional developments in their historical context through readings, class discussions, and research papers.
Effective: Fall 1983

HIST 553 **Diplomatic History of the United States** (3-6) No description.
Effective: Winter 1978

HIST 555 (L I R 555) **Topics in American Labor History** (3 per semester/maximum of 6) American working-class experience from its artisanal and agricultural roots through the rise, maturation, and transformations of industrial capitalism.
Effective: Spring 1995

HIST 559 **Cultural History of the United States** (3-6) No description.
Effective: Winter 1978

HIST 560 (RL ST 560) **Topics in American Religion** (3 per semester, maximum of 6) The social, political, and intellectual contexts of American religious thought.
Effective: Spring 1995

HIST 561 (RL ST 561) **Topics in Western Religion** (3 per semester, maximum of 6) Major issues and themes in the historical development of Christianity and Judaism.
Effective: Spring 1995

HIST 562 (RL ST 562) **Topics in Comparative Religion** (3 per semester, maximum of 6) Comparative studies of world religions.
Effective: Spring 1995

HIST 563 (RL ST 563) **Religion and Society** (3 per semester, maximum of 6) Social and political implications of religious belief and practice.
Effective: Spring 1995

HIST 564 (RL ST 564) **Topics in Asian Religions** (3 per semester, maximum of 6) Topics in Asian religions.
Effective: Spring 1995

HIST 565 (RL ST 565) **Research in Religious Studies** (3) Approaches and methodologies in the critical study of religion.
Effective: Summer 1995

HIST 566 (RL ST 566) **Islamic Studies** (3) Studies in Islamic history, historiography, theology, law, and religious life.
Effective: Spring 1997

HIST 569 **Seminar in Latin-American History** (3-6) No description.
Effective: Winter 1978

HIST 573 **Studies in Middle Eastern History** (3-6) No description.
Effective: Winter 1978

HIST 583 **Topics in Traditional East Asian History** (3 per semester, maximum of 6) Critical examination of historiography and methodological and interpretive approaches in traditional East Asian history.
Effective: Summer 1994

HIST 584 **Topics in Modern East Asian History** (3 per semester, maximum of 6) Research and readings in the history of East Asia since the early nineteenth century.
Effective: Summer 1994

HIST 587 **Topics in Modern South Asian History** (3 per semester, maximum of 6) Research and readings in the history of South Asia since the late eighteenth century.
Effective: Summer 1994

HIST 591 **Archives Practicum** (3-6) Training and supervised work experience in archival activities--Option A: Archival Management; Option B: Oral History.
Effective: Winter 1978
Prerequisite: HIST 490

HIST 592 **Proseminar** (3-9) Readings in fundamental historical works; different sections will treat such topics as United States History and Early Modern History.
Effective: Summer 1998

HIST 593 **Research Seminar** (3) Seminar in research methods of the discipline.
Effective: Summer 2009
Prerequisite: HIST 592

HIST 595 **Internship** (1-12) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 1987
Prerequisite: prior written approval of proposed assignment by instructor

HIST 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

HIST 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

HIST 597A **Slavery in the Americas, 1492-1888** (3) This course examines the rise, expansion, and destruction of African slavery in the Americas.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 597B **Religion and Secularization in the Modern Period** (3) Understanding of the social, cultural, and political significance of religion for societies across cultures and over time.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 597C **US Relations with the Middle East** (3) Seminar on history of American diplomatic, military, political, and economic relations with Middle Eastern countries from 1776 to the present.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HIST 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

HIST 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

HIST 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Students enrolled will lead discussion sections, grade papers and examinations, given an occasional lecture, and assist instructors in planning survey

level courses.
Effective: Fall 1983

HIST 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2002

HIST 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

HIST 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Homeland Security (HLS)

HLS 410 (PHP 410) **Public Health Preparedness for Disaster and Terrorist Emergencies I** (3) Analyzes the history of terrorism and explores the preparation and response to specific terrorist threats, natural disasters, and conventional catastrophes.
Effective: Summer 2007 Ending: Fall 2010
Prerequisite: Undergraduate StudentsBIOL 011 andBIOL 012 orCHEM 110 andCHEM 111 orMICRB 106 andMICRB 107 ; Graduate Students - Enrollment in the MHS program the Post- Baccalaureate Credit Certificate in Homeland Security or permission from the instructor.

HLS 410 (PHP 410) **Public Health Preparedness for Disaster and Terrorist Emergencies I** (3) Analyzes the history of terrorism and explores the preparation and response to specific terrorist threats, natural disasters, and conventional catastrophes.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: Undergraduate StudentsBIOL 011 andBIOL 012 orCHEM 110 andCHEM 111 orMICRB 106 andMICRB 107 ; Graduate Students - Enrollment in the MHS program the Post- Baccalaureate Credit Certificate in Homeland Security or permission from the instructor.

HLS 510 (PHP 510) **Public Health Preparedness for Disaster and Terrorist Emergencies II** (3) A public health perspective on the preparation necessary to develop a coordinated response to a disaster or terrorist emergency.
Effective: Summer 2005 Ending: Fall 2010
Prerequisite: permission of the instructor

HLS 510 (PHP 510) **Public Health Preparedness for Disaster and Terrorist Emergencies II** (3) A public health perspective on the preparation necessary to develop a coordinated response to a disaster or terrorist emergency.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: permission of the instructor

HLS 520 (AGBIO 520) **Agricultural Biosecurity: Protecting a Key Infrastructure** (3) Course will explore intentional and unintentional threats to the agriculture- food system, history and current approaches for safeguarding this key infrastructure.
Effective: Summer 2005 Ending: Summer 2010
Prerequisite: HLS 510 or permission of the instructor

HLS 527 (PHP 527) **Public Health Evaluation of Disasters and Bioterrorism** (3) Introduces students to the design of exposure assessment and health effect studies applicable to disasters and terrorism.
Effective: Summer 2005 Ending: Fall 2010
Prerequisite: HLS 510 or permission of the instructor

HLS 527 (PHP 527) **Public Health Evaluation of Disasters and Bioterrorism** (3) Introduces students to the design of exposure assessment and health effect studies applicable to disasters and terrorism.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: HLS 510 or permission of the instructor

HLS 530 (PHP 530) **Critical Infrastructure Protection of Health Care Delivery Systems** (3) Investigates the impact that terrorist incidents may have on healthcare facilities or their ability to deliver healthcare services.
Effective: Summer 2005 Ending: Fall 2010
Prerequisite: HLS 510 permission of the instructor

HLS 530 (PHP 530) **Critical Infrastructure Protection of Health Care Delivery Systems** (3) Investigates the impact that terrorist incidents may have on healthcare facilities or their ability to deliver healthcare services.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: HLS 510 permission of the instructor

HLS 553 (CAS 553, PHP 553) **Disaster Communication** (3) This seminar provides students with a comprehensive understanding of the multifaceted nature of disaster communication across phases of a disaster.
Effective: Summer 2006 Ending: Fall 2010

HLS 553 (CAS 553, PHP 553) **Disaster Communication** (3) This seminar provides students with a comprehensive understanding of the multifaceted nature of disaster communication across phases of a disaster.
Effective: Spring 2011 Future: Spring 2011

HLS 558 (PSY 558, PHP 558) **Disaster Psychology** (3) Explores psychological impact of disasters and terrorist attacks on victims, families, rescuers, and society and methods of reducing negative effects.
Effective: Spring 2009 Ending: Fall 2010
Prerequisite: HLS 510 or permission of the instructor

HLS 558 (PSY 558, PHP 558) **Disaster Psychology** (3) Explores psychological impact of disasters and terrorist attacks on victims, families, rescuers, and society and methods of reducing negative effects.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: HLS 510 or permission of the instructor

HLS 594 (PHP 594) **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2009 Ending: Fall 2010

Prerequisite: Completion of at least 15 credits in the program includingHLS 510 andHLS 527 or permission of the instructor

HLS 594 (PHP 594) **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: Completion of at least 15 credits in the program includingHLS 510 andHLS 527 or permission of the instructor

HLS 801 (P ADM 801) **Homeland Security Administration: Policies and Programs** (3) Foundation for understanding homeland security history, the development of homeland security policies and organizations, and current management approaches.
Effective: Summer 2010

HLS 803 (PHIL 803) **Homeland Security: Social and Ethical Issues** (3) This course will examine the social, political, legal, and ethical issues that arise in the context of homeland security.
Effective: Summer 2010

HLS 805 (CRIM 805) **Violence, Threats, Terror, and Insurgency** (3) This course provides overview of the domestic and global issues related to homeland security.
Effective: Summer 2010

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Honors (HONOR)

HONOR 401H **Honors Seminar** (3) An in-depth exploration of a topic or theme that crosses disciplinary boundaries; may be repeated for credit.
Effective: Spring 1996 Ending: Summer 2010
Prerequisite: admission to Penn State Harrisburg Honors Program

HONOR 401H **Honors Seminar** (3-6 per semester/maximum of 6) In-depth honors-level exploration of a topic or theme that crosses disciplinary boundaries; may be repeated for credit.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: admission to an honors program belonging to the Penn State Honors Consortium

HONOR 493H **Honors Service Learning** (1-3) A supervised experience of doing service for campus or community welfare and analyzing related issues.
Effective: Summer 1997 Ending: Summer 2010
Prerequisite: enrollment in the Penn State Harrisburg Honors Program

HONOR 493H **Honors Service Learning** (1-3) A supervised honors experience doing service for campus or community welfare and analyzing related issues.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: admission to an honors program belonging to the Penn State Honors Consortium

HONOR 494M **Interdisciplinary Writing and Thesis Formulation** (2) Seminar to help students approach interdisciplinary analysis, writing as interpretive process, and how to formulate a thesis project and proposal.
Effective: Summer 1999 Ending: Summer 2010
Prerequisite: enrollment in the Penn State Harrisburg Honors Program

HONOR 494M **Interdisciplinary Writing and Thesis Formulation** (2) Seminar to help students with interdisciplinary analysis, writing, and formulation of honors projects and proposals.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: admission to an honors program belonging to the Penn State Honors Consortium

HONOR 495H **Research Studies** (1) A capstone seminar for honors students working on honors theses and projects to work together and learn about their research interests.
Effective: Spring 2000 Ending: Summer 2010
Prerequisite: HONOR 301H enrollment in departmental or honor thesis study

HONOR 495H **Research Studies** (1) A capstone seminar for honors students working on honors theses and projects to work together and learn about their research interests.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: HONOR 301H and enrollment in an honors program belonging to the Penn State Honors Consortium

HONOR 496H **Honors Thesis** (3) An opportunity to pursue an interdisciplinary thesis or research project among schools or division through the Honors program.
Effective: Spring 1996 Ending: Summer 2010
Prerequisite: HONOR 301H senior standing and permission of the program

HONOR 496H **Honors Thesis** (3) Research, creative activities, and writing necessary for pursuit and completion of an interdisciplinary honors thesis.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: HONOR 301H senior standing and enrollment in an honors program belonging to the Penn State Honors Consortium

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Horticulture (HORT)

HORT 402W **Plant Nutrition** (3) Mineral nutrition of higher plants, including nutrient acquisition, transport, metabolism, and practical implications.
Effective: Spring 2003
Prerequisite: HORT 315 orBIOL 441, SOILS 101

HORT 407 **Plant Breeding** (3) The scientific principles and techniques of utilizing genetic variability in improving the heredity of plants for specific purposes.
Effective: Spring 2003

HORT 408 **Landscape Plant Establishment and Maintenance** (4) The principles and practices involved in the establishment of plants in the landscape, and their subsequent maintenance.
Effective: Summer 1998
Prerequisite: HORT 137 orHORT 138;SOILS 101

HORT 409 **Landscape Plant Establishment and Maintenance Laboratory** (1) Students will actively participate in the practices involved in the establishment of plants in the landscape, and their subsequent maintenance.
Effective: Summer 1998
Prerequisite: HORT 408

HORT 410W **Issues in Landscape Contracting** (3) This will be a survey of business management, regulatory, and environmental issues facing the landscape contracting profession. Laboratory.
Effective: Summer 1998
Prerequisite: HORT 408

HORT 412W **Post-Harvest Physiology** (3) Harvesting, handling, storage, and transportation of horticultural crops; primary emphasis on physiological response to pre- and post-harvest environmental factors.
Effective: Spring 2001
Prerequisite: 6 credits in horticulture or other plant sciences

HORT 420 **Plant Growth Regulators** (3) Plant growth regulators, their chemical and physical properties; general principles, practices, and applications in regulating plant growth and development.
Effective: Spring 2001
Prerequisite: BIOL 110 orHORT 101

HORT 430W **Landscape Maintenance and Management** (3) Principles and practices in the maintenance and management of landscaped areas.
Effective: Spring 2001
Prerequisite: HORT 101;HORT 137 orHORT 138

HORT 431 **Small Fruit Culture** (3) Cultural requirements and production practices of the principal small fruit crops: strawberries, grapes, blueberries, brambles, and cranberries.
Effective: Spring 2001
Prerequisite: HORT 101, HORT 315

HORT 432 **Deciduous Tree Fruits** (3) Science, art, and techniques of regulated cropping; orchard designs and management systems.
Effective: Spring 2001
Prerequisite: HORT 101, HORT 315

HORT 433 **Vegetable Crops** (3) Cultural requirements of important vegetable crops in conjunction with physiological processes and problems related to commercial production.
Effective: Spring 2001
Prerequisite: HORT 101, HORT 315

HORT 440W **Plant Water Relations** (3) Fundamentals of plant water relations including acquisition, transport, conservation, response to drought, measurement of water status, relationship to productivity, interaction with mineral nutrition, and use of equipment.
Effective: Spring 2003
Prerequisite: BIOL 441 orBIOL 446 or permission of department

HORT 444 **Advanced Plant Breeding** (4) Exploration of the interrelationships of genetic, cytological, physiological, and environmental factors in plant improvement. An individual research project is required.
Effective: Fall 1983
Prerequisite: HORT 407

HORT 445 **Plant Ecology** (3) Advanced lectures on plant ecology which stress integration of physiological, population-level and community-level phenomena, and ecology in agriculture.
Effective: Fall 1999
Prerequisite: BIOL 220W, FOR 308 orHORT 315

HORT 450 **Greenhouse Management** (3) Maintenance and manipulation of the greenhouse production systems including structures, covers, light, temperature, carbon dioxide, water, growing media, fertilizer and greenhouse cost accounting.
Effective: Spring 2001
Prerequisite: HORT 101, HORT 315

HORT 453 **Flower Crop Production and Management** (3) Production of greenhouse flower and foliage plants; development of management skills for a greenhouse business.
Effective: Spring 2001
Prerequisite: HORT 101, HORT 315

HORT 455 **Retail Horticulture Business Management** (3) The nature, operation, and management of retail horticulture business, emphasizing retail greenhouses, nurseries, and flower shops.
Effective: Spring 2001
Prerequisite: HORT 131, HORT 137 orHORT 138 ; 3 credits of marketing

HORT 457 **Interior Plantscaping** (3) Foliage identification, environmental factors affecting plants, concepts of interior plant design, installation and maintenance.
Effective: Summer 2004
Prerequisite: HORT 101;HORT 202 orHORT 250 orHORT 269

HORT 459 (BIOTC 459, BIOL 459) **Plant Tissue Culture and Biotechnology** (3) Principles and techniques for the in vitro culture, propagation, and genetic manipulations of plant cells.
Effective: Fall 2003
Prerequisite: BIOL 230W ; orB M B 251, B M B 252

HORT 464 **Landscape Construction I** (4) Standards, processes, and computations for site grading, drainage, earthwork, vehicular circulation, parking; detailing, and finishing of landscape construction materials.
Effective: Spring 2001
Prerequisite: HORT 269

HORT 466 **Landscape Construction II** (5) Project scheduling methods, plant installation techniques, and field layout principles and practices. Implications of site preparation.
Effective: Summer 1988
Prerequisite: HORT 464

HORT 468 **Landscape Estimating and Bidding** (2) Reading and interpreting contract drawings and specifications, quantity take- offs, cost estimating, and bid document preparation.
Effective: Spring 2001
Prerequisite: HORT 409 orHORT 466

HORT 490 **Senior Seminar** (1) Exploration of the interrelationships of horticulture, science, and society; evaluation of attributes and abilities related to various career opportunities.
Effective: Spring 1993
Prerequisite: HORT 390 seventh-semester standing

HORT 495 **Internship** (1-13) Supervised off campus experience in a public or commercial horticultural enterprise. Written and oral critique of activity required.
Effective: Fall 1983
Prerequisite: approval of proposed assignment required prior to registration

HORT 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

HORT 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

HORT 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

HORT 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

HORT 514 (PLPHY 514) **Modern Techniques and Concepts in Plant Ecophysiology** (2) An intensive introduction to concepts of plant ecophysiology and modern techniques used in this field.
Effective: Summer 1998
Prerequisite: BIOL 220W

HORT 517 (PLPHY 517) **Ecology of Plant Roots** (2) Form and function of roots from an ecological perspective using examples from both wild and crop plants.
Effective: Spring 1999

HORT 520 **Advanced Plant Growth Regulators** (2) Advanced topics in plant growth regulators, their chemical and physical properties; physiological, biochemical and molecular regulation of plant growth and development.
Effective: Spring 1998
Prerequisite: HORT 420

HORT 524 **Experimental Procedures in Plant Science Research** (3) Experimental methods, computer techniques,

interpretation of statistical analyses, and communication of research results.
Effective: Fall 1983
Prerequisite: 3 credits in 400-level statistics orAGRO 512

HORT 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1990

HORT 596 **Individual Studies** (1-9) Creative projects including non-thesis research, supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

HORT 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

HORT 597A **Statistical Meta-Analysis in Biology** (3) Statistical meta-analysis in biology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HORT 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

HORT 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

HORT 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Provides an opportunity for horticulture graduate students to gain experience in teaching under the supervision of a faculty member.
Effective: Fall 1983

HORT 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2009

HORT 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

HORT 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Hotel, Restaurant, and Institutional Management (HRIM)

HRIM 411 **Beverage Management and Wine Selection** (3) Management issues in beverage service and products. Students taste wines, brews, and distilled spirits.
Effective: Spring 2004
Prerequisite: students must be at least 21 years old

HRIM 412 **Advanced Institutional Food Service Management** (4) Advanced principles of food production management and service and their application in institutional food service settings.
Effective: Spring 2004
Prerequisite: HRIM 330

HRIM 413 **New Product Development for Commercial Foodservice** (3) This course introduces students to a new product development process that requires coordination, communication, and integration throughout the organization.
Effective: Spring 2010
Prerequisite: a grade of "C" or better forHRIM 329

HRIM 415 **International Cuisine** (3) Cooking and eating practices of cultures around the world, including historical, religious, cultural, geographic, and political influences on each cuisine.
Effective: Spring 2007
Prerequisite: A grade of "C" or better required forHRIM 201, NUTR 100, NUTR 119

HRIM 430 **Advanced Food Production and Service Management** (3) Simulation and application of technical, conceptual, interpersonal skills. Emphasis on group dynamics; improvement in managerial skills; management team functions.
Effective: Spring 2007
Prerequisite: A grade of "C" or better required forHRIM 330

HRIM 435 **Financial Management in Hospitality Operations** (3) Fiscal techniques in the development, management, and control of hospitality establishments.
Effective: Spring 2007
Prerequisite: A grade of "C" or better required forECON 002 orECON 014 andHRIM 336 . Prerequisite or concurrent:HRIM 350

HRIM 436 **Hospitality Operational Management** (3) Tactical management processes of hospitality operations, with an emphasis on integrating concepts from previous courses into daily managerial systems.
Effective: Spring 2004
Prerequisite: HRIM 435, HRIM 442

HRIM 437 **Hospitality Project Evaluation and Funding** (3) Current techniques for project evaluation in the hospitality industry; trends in hospitality project funding.
Effective: Spring 2004
Prerequisite: HRIM 435

HRIM 438 **Cases in Financial Analysis** (3) Financial analysis and decision making is examined through a series of hospitality-oriented cases.
Effective: Spring 2004
Prerequisite: HRIM 435

HRIM 442 **Hospitality Marketing** (3) Marketing management in the hospitality industry, including analyzing the market through market research and developing a marketing plan.
Effective: Spring 2007 Ending: Summer 2010
Prerequisite: A grade of "C" or better required forHRIM 350, MKTG 221

HRIM 442 **Hospitality Marketing** (3) Marketing management in the hospitality industry, including analyzing the market through market research and developing a marketing plan.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: A grade of "C" or better required forHRIM 201, MKTG 221

HRIM 443 **Sales Planning and Advertising for Hospitality Operations** (3) Elements of sales management, advertising, promotion, and public relations as applied to hospitality organizations.
Effective: Spring 2004 Ending: Summer 2010
Prerequisite: HRIM 442 or 3 credits in marketing

HRIM 443 **Sales Planning and Advertising for Hospitality Operations** (3) Elements of sales management, advertising, promotion, and public relations as applied to hospitality organizations.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: a grade of "C" or better forHRIM 442

HRIM 444 **Caribbean Hospitality/Tourism Development** (3) Evaluation of sustainable hospitality/tourism.
Effective: Spring 2004

HRIM 455 **Convention Management** (3) Management principles of hotel convention sales and service.
Effective: Spring 2004
Prerequisite: HRIM 380, HRIM 442

HRIM 456 **Casino Operations Management** (3) Historical and current perspective of the gaming industry. Management

principles of casino operations, including coordination with traditional hospitality services.
Effective: Spring 2004

HRIM 466 (US) **Human Resource Management in the Hospitality Industry** (3) Recruitment, selection, training, performance appraisal, and compensation of hospitality human resources in today's culturally diverse work force.
Effective: Spring 2007 Ending: Summer 2010
Prerequisite: A grade of "C" or better required forHRIM 365

HRIM 466 (US) **Human Resource Management in the Hospitality Industry** (3) Recruitment, selection, training, performance appraisal, and compensation of hospitality human resources in today's culturally diverse work force.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: A grade of "C" or better required forHRIM 201, HRIM 365

HRIM 467 **Management of Hotel and Restaurant Employee Relations** (3) Survey and analysis of managerial strategies for employee relations in hospitality operations.
Effective: Spring 2004 Ending: Summer 2010
Prerequisite: HRIM 466

HRIM 467 **Management of Hotel and Restaurant Employee Relations** (3) Survey and analysis of managerial strategies for employee relations in hospitality operations.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: a grade of "C" or better forHRIM 466

HRIM 470 **Hospitality Management Information Systems** (3) Design, implementation, and analyses of information systems for strategic, tactical, and operational functions of hospitality management.
Effective: Spring 2007
Prerequisite: A grade of "C" or better required forHRIM 350

HRIM 471 **Evaluation of Hospitality Technology** (3) This course provides students with an understanding of the variety of information technologies used in the hospitality industry.
Effective: Spring 2007
Prerequisite: A grade of "C" or better required forHRIM 350, HRIM 470

HRIM 480 **Advanced Hotel Management** (3) Advanced hotel operations, internal control systems, and service philosophy. Integrates management, departmental operations, law, technology applications, marketing and managerial accounting.
Effective: Spring 2007
Prerequisite: A grade of "C" or better required forHRIM 336, HRIM 380

HRIM 482 **Hospitality Real Estate** (3) The course focuses on commercial real estate concepts related to the hospitality industry.
Effective: Fall 2008 Ending: Summer 2010
Prerequisite: HRIM 336, HRIM 380

HRIM 482 **Hospitality Real Estate** (3) The course focuses on commercial real estate concepts related to the hospitality industry.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: A grade of "C" or better required forHRIM 336, HRIM 380

HRIM 486 **Casino Marketing** (3) Students will learn marketing techniques for casinos which take into account the external environment, individual consumer choices, and ethical considerations.
Effective: Summer 2010
Prerequisite: "C" or better inMKTG 221, HRIM 387, HRIM 388 andHRIM 495 Concurrent: HRIM 487

HRIM 487 **Casino Operations and Societal Impact of Gaming** (3) Students will learn the structure, culture, and ethical responsibility toward disordered gambling and other lifestyle issues of modern casinos.
Effective: Summer 2010
Prerequisite: "C" or better inHRIM 387, HRIM 388 andHRIM 495 Concurrent: HRIM 486

HRIM 489 **Seminar in Institutional Food Service Management** (3) Contemporary issues in institutional food service management.
Effective: Spring 2004
Prerequisite: HRIM 304

HRIM 490W **Strategic Hospitality Management** (3) This capstone writing-intensive class integrates content from throughout the previous curriculum, focusing on strategic application to current industry issues.
Effective: Fall 2007 Ending: Summer 2010
Prerequisite: HRIM 365, HRIM 435, HRIM 442

HRIM 490W **Strategic Hospitality Management** (3) This capstone writing-intensive class integrates content from throughout the previous curriculum, focusing on strategic application to current industry issues.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: a grade of "C" or better forHRIM 365, HRIM 435, HRIM 442

HRIM 491 **Operational Analysis of Institutional Food Service** (3) The development and application of quantitative and qualitative techniques for evaluation of institutional food service.
Effective: Spring 2004
Prerequisite: HRIM 330, HRIM 336, HRIM 337, HRIM 350

HRIM 492 **Advanced Professional Seminar in Hotel, Restaurant and Institutional Management** (1) Course prepares senior HR&IM students to assume leadership positions in the hospitality industry (Focus on careers, leadership, ethics,

lifelong learning).
Effective: Spring 2004
Prerequisite: 1000 hours of work experience in the hotel restaurant and institutional management industry Concurrent: HRIM 430 HRIM 466 HRIM 490

HRIM 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2004
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495A **Hotel Internships-PS Hospitality Services Internship** (3) Students will participate in a supervised internship with Penn State Hospitality Services.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495A **Hotel Internship-PS Hospitality Services Internship** (3) Students will participate in a supervised internship with Penn State Hospitality Services.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495B **Executive Internship-NLI** (3) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495B **Executive Internship-NLI** (3) Students will participate in a supervised internship with the Nittany Lion Inn.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495D **HRIM Teaching Assistant** (1-6) Student performs as a teaching assistant for an HRIM course. Assists faculty member with class.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495D **HRIM Teaching Assistant** (1-6) Student performs as a teaching assistant for an HRIM course. Assists faculty member with class.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495D **HRIM Teaching Assistant** (1-6) Student performs as a teaching assistant for an HRIM course. Assists faculty member with class.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495E **External/Off Campus Internship** (1-6) Students will participate in a supervised internship with an approved site participant. Internships are typically one semester in length.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495E **External/Off Campus Internship** (1-6) Students will participate in supervised internship with an approved site participant. Internships are typically one semester in length.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495E **External/Off Campus Internship** (1-6) Students will participate in a supervised internship with an approved site participant. Internships are typically one semester in length.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495F **Housing and Food Service Internship** (3) Students will participate in a supervised internship with a facility within PSU Housing and Food Service.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495F **Housing & Food Service Internship** (3) Students will participate in a supervised internship with a facility within PSU Housing & Food Service.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

HRIM 495G **Supervisory Internship** (6) Students will participate in a supervised internship with an approved site location.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: prior approval of proposed assignment by instructor

HRIM 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2004

HRIM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2004

HRIM 497A **Meeting & Events I** (3) Students will learn concepts and applications to Event & Meeting Planning.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HRIM 497B **Special Topics in Hotel Management** (3) Students, through research and on-line activities, will discuss special or current interest in the hotel industry.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HRIM 497C **Revenue Management** (3) Students will learn concepts and applications relating to revenue management within the Hospitality industry.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

HRIM 497D **Casino Marketing** (3) Students will learn marketing techniques for casinos which take into account the external environment, individual consumer choices, and ethical considerations.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HRIM 497D **Managing Continuing Care Retirement Communities** (3) Managing continuing care retirement communities.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

HRIM 497E **Business Ethics and Corporate Social Responsibility** (3) Examines the role of ethics and corporate social responsibility in hospitality including the concepts of management, sustainability, and leadership.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HRIM 497F **Entrepreneurship in the Hospitality Industry** (3) This course will explore the characteristics of the successful entrepreneur and the process of starting a new business venture.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HRIM 497G **French Cuisine/Culture** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

HRIM 497G **Casino Operations and Societal Impact of Gaming** (3) Students learn organization structure, organization culture, and ethical responsibility toward disordered gambling and other lifestyle issues of modern casinos.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HRIM 497H **Contemporary Research Issues** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HRIM 497I **Special Topics in Restaurant Management** (3) Students learn about special or current issues in the restaurant and foodservice industry through library research, on-line activities, class presentations.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

HRIM 497K **New Product Development** (3) Students participate in the testing and development of new products from participating industry companies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HRIM 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2008

HRIM 498D **International Hospitality Management** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

HRIM 498F **International Restaurant and Food Service Management** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

HRIM 498G **French Cuisine and Culture** (3) Program will include intensive classes on language and culture, products, cuisine, wine, and also design and atmosphere.
Effective: Summer 2010 Ending: Summer 2010

HRIM 498I **International Hospitality Management** (3) Formal courses given infrequently to explore, in depth, a

comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

HRIM 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual of group instruction.
Effective: Fall 2007

HRIM 501 **Hospitality Corporate Strategy** (3) This course focuses on advanced strategic theories and concepts oriented towards hospitality organization corporate-level management.
Effective: Spring 2003

HRIM 502 **HRI Facilities Planning and Design Evaluation** (3) The planning, design, evaluation, and management of the physical plant of a hotel, restaurant, and institutional facility.
Effective: Fall 2003

HRIM 503 **Research Methods in Hotel, Restaurant, and Institutional Management** (3) An introduction to the process of research; problem-solving approaches; the research proposal and the development of the research question.
Effective: Fall 2003
Prerequisite: STAT 451

HRIM 504 **Leading Hospitality Organizations in a Changing World** (3) Leading and managing hospitality firms through the industry's changeful environments--both political and economic.
Effective: Summer 2002

HRIM 505 **Managing Hospitality Knowledge Systems** (3) Managing hospitality knowledge systems as a strategic asset to mold competitive strategies and change organizational processes.
Effective: Summer 2002

HRIM 507 **Managing Hospitality Human Resources for Organizational Success** (3) Managing hospitality human resources, including individual behavior and job design, group behavior and team building, and HR functions.
Effective: Spring 2003

HRIM 509 **Hospitality Decision Making Using Business Data** (3) Management of hospitality business data including decision-making tools such as flexible budgeting, variance analysis, Balance Scorecard and Economic Value added.
Effective: Spring 2003

HRIM 510 **Nonthesis Research** (1-6) This course provides for the development of non-thesis student research under the guidance of a faculty member.
Effective: Fall 2003

HRIM 511 **Services Marketing for the Hospitality Industry** (3) Hospitality services marketing.
Effective: Spring 2003

HRIM 515 **Hospitality Financial Decision-making** (3) Principles and applications of financial decision-making.
Effective: Spring 2003
Prerequisite: HRIM 505, HRIM 509

HRIM 517 **Managing Service Delivery in Hospitality Operations** (3) Managing the design and delivery of quality service in hospitality operations.
Effective: Spring 2003
Prerequisite: HRIM 511, HRIM 515

HRIM 519 **Managing Hospitality Operations in a Regulated World** (3) Managing hospitality operations and government regulations of employment, the environment, tourism, business operations.
Effective: Summer 2002

HRIM 521 **Envisioning Future Hospitality** (3) This course focuses on theories, strategies, and methods for envisioning and managing the future of hospitality organizations.
Effective: Summer 2002
Prerequisite: HRIM 517, HRIM 519

HRIM 525 **Institutional Food Service Management** (3) The development of a working comprehension and integration of institutional management into the hotel, restaurant, and institutional field.
Effective: Fall 2003
Prerequisite: HRIM 310

HRIM 526 **Hospitality Strategic and Operational Simulation** (3) Course integrating hospitality marketing, human resources, finance, operations management, law ecommerce, global perspectives, communications, and leadership.
Effective: Summer 2003
Prerequisite: completion of MHRIM core courses

HRIM 585 **Seminar in Hotel, Restaurant, and Institutional Management** (1-9) This course is a doctoral seminar in HR&IM that addresses the conceptual foundations of the HR&IM knowledge base.
Effective: Fall 2003

HRIM 586 **Research Methods and Evaluation in Hotel, Restaurant, and Institutional Management** (1-9) This course is a doctoral seminar in HR&IM that addresses various research methodologies and evaluation procedures that are applicable to HR&IM.
Effective: Fall 2003

HRIM 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2003

HRIM 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Fall 2003

HRIM 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Fall 2003

HRIM 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2003

HRIM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2003

HRIM 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Fall 2007

HRIM 600 **Thesis Research** (1-15) No description.
Effective: Fall 2004

HRIM 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 2004

HRIM 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) No description.
Effective: Fall 2004

HRIM 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 2004

HRIM 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 2004

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Human Development and Family Studies (HD FS)

HD FS 401 **Project Planning, Implementation, and Evaluation in the Human Services** (3) Exercises and activities related to the design, planning, implementation and management, and evaluation of projects and programs in the human services.
Effective: Fall 2006
Prerequisite: HD FS 312W ; approval by internship coordinator. Prerequisite or concurrent:HD FS 411

HD FS 402 **Human Services Seminar** (4) Presentations and discussion of contemporary human issues by students and visiting professionals.
Effective: Summer 1997
Prerequisite: HD FS 401

HD FS 405 (US) **Gender and Social Development** (3) A review of gender-related patterns of social development over the lifespan, as influenced by biological, sociological, and psychological factors.
Effective: Spring 2006
Prerequisite: HD FS 129, HD FS 312W ; or 6 credits in social sciences

HD FS 410 **Communities and Families** (3) Family and community interaction, emphasizing strategies for intervention to solve family-community problems.
Effective: Spring 1996
Prerequisite: HD FS 312W ; 3 credits of social/behavioral sciences

HD FS 411 **The Helping Relationship** (3) Theory and research related to interpersonal conditions which facilitate personal growth; intensive interpersonal competency training.
Effective: Spring 1996
Prerequisite: HD FS 311;HD FS 312W ; or 6 credits in Human Development and Family Studies or psychology

HD FS 412 **Adult-Child Relationships** (3) Theories, research, and application of adult behavior for maximizing adult-child relationships and optimizing child socialization and self-development.
Effective: Spring 2007
Prerequisite: HD FS 229 orPSYCH 212;HD FS 311;HD FS 315 orHD FS 315W;HD FS 312W

HD FS 413 **Developmental Problems in Adulthood** (3) Analysis of individual developmental problems from young adulthood through old age and their prevention and modification.
Effective: Spring 2001
Prerequisite: HD FS 129;HD FS 249;HD FS 312W

HD FS 414 **Resolving Human Development and Family Problems** (3) Strategies for, and roles of professional specialists in, the solution of problems in human development and family functioning.
Effective: Spring 1996
Prerequisite: HD FS 312W ; 6 credits in Human Development and Family Studies or psychology

HD FS 415 **Program Development in Family Relationships** (3) Methods for planning, developing, and evaluating human service programs for families across the life span.
Effective: Spring 2001
Prerequisite: HD FS 311;HD FS 312W;HD FS 315 orHD FS 315W

HD FS 416 (US) (SOC 411) **Racial and Ethnic Diversity and the American Family** (3) This course will explore the nature and determinants of racial and ethnic variation in family processes in the United States.
Effective: Spring 2005
Prerequisite: 3 credits in sociology

HD FS 417 (US;IL) **Biocultural Studies of Family Organization** (3) Study of variability in family organization with an emphasis on cultural and economic factors influencing household organization and family roles.
Effective: Spring 2006
Prerequisite: HD FS 129;HD FS 312W;HD FS 315 orHD FS 315W ; or 6 credits in sociology or anthropology

HD FS 418 **Family Relationships** (3) Dynamics of family interaction; effects of parenthood, sibling and intergeneration relationships on family solidarity.
Effective: Spring 2001
Prerequisite: HD FS 312W;HD FS 315 orHD FS 315W

HD FS 420 **Laboratory in Individual and Family Enhancement** (3) Supervised practice in methods of assessment, intervention, and evaluation to enhance individual and family development.
Effective: Spring 1996
Prerequisite: HD FS 312W;HD FS 411 ; 6 additional credits in Human Development and Family Studies

HD FS 424 (US) **Family Development in an Economic Context** (3) Economic conditions influencing family functioning; familial effects on the economy; strategies to enhance work-family relations.
Effective: Spring 2006
Prerequisite: HD FS 312W;HD FS 315 orHD FS 315W

HD FS 425 (US) **Work as a Context for Human Development** (3) Theory and research on role of work in adult development; interrealtionships between work and family; workplace interventions to enhance development.
Effective: Spring 2006
Prerequisite: HD FS 312W ; 3 credits in social and behavioral sciences

HD FS 427 (KINES 427) **Developmental Sport & Exercise Psychology** (3) Developmental changes in the antecedents and consequences of physical activity across the lifespan.
Effective: Spring 2008
Prerequisite: PSYCH 100 andKINES 321 orHD FS 129 orPSYCH 212

HD FS 428 **Infant Development** (3) Conceptual analysis, assessment, and empirical investigation of normal and deviant development, prenatal through first two years of life.
Effective: Spring 2007
Prerequisite: HD FS 229 orPSYCH 212;HD FS 312W

HD FS 429 **Advanced Child Development** (3) Processes of development during childhood from birth to adolescence. Emphasis upon theory, method, and empirical research.
Effective: Spring 2007
Prerequisite: HD FS 229 orPSYCH 212;HD FS 312W

HD FS 430 **Experience in Preschool Groups** (6) Guided practicum experience in planning and facilitating developmentally appropriate activities for young children.
Effective: Spring 2007
Prerequisite: HD FS 229 orPSYCH 212;HD FS 312W;HD FS 330

HD FS 431 (SOC 431) **Family Disorganization: Stress Points in the Contemporary Family** (3) Focuses on divorce, remarriage, incest, family violence as well as problems associated with family formation and parent-child relations.
Effective: Spring 1996
Prerequisite: HD FS 312W ; 6 credits of Human Development and Family Studies psychology sociology

HD FS 432 **Developmental Problems in Childhood and Adolescence** (3) Analysis of problems in individual development from infancy through adolescence; prevention and modification of developmental difficulties.
Effective: Spring 2007
Prerequisite: HD FS 229;HD FS 239 orPSYCH 212;HD FS 312W

HD FS 433 **Developmental Transition to Adulthood** (3) Conceptual analysis and empirical investigation of interrelationships between developmental processes during the period of pubertal growth.
Effective: Spring 1996
Prerequisite: HD FS 239;HD FS 312W

HD FS 434 (SOC 435) **Perspectives on Aging** (3) An analysis of the demographic, social, and cultural factors affecting the aged population in American society.
Effective: Fall 2007
Prerequisite: HD FS 312W ; 6 credits in sociology

HD FS 440 (SOC 440) **Family Policy** (3) An in-depth examination of family policy.
Effective: Spring 2007
Prerequisite: 3 credits of SOC or HD FS

HD FS 445 (PSYCH 416) **Development Throughout Adulthood** (3) Processes of development and change of behavior from early adulthood through old age, emphasizing theory, method, and empirical research.
Effective: Spring 2007
Prerequisite: HD FS 249 orPSYCH 100;HD FS 312W orPSYCH 301W;PSYCH 200, STAT 200 or 3 credits of statistics ; 6 credits in HD FS PSYCH or SOC.

HD FS 446 **Programs and Services in Gerontology** (3) Theoretical and historical views of the conceptualization and delivery of programs and services to older persons within a multidisciplinary developmental framework.
Effective: Spring 1996
Prerequisite: HD FS 249 orHD FS 445;HD FS 312W

HD FS 447 **Issues in Gerontology** (3) Analysis of major issues in adulthood and aging, with an emphasis on integration of theory and research.
Effective: Spring 1996
Prerequisite: HD FS 249 orHD FS 445;HD FS 312W

HD FS 450 **Developmental Child Programs and Services** (3) Current and historical views of the conceptualization and delivery of child programs and services within a multidisciplinary developmental framework.
Effective: Spring 2007
Prerequisite: HD FS 229 orPSYCH 212;HD FS 312W

HD FS 453 **Family Participation and Involvement in Child Services** (3) Current and historical perspectives of roles and functions of family members in designing, delivering, and evaluating of child service programs.
Effective: Spring 2001
Prerequisite: HD FS 229;HD FS 312W;HD FS 315 orHD FS 315W

HD FS 454 (E C E 454) **Development and Administration of Child Service Programs** (3) Planning, administering, and evaluating child service programs at several administrative levels using methods from relevant disciplines.
Effective: Spring 1996
Prerequisite: HD FS 312W;HD FS 453;C I 295 orHD FS 330

HD FS 455 **Development and Administration of Human Services Programs** (3) Fundamentals of program development and administration of human service programs in community settings; emphasis given to program content, strategies, and the overall planning process.
Effective: Fall 2009
Prerequisite: HD FS 311

HD FS 468 **Biological Bases of Behavioral Development** (3) Biological, genetic, and experiential influences in development through the lifespan.
Effective: Spring 2007
Prerequisite: HD FS 129 orPSYCH 100;HD FS 312W ; 3 credits in human biology

HD FS 469U (IL) **Family Change in the Global Economy** (3) Exploration of how family life, quality, and structures in each region of the world are affected by the new global economy.
Effective: Fall 2005
Prerequisite: HD FS 315 orSOC 030

HD FS 477 **Analysis of Family Problems** (3) Analysis of families' behavioral, managerial, interpersonal, and financial problems and their interrelationships.
Effective: Spring 2001
Prerequisite: HD FS 312W;HD FS 315 orHD FS 315W ; 3 credits in social sciences

HD FS 490 **Introduction to Internship Experience** (2) Planning and preparation for field experience in human service setting. Analysis of human service system and arrangement of site.
Effective: Spring 1996
Prerequisite: HD FS 312W ; approval by internship coordinator. Prerequisite or concurrent:HD FS 411

HD FS 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2000

HD FS 494C **Strengthing Families** (1-3) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 494H **Senior Honors Thesis** (1-6) Independent study under the direction of the thesis advisor of topics related to the interests of the student, culminating in presentation of a thesis.
Effective: Summer 1997
Prerequisite: approval of honors thesis advisor

HD FS 495A **Internship: Advanced Experience** (9) Full-time, one semester experiential training in human service settings. Open to HD FS majors only.
Effective: Fall 2006
Prerequisite: HD FS 490 ; permission of internship coordinator

HD FS 495B **Internship: Advanced Project** (3) Implementation of internship projects or scholarly paper. Open to HD FS majors only.
Effective: Fall 2006
Prerequisite: or concurrent:HD FS 495A

HD FS 495C **Professional Practicum in Human Services** (3-8) Guided professional practicum in human services, usually in the form of a project related to a human services issue.
Effective: Summer 1997
Prerequisite: HD FS 401 orHD FS 490

HD FS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

HD FS 496B **Infant Temperament** (1-3) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1990

HD FS 497A **Child Abuse Prevention and Intervention** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: HD FS 229 orHD FS 239 ; andHD FS 312W

HD FS 497B **Parenting** (3) Course will focus on the determinants of parenting in the diverse cultures within the US.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 497C **Peer and Consultation** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 497D **Foundations of Marriage** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow

subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 497E **Risk and Resilience over the Life Span** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 497H **Professional Development** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

HD FS 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual of group instruction.
Effective: Fall 2007

HD FS 500 **Nonthesis Research** (1-9) No description.
Effective: Summer 1990

HD FS 501 **Human Development Across the Lifespan** (3) Multidisiciplinary study of theories and research on human development across the lifespan.
Effective: Spring 2002

HD FS 503 **Human Development Intervention: Analysis of Theories and Approaches** (3) Theoretical and empirical analyses of multilevel approaches for enhancing development of individuals and families.
Effective: Spring 1993
Prerequisite: graduate status in HD FS or related fields; 1st in a sequence

HD FS 504 **Consultation in Human Development Intervention** (3) Principles of consultative and collaborative practice with human development intervention programs in formal or informal community settings.
Effective: Spring 1993
Prerequisite: HD FS 503

HD FS 505 **Assessment in Human Development** (3) Overview of methods and procedures used for the assessment of families and the development of individuals across the lifespan.
Effective: Spring 1993
Prerequisite: at least one course in measurement test construction or assessment

HD FS 506 **Design and Evaluation of Prevention Programs Across the Life Span** (3) An introduction to the theory and application of program evaluation; both process and outcome evaluation strategies are addressed.
Effective: Spring 2002
Prerequisite: HD FS 503, HD FS 516

HD FS 507 **Women, Families, and Society** (3) Analysis and critique of research and theory on women's development and role in family and society.
Effective: Spring 2002

HD FS 508 **Best Practices in Preventive Intervention** (1-6) Implementing empirically validated preventative programs; discussion and evaluation of theory and techniques.
Effective: Spring 2002
Prerequisite: HD FS 503

HD FS 509 **Nature-Nurture Issues in Human Development** (3) Introduction to nature-nurture interactions in life-span development; biological, psychological, and cultural factors in ontogeny and phylogeny.
Effective: Spring 1999

HD FS 515 **Professional Issues in Human Development and Family Studies** (1-6) Overview of issues in professional development for careers in human develop- ment and family studies.
Effective: Spring 2002

HD FS 516 **Methods of Research in Human Development** (3) Review of basic research methods and statistics as applied to human development and family studies.
Effective: Fall 2001

HD FS 517 **Multivariate Study of Change and Human Development** (3) Models of development and change derived from empirical research utilizing multivariate research design and procedures.
Effective: Spring 1992
Prerequisite: at least three statistics courses including correlation and regression analysis

HD FS 518 **Applied Statistics Laboratory** (1) This course provides graduate students with practical skills in data entry, data management, and applied statistical analyses.
Effective: Fall 2001

HD FS 519 **Methods of Statistical Analysis in Human Development** (3) An overview of basic statistical concepts, models, and methods for the analysis of development and change.
Effective: Summer 1990
Prerequisite: H DEV 516, introductory statistics

HD FS 520 **Seminar in Prenatal and Infant Development** (1-6) Prenatal and infant development, with emphasis on multiple determinants of early development and their relationship to later behavior.
Effective: Summer 1990
Prerequisite: 6 graduate credits in individual development psychology or biological science; 3 credits in statistics

HD FS 521 **Qualitative Methods in Human Development and Family Studies** (3) Introduction to interdisciplinary qualitative methods, principles and theory of interpretation, methodologies, data collection and analysis.
Effective: Spring 1992

HD FS 522 **Risk and Resilience in Human Development: Foundation for Prevention** (3) Reviews the concepts of risk, protection, resilience, and competence; examines these concepts in intervention and longitudinal studies.
Effective: Spring 2002
Prerequisite: HD FS 503

HD FS 523 **Strategies for Data Analysis in Developmental Research** (3) This course provides the skills necessary to confront the data analytic issues presented in the Human Development and Family Studies methodology core curriculum.
Effective: Spring 1996
Prerequisite: HD FS 519 orSTAT 501

HD FS 524 **Work as a Context for Human Development** (3) The interconnections between work, family life, and individual development.
Effective: Spring 2002
Prerequisite: HD FS 525

HD FS 525 **Introduction to Family Studies** (3) Introduction to current theory and research about micro and macro forces related to family relationships and development.
Effective: Spring 2002

HD FS 526 (PSY 526) **Measurement in Human Development** (3) Principles and methods for assessment of human developmental processes across the life span.
Effective: Spring 2007
Prerequisite: EDPSY 450 orPSYCH 404;HD FS 519

HD FS 527 **Social Epidemiology** (3) Application of epidemiological methods to issues in the study of human development.
Effective: Fall 2001
Prerequisite: HD FS 503, HD FS 516

HD FS 528 (PSY 528) **Observational Methodologies for Development** (3) Design and application of observational methods in developmental research.
Effective: Spring 1994
Prerequisite: graduate student standing in HD FS or psychology

HD FS 529 (PSY 529) **Seminar in Child Development** (1-6) Readings and reports on recent findings in child development.
Effective: Summer 1990
Prerequisite: 6 graduate credits in child development child psychology or educational psychology; 3 in statistics

HD FS 531 (SOC 531) **Family Disorganization: Stress Points in the Contemporary Family** (3) Focuses on divorce, remarriage, incest, family violence as well as problems associated with family formation and parent-child relations.
Effective: Summer 1994

HD FS 536 (PSY 536) **Research Methods in Developmental Processes** (3) Methodological issues in research on varying stages of development across the individual life span.
Effective: Spring 1995
Prerequisite: 6 credits in individual development or psychology and a course in statistics

HD FS 537 (SOC 537) **Biosocial Perspectives on the Family** (3) The implications of knowledge from behavioral endocrinology, behavior genetics, and evolutionary psychology for understanding family relationships and child development.
Effective: Summer 2002

HD FS 539 **Seminar in Adolescent Development** (1-6) Cultural, psychological, and biological aspects of the developmental transition to adulthood.
Effective: Summer 1990
Prerequisite: 6 credits in individual development or psychology; 3 credits in sociology and statistics

HD FS 544 **Seminar in Dysfunctional Patterns in Family Organization** (1-6) Processes of familial dysfunction and

disorganization and their explanation in economic, social-psychological, and managerial terms.
Effective: Summer 1990
Prerequisite: I F S 418 orI F S 424 orSOC 430

HD FS 545 **Families and Socioeconomic Systems** (1-6) Functional interrelationships between families and social and economic systems.
Effective: Summer 1990
Prerequisite: I F S 418, I F S 424

HD FS 546 **Seminar in Family Relationships** (1-9) Interpersonal interaction within family systems throughout the life cycle.
Effective: Summer 1990
Prerequisite: I F S 418

HD FS 549 (PSY 549) **Developmental Theory** (3) Conceptual frameworks and major contributions to the study of individual development across the life-span.
Effective: Summer 1990
Prerequisite: 6 credits at the 400 level in individual development or psychology

HD FS 565 **Developmental Behavioral Genetics** (3) Theories and methods of developmental behavioral genetics and their application to human life-span development.
Effective: Spring 1990

HD FS 569 **Seminar on Development in Middle Age** (1-6) Interdisciplinary approach to study of human development in middle age, including psychological, cultural, and biological aspects.
Effective: Fall 2001
Prerequisite: HD FS 501

HD FS 577 **Poverty, Policies, and Child Development** (3) Focuses on interrelationships among families, poverty, and social policies.
Effective: Fall 2001
Prerequisite: HD FS 525

HD FS 579 **Seminar in Adult Development and Aging** (1-9) A seminar dealing with specific topics concerning adult development and aging.
Effective: Summer 1990
Prerequisite: I F S 445 statistics

HD FS 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1990

HD FS 595 **Field Projects in Individual and Family Studies** (1-9) Supervised research or internship in human services program.
Effective: Summer 1990
Prerequisite: instructor's approval of proposed project

HD FS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990
Prerequisite: instructor's approval of proposed study

HD FS 596A **Graduate Student Orientation** (1) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: instructor's approval of proposed study

HD FS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 1990

HD FS 597A **Categorical Data Analysis** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 597B **Person Specific** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 597C **Parenting** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 597D (EDPSY 597D, PSY 597C) **Conducting Cluster Randomized Trials in Schools: Social Intervention** (2) This seminar will focus on conducting CRT's in schools. The emphasis will be on the development of evaluation of

interventions aimed at enhancing the social context of learning.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 597E **Longitudinal Analysis** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 597F **Configural Frequency Analysis** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 597G (EDPSY 597C, PSY 597B) **TIES Fellowship Seminar: School Interventions** (2) TIES seminar on issues in literacy and conducting literacy research. r
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 597I **EEG Coherency** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

HD FS 600 **Thesis Research** (1-15) No description.
Effective: Summer 1990

HD FS 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1990

HD FS 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Summer 2004

HD FS 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 2006

HD FS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1990

HD FS 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1990

1 Student may take only one course for General Education credits from HD FS 129 GS or SOC 030 GS.

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Humanities (HUM)

HUM 420 **Dilemmas of War and Peace** (3) A multidisciplinary examination of the dilemmas, paradoxes, problems and questions of war and peace, historically and in the contemporary world.
Effective: Spring 1996

HUM 500 **Research Methods and Scholarly Inquiry in the Humanities** (3) Study of the methods and materials of scholarship, use of reference tools, evaluation of evidence, and writing of research papers.
Effective: Spring 1989

HUM 515 **Seminar** (3 per semester/maximum of 9) A seminar focusing on typical methods and approaches of a single discipline within the humanities.
Effective: Summer 1988

HUM 525 **Studies in Aesthetics** (3) Philosophical investigation into the nature of art, aesthetic experience, artistic meaning, criticism, grounds for judgment, and history of aesthetic theory.
Effective: Spring 1989

HUM 530 **Seminar in Comparative Arts** (3 per semester/maximum of 9) A seminar focusing on selected periods or artists in two or more disciplines within the humanities.
Effective: Summer 1988

HUM 535 **Topics in Cultural and Intellectual History** (3 per semester/maximum of 9) Study of methods, issues, and selected topics in the history of thought, social values, and creative expression.
Effective: Summer 1988

HUM 550 **Junior College Teaching Internship** (3) Teaching humanities courses in a two-year college under a faculty supervisor, who will direct, criticize, and evaluate the intern.
Effective: Summer 1988
Prerequisite: HUM 500, HUM 560 12 additional graduate credits

HUM 560 **Interrelations in the Humanities** (3) The study and practice of conducting interdisciplinary research and of investigating and supporting inter-art analogies.
Effective: Spring 1989
Prerequisite: HUM 500

HUM 580 **Master's Production** (1-6) An original scholarly master's paper or creative production initiated by the student, supervised by an appropriate professor, and judged by a committee.
Effective: Winter 1981

HUM 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

HUM 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

HUM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1987

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Humanities and Social Sciences (H&SS)

H&SS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1989

H&SS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1989

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Indus Eng Technol (IET)

IET 402 **Production Management** (3) Principles and practices of managing the manufacturing operations of companies. Topics include management structure, physical plant, quality control, work sampling.
Effective: Fall 2007
Prerequisite: IET 321

IET 405 **Quality Control and Reliability Engineering** (3) Application of statistical methods to the control of quality, sampling inspection, and reliability engineering.
Effective: Fall 2007
Prerequisite: E T 313

IET 431 **An Introduction to Plastics and Ceramics** (3) An introductory study of the properties and processing parameters utilized for plastic and ceramic materials.
Effective: Fall 2007
Prerequisite: IET 311

IET 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2007

IET 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2007

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Industrial Engineering (I E)

I E 400 **Engineering for Production** (3) The selection of the most effective materials and processes and the application of decision theory to product design.
Effective: Fall 1992
Prerequisite: I E 328, ENGL 202C

I E 402 **Advanced Engineering Economy** (3) Concepts and techniques of analyses useful in evaluating engineering projects under deterministic and uncertain conditions.
Effective: Summer 1995
Prerequisite: I E 302, I E 322, I E 405

I E 404 **Management Science** (3) The science and art of administration in the management, organization, and coordination of human activity in industrial enterprises.
Effective: Fall 1992
Prerequisite: I E 327

I E 405 **Linear Programming** (3) An introduction to the theory and application of the simplex method in solving the linear programming and dual problem.
Effective: Spring 2001
Prerequisite: MATH 220

I E 408 **Cognitive Work Design** (3) Design and evaluation of cognitive work, including the human/computer interface, visual displays, software design, and automated system monitoring, with emphasis on human performance.
Effective: Spring 2006
Prerequisite: I E 327

I E 414 **Materials Joining Processes and Principles** (3) Characteristics of principal processes for arc, resistance, and solid-state welding; brazing, soldering, adhesive bonding. Laboratory projects using various processes.
Effective: Summer 1995
Prerequisite: I E 311, I E 312 orMETAL 408W

I E 418 **Human/Computer Interface Design** (3) Design and evaluation of the human/computer interface, including human performance, visual displays, software design, and automated system monitoring.
Effective: Spring 2008
Prerequisite: I E 330

I E 419 **Work Design - Productivity and Safety** (3) Methods improvement, physical work design, productivity, work measurement; principles and practice of safety.
Effective: Spring 2006
Prerequisite: I E 327

I E 423 **Quality Control and Reliability** (3) Application of statistical methods to the control of quality, sampling inspection, and reliability engineering.
Effective: Summer 1995
Prerequisite: I E 323

I E 424 **Process Quality Engineering** (3) Statistical methods for engineering process characterization and improvement. For non-Industrial Engineering majors.
Effective: Summer 1994
Prerequisite: MATH 141, MATH 220

I E 425 **Introduction to Operations Research** (3) An introduction to the method and techniques of mathematical decision making, including inventory, replacement, allocation, and waiting line problems.
Effective: Spring 2006
Prerequisite: I E 322 Concurrent: I E 405

I E 425H **Introduction to Operations Research** (3) An introduction to the method and techniques of mathematical decision making, including inventory, replacement, allocation, and waiting line problems.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: I E 322 Concurrent: I E 405

I E 426 **Industrial Automation** (3) Fundamentals, control, and theory for application of pneumatic, hydraulic, electrical, fluidic, transfer, feeding, and numerical control devices to automated equipment.
Effective: Fall 1992
Prerequisite: I E 328

I E 428 **Metal Casting** (3) Application of engineering principles to the design of castings; casting of ferrous and nonferrous alloys; laboratory and simulation projects.
Effective: Summer 1995
Prerequisite: I E 311, I E 312 orMETAL 408W

I E 430 **Industrial Project** (3) A project is carried out in conjunction with an industrial company and supplemented by tutorials.
Effective: Fall 1992
Prerequisite: I E 302, I E 327, I E 328

I E 433 **Regression Analysis and Design of Experiments** (3) Theory and Application of Regression Analysis and Design of Experiments to build models and optimize process and product parameters.
Effective: Summer 2005
Prerequisite: I E 323

I E 434 **Statistical Quality Control** (3) Statistical techniques for univariate and multivariate monitoring of independent and autocorrelated processes; foundations of quality control and improvement.
Effective: Summer 2007
Prerequisite: I E 323

I E 435 **Operations Research Models** (3) An introduction to basic deterministic and probabilistic models, linear programming, dynamic programming, simulation, Markov chains, queueing.
Effective: Summer 1993
Prerequisite: 3 credits of elementary probability theory

I E 436 **Six Sigma Methodology** (3) Techniques for structured problem-solving to improve the quality and cost of products and processes.
Effective: Spring 2010
Prerequisite: I E 323

I E 438 **Metal Cutting Principles and Practice** (3) Principles of metal cutting and introduction to current theories; analysis of metal removal processes; laboratory experiments for metal cutting analysis.
Effective: Summer 1995
Prerequisite: I E 310, I E 312 orMETAL 408W

I E 450 **Manufacturing Systems Engineering** (3) Components of automated manufacturing systems (CNC, robots, programmable logic controllers). Design, analysis and operational issues related to improved productivity in modern manufacturing systems.
Effective: Spring 2008
Prerequisite: CMPSC 201 andI E 328

I E 451 **Numerical Control** (3) Introduction to numerical control machines, design considerations, components, manual and computer-aided part programming for multiaxis NC machines.
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 202;I E 328

I E 452 **Microcomputers--Programming and Industrial Applications** (3) Microcomputer principles, capabilities, and limitations; programming and software techniques for real-time industrial engineering application, with integrated laboratory.
Effective: Spring 2008
Prerequisite: CMPSC 201 orCMPSC 202;I E 426

I E 453 **Simulation Modeling for Decision Support** (3) Introduction of concepts of simulation modeling and analysis, with application to manufacturing and production systems.
Effective: Fall 2009
Prerequisite: CMPSC 200, CMPSC 201 orCMPSC 202 andI E 323 andI E 425

I E 454 **Applied Decision Analysis** (3) Theory and practice of decision analysis applied to engineering problems.
Effective: Fall 1992
Prerequisite: I E 322

I E 455 **Production Planning and Control** (3) Production palnning/control methods from aggregate to detailed levels; includes underlying theories and principles and industrial applications.
Effective: Spring 2001
Prerequisite: I E 322 . Prerequisite or concurrent:I E 405

I E 456 (M E 456) **Industrial Robot Applications** (3) Introduction to robotics, with emphasis on robot selection, programming, and economic justification for manufacturing applications.
Effective: Fall 2007 Ending: Fall 2010
Prerequisite: MATH 220;MATH 250 orMATH 251;I E 328 orM E 360

I E 456 (M E 456) **Industrial Robot Applications** (3) Introduction to robotics, with emphasis on robot selection, programming, and economic justification for manufacturing applications.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MATH 220;MATH 250 orMATH 251;I E 305 orM E 360;CMPSC 200 orCMPSC 201

I E 462 **Introduction to Expert Systems** (3) Building expert systems in general; emphasis on knowledge representation and inference mechanisms in the manufacturing domain.
Effective: Fall 2009
Prerequisite: CMPSC 200, CMPSC 201 orCMPSC 202 andI E 323

I E 463 **Computer Aided Design and Manufacturing** (3) Three dimensional modeling and manufacture of parts and assemblies using Computer Aided Design and manufacturing software, and numerically controlled machines.
Effective: Spring 2008
Prerequisite: Any IE Manufacturing Process elective

I E 464 **Assembly of Printed Circuit Boards** (3) Manufacturing processes and principles for assembly of printed circuit boards with surface mount and through-hole technology.
Effective: Spring 2008
Prerequisite: PHYS 212, I E 305

I E 466 **Concurrent Engineering** (3) Concurrent engineering methods for product/process development, capturing customer requirements, insuring manufacturability and serviceability.
Effective: Summer 1996
Prerequisite: MATH 141, MATH 220

I E 467 **Facility Layout and Material Handling** (3) Analytical, simulation and computer-aided graphical methods to generate effective layout designs; design and integration of material handling systems and equipment. For Industrial Engineering majors.
Effective: Fall 2007
Prerequisite: I E 302, I E 327

I E 468 **Optimization Modeling and Methods** (3) Mathematical modeling of linear, integer, and nonlinear programming problems and computational methods for solving these classes of problems.
Effective: Fall 2001
Prerequisite: I E 405, MATH 231

I E 469 **Global Industrial Engineering Experience** (1) Students will learn how to prepare for a short term, professional exchange in a foreign nation. Students will then travel to a designated university within a foreign nation for the purpose of a five day cultural and professional exchange.
Effective: Summer 2009
Prerequisite: 5th semester standing or higher

I E 470 **Manufacturing System Design and Analysis** (3) Contemporary design and analysis methodologies used to organize systems for economic manufacture of products.
Effective: Summer 2005
Prerequisite: I E 310, I E 311, I E 464 or an approved coruse in any manufacturing process

I E 477 **Computer Control of Manufacturing Machines and Processes** (3) Elements of computer control and discrete-time modeling. Design and analysis of digital controls for manufacturing machines and processes.
Effective: Fall 2009
Prerequisite: MATH 141, CMPSC 200, CMPSC 201 orCMPSC 202 andI E 305

I E 478 **Retail Services Engineering** (3) Introduction to retail services operations, process models, and application of information technologies to enhance productivity and profitability.
Effective: Spring 2010
Prerequisite: I E 330

I E 479 (EDSGN 479) **Human Centered Product Design and Innovation** (3) Consumer product design for a global market, incorporating human factors principles and user desires in a multicultural perspective.
Effective: Summer 2010
Prerequisite: I E 408 orI E 419 or equivalent

I E 480W **Capstone Design Project** (3) Industry-based senior capstone design project emphasizing manufacturing systems, service systems, and information systems in an interdisciplinary setting.
Effective: Spring 2009
Prerequisite: I E 302, I E 327, I E 323, I E 305, I E 330, I E 405

I E 494H **Senior Honors Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Spring 2000

I E 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1992

I E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

I E 497A **Human Centered Product Design and Innovation** (3) Consumer product design for a global market, incorporating human factors principles and user desires in a multicultural perspective.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: I E 408 orI E 419 or graduate standing

I E 497B **Healthcare Systems Engineering** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: I E 302, I E 323, I E 327 andI E 405

I E 497D **Micro/Nano Technology** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

I E 499 (IL) **Foreign Studies--Industrial Engineering** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

I E 505 **Linear Programming** (3) An accelerated treatment of the main theorems of linear programming and duality structures plus introduction to numerical and computational aspects of solving large-scale problems.
Effective: Fall 1992
Prerequisite: I E 405

I E 507 **Operations Research: Scheduling Models** (3) Scheduling models with simultaneous job arrival and probabilistic job arrival, network scheduling, and scheduling simulation techniques.
Effective: Fall 1992
Prerequisite: I E 425

I E 508 **Operations Research: Inventory Models** (3) A study of inventory theory, deterministic models, probabilistic models, multiproduct models for both single and multiperiod models.
Effective: Spring 1994
Prerequisite: I E 516

I E 509 **Operations Research: Waiting Line Models** (3) Waiting line models including models with infinite queues, finite queues, single and multiple servers under various priorities and disciplines.
Effective: Spring 1994
Prerequisite: I E 516

I E 510 **Integer Programming** (3) Study of advanced topics in mathematical programming; emphasis on large-scale systems involving integer variables.
Effective: Spring 1994
Prerequisite: I E 405

I E 511 **Experimental Design in Engineering** (3) Statistical design and analysis of experiments in engineering; experimental models and experimental designs using the analysis of variance.
Effective: Fall 1992
Prerequisite: I E 323

I E 512 **Graph Theory and Networks in Management** (3) Graph and network theory; application to problems of flows in networks, transportation and assignment problems, pert/CPM, facilities planning.
Effective: Spring 1994
Prerequisite: I E 405

I E 513 **Real-Time Microcomputer Applications** (3) Study of real-time industrial engineering microcomputer applications, including the hardware and software techniques necessary to implement these systems.
Effective: Fall 1992
Prerequisite: I E 452

I E 514 **Data Management Systems Design** (3) Computer-based technology and design requirements for data acquisition and entry, data communications, transaction management, data-base management, and data utilization.
Effective: Fall 1992
Prerequisite: I E 513

I E 515 **Complex Linear Flow Models** (3) Application of complex linear flow models in engineering and management science, including static and dynamic system simulations.
Effective: Fall 1992
Prerequisite: I E 405

I E 516 (SC&IS 516) **Applied Stochastic Processes** (3) Study of stochastic processes and their applications to engineering and supply chain and information systems.
Effective: Spring 2006
Prerequisite: I E 322 orSTAT 318

I E 518 **Materials, Forming Processes, and Quality** (3) Study of the principles and mechanisms of conventional and developing manufacturing processes and the methods of determining work piece quality and properties.
Effective: Summer 1995
Prerequisite: I E 310, I E 311 orI E 312

I E 519 (SC&IS 519) **Dynamic Programming** (3) Theory and application of dynamic programming; Markov decision processes with emphasis on applications in engineering systems, supply chain and information systems.
Effective: Spring 2006
Prerequisite: I E 516 orSC&IS 516 or equivalent

I E 520 **Multiple Criteria Optimization** (3) Study of concepts and methods in analysis of systems involving multiple objectives with applications to engineering, economic, and environmental systems.
Effective: Spring 2000
Prerequisite: I E 405 orB A 450

I E 521 **Nonlinear Programming** (3) Fundamental theory of optimization including classical optimization, convex analysis, optimality conditions and duality, algorithmic solution strategies, variational methods in optimization.
Effective: Spring 1994
Prerequisite: I E 505

I E 522 **Discrete Event Systems Simulation** (3) Fundamentals of discrete event simulation, including event scheduling, time advance mechanisms, random variate generation, and output analysis.
Effective: Spring 2002
Prerequisite: I E 425

I E 528 **Metal Cutting Theory** (3) Study of the theory of metal cutting, contemporary and future problems of metal

removal processes; critical analysis of current literature.
Effective: Fall 1992
Prerequisite: I E 438

I E 532 **Reliability Engineering** (3) Mathematical definition of concepts in reliability engineering; methods of system reliability calculation; reliability modeling, estimation, and acceptance testing procedures.
Effective: Fall 1992
Prerequisite: I E 323 or 3 credits in probability and statistics with a prerequisite of calculus

I E 538 **Experimental Investigations in Materials Processing** (3) Experimental investigation on selected subjects in processing involving instrumentation, methods, and analysis.
Effective: Fall 1992
Prerequisite: I E 528

I E 540 **Manufacturing Systems Simulation** (3) Use of simulation in design and process improvement of manufacturing systems. Analysis of simulation language structure. Readings in current literature.
Effective: Spring 1998
Prerequisite: I E 453

I E 546 (M E 546) **Designing Product Families** (3) Product families, product platforms, mass customization, product variety, modularity, commonality, robust design, product architectures.
Effective: Fall 2007
Prerequisite: M E 414 orM E 415 orI E 430 orI E 466

I E 547 (EDSGN 547, M E 547) **Designing for Human Variability** (3) Statistics, optimization, and robust design methodologies to design products and environments that are robust to variability in users.
Effective: Summer 2009

I E 550 **Manufacturing Systems** (3) Fundamental theory for analyzing manufacturing systems including structural analysis, optimization and economics of manufacturing systems, automated and computer-aided manufacturing.
Effective: Fall 1992
Prerequisite: I E 450

I E 551 **Computer Control of Manufacturing Systems** (3) Analysis of microprocessor-controlled servo loops, adaptive control, stochastic methods in control; analysis of NC machines, robots, and their controllers.
Effective: Fall 1992
Prerequisite: I E 451

I E 552 (BIOE 552) **Mechanics of the Musculoskeletal System** (3) Structure and biomechanics of bone, cartilage, and skeletal muscle; dynamics and control of musculoskeletal system models.
Effective: Summer 1998
Prerequisite: Consent of program. Prerequisite or concurrent:BIOL 472

I E 553 (BIOE 553) **Engineering of Human Work** (3) Physics and physiology of humans at work; models of muscle strength, dynamic movements; neural control; physical work capacity; rest allocation.
Effective: Fall 1992
Prerequisite: BIOL 141 orBIOL 472

I E 554 **Production, Planning, and Control** (3) Analysis of research literature for topics including scheduling, capacity planning, and lot sizing applied to manufacturing and production.
Effective: Spring 1996
Prerequisite: I E 455, I E 507

I E 555 **Statistical Process Monitoring and Analysis** (3) Statistical techniques for univariate and multivariate monitoring of dependent and autocorrelated processes; theoretical and numberical approaches for analyzing performance.
Effective: Spring 2008

I E 556 (M E 556) **Robotic Concepts** (3) Analysis of robotic systems; end effectors, vision systems, sensors, stability and control, off-line programming, simulation of robotic systems.
Effective: Fall 1992
Prerequisite: I E 456 orM E 456

I E 557 **Human-in-the-Loop Simulation** (3) Design and programming of simulations that facilitate human control, real-time discrete-event simulation, supervisory control of dynamic system.
Effective: Spring 2009
Prerequisite: I E 418 andI E 453

I E 558 **Engineering of Cognitive Work** (3) Information processing and decision making models of the human in the modern workplace, emphasizing visual inspection and other industrial applications.
Effective: Fall 1992
Prerequisite: I E 323 andI E 408

I E 559 **Law and Technology: Products Liability** (3) A seminar course on one area of law and technology, products liability.
Effective: Spring 2008

I E 560 **Material Handling Systems** (3) Modeling, analysis, and design of handling systems in manufacturing with emphasis on flow, storage, control, automation, and integration.

Effective: Spring 1996
Prerequisite: I E 405, I E 450

I E 561 **Weld Design** (3) Weld design examining joint configuration, loading conditions, weld size, to avoid brittle fracture and fatigue failure in weldments.
Effective: Fall 1992
Prerequisite: I E 414

I E 562 **Expert Systems Design in Industrial Engineering** (3) Methodological aspects of expert systems design and review of some existing systems with emphasis on manufacturing and industrial engineering.
Effective: Fall 1992
Prerequisite: I E 450 background in one programming language would be useful

I E 563 **Computer-Aided Design for Manufacturing** (3) Study of CAD systems and concepts including 3D wireframe and solid modeling systems, emphasizing manufacturing applications.
Effective: Fall 1992
Prerequisite: I E 463

I E 565 **Manufacturing Facilities Design** (3) Study of the factors which influence the selection and design of facilities for manufacturing.
Effective: Fall 1992
Prerequisite: I E 327, I E 425

I E 566 **Quality Control** (3) Advanced quality assurance and control topics, including multivariate methods, economic design for control and acceptance, dimensioning, tolerancing, and error analysis.
Effective: Fall 1992
Prerequisite: I E 423

I E 567 **Distributed Systems and Control** (3) Advances in distributed control and decision-making in enterprises and supply chains with emphasis on computing, algorithms, and dynamics.
Effective: Spring 2006

I E 570 (SC&IS 570) **Operations Research in Supply Chains** (3) Use of operations research models and methods for solving problems in supply chain systems.
Effective: Summer 2006
Prerequisite: I E 405, I E 425 orSC&IS 510

I E 571 **Distributive Process Control and Factory Communications** (3) Analysis and design of distributive systems which incorporates data flows associated with sensors, machine control, networks, protocols, and interface resolution.
Effective: Spring 1993
Prerequisite: I E 513, I E 514

I E 575 **Technology of Modern Machine Tool Systems** (3) Mechanics and technologies useful in evaluating, monitoring, and controlling automated machine tool systems in modern manufacturing environment.
Effective: Fall 1992
Prerequisite: I E 328, I E 438 orI E 528 . Prerequisite or concurrent:I E 551

I E 576 **Computer-Aided Tolerancing in Design and Manufacturing** (3) A comprehensive treatment of dimensional and geometric tolerances with computer applications for design, manufacturing, assembly, and inspection.
Effective: Fall 1992
Prerequisite: I E 450

I E 578 **Using Simulation Models for Design** (3) Use of case study computer simulation (CAD) models for yield analysis, sensitivity analysis, performance optimization, and yield optimization.
Effective: Spring 1994
Prerequisite: I E 323

I E 580 **Analysis of Machining Precision** (3) The objective of this course is to instruct techniques for analysing the impact of tool design and machining process parameters on workpiece geometric error.
Effective: Spring 1995
Prerequisite: I E 328

I E 582 **Information Technology for Industrial and Manufacturing Engineering** (3) Students will learn advanced information technology concepts, tools, and techniques for designing and implementing manufacturing systems.
Effective: Spring 2008
Prerequisite: CMPSC 201, CMPSC 121 orMIS 432

I E 583 **Response Surface Methodology and Process Optimization** (3) Response Surface Methodologies used for sequential experimentation and optimization of production processes. Statistical design and analysis of such experiments.
Effective: Spring 2002
Prerequisite: I E 511 orSTAT 501

I E 584 **Time Series Control and Process Adjustment** (3) Design of Time Series-based process controllers for Quality Engineering. Study of the effect of autocorrelation on control chart performance.
Effective: Spring 2002
Prerequisite: I E 423

I E 589 **Dynamic Optimization and Differential Games** (3) Dynamic optimization and dynamic non-cooperative games emphasizing industrial applications.
Effective: Fall 2007

Prerequisite: I E 425 andI E 505 Concurrent: I E 521

I E 590 **I E Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1993
Prerequisite: graduate standing in Industrial Engineering

I E 591 **Academic Career Preparation Seminar** (1) This seminar will assist Ph.D. students in preparing for careers in research and teaching.
Effective: Spring 1996
Prerequisite: completed candidacy exam

I E 594A **Technical Paper Presentation** (1) Preparation of a paper in a technical journal format based upon the student's course work project.
Effective: Spring 2000
Prerequisite: I E 511, I E 550

I E 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1992

I E 597 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

I E 597A **Financial Services for Enterprise and Supply Chain** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

I E 597A **Measurement System Design and Analysis** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

I E 597B **Human Product Design** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

I E 597C **Global Manufacturing** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

I E 597D **Healthcare Systems Engineering** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

I E 597D **Nonlinear Networks and the Price of Anarchy** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

I E 597E **Work Force Engineering** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

I E 597F **Financial Engineering** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

I E 600 **Thesis Research** (1-15) No description.
Effective: Fall 1992

I E 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1992

I E 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1992

I E 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1992

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Industrial Health and Safety (I H S)

I H S 400 **Safety Engineering** (3) An examination of the engineering aspects of the safety discipline and it's management in the work environment.
Effective: Fall 2009
Prerequisite: CHEM 110, E MCH 210, MATH 141, PSYCH 100

I H S 410 **Safety Behavior and the Investigation Process** (3) This course investigates the relationship between human behavior and safety; includes an overview of human behavior issues in the context of accident/incident investigation techniques.
Effective: Spring 2007
Prerequisite: PSYCH 100

I H S 420 **Fire Protection Engineering** (3) Overview of the behavior of fire, fire hazards, suppression systems, alarms and detection systems, and fire safe design and prevention.
Effective: Fall 2009
Prerequisite: CHEM 110, CHEM 111, MATH 141, PHYS 212

I H S 425 **Industrial Electrical Safety** (3) Description and analysis of electrical hazards in industrial environments, hazard reduction practices, technologies, and programs. A laboratory is included.
Effective: Spring 2001
Prerequisite: PHYS 211, PHYS 212

I H S 430 **Industrial Health and Safety Program Management** (3) This course examines the essence of safety management in terms of its responsibilities, objectives, and organization.
Effective: Spring 1999
Prerequisite: MGMT 100

I H S 435 **Introduction to Mill and Plant Operations** (1) An introduction to methods used in the mineral and related process industries; relevant unit operations; selection of equipment. Not intended for students majoring in Mining Engineering, Mineral Processing, or Geo-Environmental Engineering.
Effective: Spring 1999
Prerequisite: MATH 141

I H S 440 **Ventilation for Contaminant Control** (3) Ventilation design and analysis for removal and control of industrial contaminants; measurement, isolation, dilution, and exhaust strategies; laboratory work included.
Effective: Fall 2009
Prerequisite: MATH 141, PHYS 212, CHEM 110

I H S 445 **Industrial Hygiene and Toxicology** (3) Recognition, evaluation, and control of physical, chemical, and biological hazards to promote safety and health using regulatory requirements and professional judgement.
Effective: Summer 2007
Prerequisite: CHEM 110, PHYS 211, PHYS 212

I H S 447 **Industrial Hygiene Measurements** (4) Introduction to industrial hygiene measurement techniques for evaluating occupational exposure to chemical, physical, and biological hazards; laboratory work included.
Effective: Fall 2003
Prerequisite: I H S 445

I H S 450 **Environmental Health and Safety** (3) Overview of toxicology, exposure assessment, industrial hygiene, environmental laws, and contemporary issues in environmental health and safety.
Effective: Fall 2009
Prerequisite: CHEM 110

I H S 470 **Systems Engineering in Process Safety** (3) Quantitative methods of systems analysis, risk analysis and rolerance, as well as accident cost and cost-benefit analysis are covered.
Effective: Fall 2009
Prerequisite: MATH 251

I H S 490 **Industrial Health and Safety Seminar** (1) Seminar dealing with contemporary issues of industrial health and safety.
Effective: Spring 1999
Prerequisite: senior standing

I H S 495W **Industrial Health and Safety Internship** (2) The preparation of a technical report on hazard assessment and control, resulting from experiential education gained at industrial worksites.
Effective: Fall 2009
Prerequisite: junior or senior standing

I H S 496 **Independent Studies** (1-18) Creative projects, including research and design,that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2002

I H S 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2000

I H S 500 **Occupational Safety Engineering** (3) Provides a basis to assist students in understanding/applying the scientific and engineering principles associated with the field of safety.
Effective: Summer 2002
Prerequisite: undergraduate science or engineering degree with previous exposure to occupational safety

I H S 510 **Occupational Health** (3) Introduction to Occupational Health including history, general concepts, hazardous workplace exposures, occupational disorders, and prevention of occupational disease.
Effective: Summer 2002
Prerequisite: undergraduate science or engineering degree with previous exposure to occupational safety and health and toxicology

I H S 520 **Contemporary Issues in Industrial Health and Safety** (3) Evaluation of industrial processes, hazards, labor, and corporate structure, so that hazard control programs and implementation plans can be formulated.
Effective: Summer 2002
Prerequisite: undergraduate science or engineering degree with previous exposure to occupational safety and health

I H S 590 (ENNEC 590) **Colloquium** (1-3) Continuing seminars that consist of individual lectures by faculty, students or outside speakers on energy and mineral engineering issues.
Effective: Spring 2009

I H S 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2002

I H S 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2002

I H S 600 **Thesis Research** (1-15) No description.
Effective: Summer 2002

I H S 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 2002

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Information Science (IN SC)

IN SC 431 **Information Systems Architecture** (3) Principles and priorities of enterprise system design, middleware and service-oriented architectures and web services.
Effective: Summer 2005

IN SC 463 **Languages of the Web** (3) Taxonomy of programming languages and frameworks used in the development of web-based information systems.
Effective: Summer 2005

IN SC 480 **Software Development Lifecycle** (3) Modern Software Development Techniques and Processes. Software Paradigms including OO and lifecycle modeling and improvement.
Effective: Summer 2005

IN SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that they may be topical or of special interest.
Effective: Spring 1998

IN SC 497A **Fundamentals of Information Security** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that they may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

IN SC 497A **Computer Forensics** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that they may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IN SC 497B **Fundamentas of Telecommunications** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that they may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

IN SC 497C **Business Intelligence** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that they may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

IN SC 521 **Database Design Concepts** (3) The requirements capture, design, and development of relational database applications; analysis of business requirements and development of appropriate database systems.
Effective: Summer 2002
Prerequisite: completion of all IN SC or SWENG core courses or with instructor or division approval

IN SC 525 **Applied Data Mining** (3) Functional overviews of algorithms used in data mining will be presented and contemporary data mining software used to conduct a project.
Effective: Spring 2006
Prerequisite: SC&IS 535 or with instructor or division approval

IN SC 531 **Information Technology Law** (3) Examines the legal concepts/issues applicable to the field of information technology and to information technology, software engineering, and computer professionals.
Effective: Summer 2002
Prerequisite: completion of all IN SC core courses or with instructor or division approval

IN SC 533 **Cyberlaw** (3) Course examines the legal concepts and issues applicable to the Internet and Internet-related activities.
Effective: Summer 2002
Prerequisite: students should have taken IN SC 531 or have a basic understanding of the concepts discussed in that course

IN SC 535 **Information Technology: Economic Aspects** (3) Course examines how changes in information technology affect established organizations and the development of new firms, products, and markets.
Effective: Summer 2002
Prerequisite: completion of IN SC core courses or with instructor or division approval

IN SC 536 **Information Technology: Economic Aspects Seminar** (3) Course examines the start up of new technology firms or the transformation of old economy companies into Internet companies.
Effective: Fall 2003
Prerequisite: Completion of IN SC core courses or with approval of program.

IN SC 539 **IT Systems Seminar** (3) A culminating, integrative capstone experience for IN SC students, including a formal technical paper and in-class presentation.
Effective: Spring 2001
Prerequisite: taken as the final course in the Master of Science in Information Science degree or with instructor's

permission

IN SC 561 **Web Security and Privacy** (3) A web-centric look at the latest techniques and practices in computer security as they apply to the Internet.
Effective: Spring 2010
Prerequisite: CSE 543 orIST 515

IN SC 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1999

IN SC 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1999

IN SC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

IN SC 597 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1998

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Information Sciences And Technology (IST)

IST 402 **Emerging Issues and Technologies** (3 per semester/maximum of 9) Introduction to emerging issues, technology forecasting and analysis; overview of emerging issues and leading technologies in IST and how they impact information systems, users, the IT labor force and society.
Effective: Fall 2006
Prerequisite: IST 210, IST 220

IST 402H **Emerging Issues and Technologies** (3 per semester/maximum of 9) Introduction to emerging issues, technology forecasting and analysis; overview of emerging issues and leading technologies in IST and how they impact information systems, users, the IT labor force and society.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: IST 210, IST 220

IST 411 **Distributed-Object Computing** (3) Introduction to distributed-object computing and its use in client/server and real-world computing applications.
Effective: Summer 1999
Prerequisite: IST 311

IST 412 **The Engineering of Complex Software Systems** (3) Introduction to the engineering of complex software systems including software system specification, design and implementation, integration and test, and evolution.
Effective: Summer 1999
Prerequisite: IST 311

IST 413 **Usability Engineering** (3) This course addresses activities in the system development process that ensure usability. It considers the emerging concept of usability, requirements gathering and analysis, activity design, information design, interaction design, documentation design, user testing and usability evaluation.
Effective: Spring 2007
Prerequisite: IST 331

IST 420 **Fundamentals of Systems and Enterprise Integration** (3) Introductory course on integration of information technology into different venues, including the planning, development, and implementation of the integration.
Effective: Summer 2003
Prerequisite: IST 240, IST 301, IST 302

IST 421 **Advanced Enterprise Integration: Technologies and Applications** (3) Advanced course on the integration of information technology into systems applications.
Effective: Spring 2004
Prerequisite: IST 420

IST 425 (MGMT 425, ENGR 425) **New Venture Creation** (3) Via problem-based learning, teams define new business ventures to meet current market needs, develop business plans, and present to investors.
Effective: Spring 2007
Prerequisite: ECON 002 orECON 004 orECON 014;CAS 100

IST 426 (ENGR 426, MGMT 426) **Invention Commercialization** (3) Working with Penn State inventions selected by the Intellectual Property Office, student teams define an optimum commercialization path each technology.
Effective: Spring 2007
Prerequisite: ECON 002 orECON 004 orECON 014;CAS 100

IST 431 **The Information Environment** (3) Survey of social environment of information technology themes: Community, sovereignty, privacy, ethics, economics, and knowledge management.
Effective: Fall 2004
Prerequisite: IST 210, IST 220

IST 432 **Legal and Regulatory Environment of Information Science and Technology** (3) Legal environment of information technology, constitutional/political issues, intellectual property, management, e-commerce, privacy, access, computer contracting, cyberspace regulation.
Effective: Spring 2007
Prerequisite: IST 301 orSRA 231 or equivalent

IST 440W **Information Sciences and Technology Integration and Problem Solving** (3) Problem-based approach to technology integration by focussing on real-life problems faced by an organization.
Effective: Fall 2002
Prerequisite: ENGL 202C orENGL 202D seventh-semester standing (this course is intended for seniors) and the five common course requirements plus at least three of the required courses in an option

IST 441 **Information Retrieval and Organization** (3) Introductory course for seniors and graduate students covering the practices, issues, and theoretical foundations of organizing and analyzing information and information content for the purpose of providing access to textual and nontextual information resources. Introduces students to the principles of information storage and retrieval systems and databases.
Effective: Spring 2004
Prerequisite: IST 210, IST 240

IST 442 (IL) **Information Technology in an International Context** (3) International concepts to improve strategies for the design, dissemination, and use of information technology.
Effective: Summer 2006

Prerequisite: IST 110

IST 443 **IT Professional Services Theory and Practice** (3) Explores and applies the basic concepts, methodologies, tools, and techniques of consulting and professional service organizations in information sciences and technology.
Effective: Spring 2006
Prerequisite: IST 210, IST 220 . Prerequisite or concurrent:IST 302 orIST 412

IST 444 **Advanced IT Professional Services** (3) Explores advanced IT professional services topics, and the unique application of consulting methods in various industry sectors.
Effective: Summer 2005
Prerequisite: IST 443

IST 445H **Globalization Trends and World Issues** (3) This course covers trends in globalization and their influence on U.S. policy making as well as the role of the U.S. in international issues.
Effective: Summer 2005
Prerequisite: 6 credits of honors course work

IST 446 **An Introduction to Building Computer/Video Games** (3) An interdisciplinary course that introduces students to process and techniques involved in developing a video or computer game.
Effective: Summer 2006
Prerequisite: IST 311, IST 331 or approval of program

IST 451 **Network Security** (3) Fundamental issues and concepts of network security, network security technologies and protocols, and emerging technologies in network security.
Effective: Summer 2004
Prerequisite: IST 220

IST 452 **Legal and Regulatory Environment of Privacy and Security** (3) Exploration of legal, regulatory, public policy, and ethical issues related to security and privacy for information technology professionals in public institutions, private enterprise, and IT services.
Effective: Spring 2007
Prerequisite: IST 301 orSRA 231 or equivalent

IST 453 **Legal, Regulatory, Policy Environment of Cyber Forensics** (3) Legal, regulatory and public policy environment of computer and network forensics that constrain investigatory and monitoring activities in computer and network environments.
Effective: Summer 2006
Prerequisite: IST 110 and 6th-semester standing or higher

IST 454 **Computer and Cyber Forensics** (3) Fundamental issues and concepts of computer forensics; aspects of computer and cyber crime; methods to uncover, protect, exploit, and document digital evidence; tools, techniques, and procedure to perform computer and cyber crime investigation.
Effective: Summer 2006
Prerequisite: IST 220

IST 456 **Security and Risk Management** (3) Contemporary Security Issues; security management processes, architecture and models; risk analysis and management; security planning, analysis and safeguards; security policies development and administration; contingency planning, incidence handling and response; and security standards and certification processes.
Effective: Summer 2006
Prerequisite: IST 220

IST 461 **Database Management and Administration** (3) Introduces advanced topics in database management systems that are fundamental to effective administration of enterprise information systems.
Effective: Spring 2006
Prerequisite: IST 210, IST 240

IST 462 **Database Modeling and Applications** (3) This course introduces advanced topics in database modeling and applicaitons.
Effective: Spring 2006
Prerequisite: IST 210, IST 240

IST 489H **Research Methods for the Information Sciences and Technology** (3) Seminar course focused on approaches to studying information and communication technologies and writing theses and other research reports.
Effective: Summer 2006
Prerequisite: IST 110 honors standing or permission of program

IST 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Fall 1999
Prerequisite: prior approval of proposed assignment by instructor

IST 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2000

IST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2000

IST 497A **Enterprise Architecture Fundamentals** (2) This course is designed to provide a first exposure to enterprise architecture (EA) and set a "common language" and understanding for IT professionals, functional business people, and customers that need an understanding of EA and its business value.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IST 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2001

IST 501 **Integrative Theories and Methods of the Information Sciences and Technology** (3) An integrative treatment of research and theories on how technologies are used to meet information needs at multiple levels of analysis.
Effective: Fall 2001

IST 503 **Foundations for IST Research** (3) Study of major methodological, normative, and theoretical issues in philosophy of science related to reserach in information sciences and technology.
Effective: Spring 2007
Concurrent: IST 501

IST 511 **Information Management: Information and Technology** (3) Introducton to theoretical, computational, and practical issues involved in managing textual, spatial, temporal, and multimedia information in a computerized system.
Effective: Fall 2001
Prerequisite: IST 501

IST 512 **Information Processing Architecture and Technology** (3) This course introduces the core theories, concepts, and methods regarding information and technology from an information processing point of view.
Effective: Summer 2005

IST 515 **Information Security and Assurance** (3) This course covers theoretical, conceptual, and methodological foundations of information security and assurance.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: IST 511 orIST 512

IST 515 **Information Security and Assurance** (3) This course covers theoretical, conceptual, and methodological foundations of information security and assurance.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: IST 511 orIST 512 orIST 554

IST 516 **Web and Internet Information Retrieval** (3) The course addresses aspects of searching, retrieving and modeling the Web/ Internet as information repositories using mathematical and probabilistic treatments.
Effective: Spring 2007
Prerequisite: IST 511 orIST 512

IST 521 **Human-Computer Interaction: The User and Technology** (3) Users, models of users, developing the models, technology for creating interfaces; examples of good research and implications for Human-Computer Interface (HCI) design.
Effective: Fall 2001
Prerequisite: IST 501

IST 522 **Models and Theories of Human-Computer Interaction** (3) This course covers the theoretical foundations of human-computer interaction that prepares students in planning and conducting research in HCI.
Effective: Summer 2005

IST 525 **Computer-Supported Cooperative Work** (3) IST 525 introduces theories, empirical findings, evaluation methods, and design frameworks in computer-supported cooperative work.
Effective: Spring 2007
Prerequisite: IST 521 orIST 522

IST 526 **Development Tools and Visualizations for Human-Computer Interaction** (3) IST 526 addresses concepts and tools for developing working user interface software and prototypes to provide effective information visualizations.
Effective: Spring 2007
Prerequisite: IST 521 orIST 522

IST 531 **Human Information Behavior: Information and the User** (3) Introduction to research into the nature of human information and communication processes at the individual, social, and organizational levels.
Effective: Fall 2001
Prerequisite: IST 501

IST 532 **Organizational Informatics** (3) Researching Information and Information Systems in Organizations.
Effective: Summer 2005
Prerequisite: IST 501

IST 535 **Information Technology Valuation, Markets and Innovation** (3) This course covers the economic aspects of information technology and innovations.
Effective: Summer 2006
Prerequisite: IST 501

IST 536 **Public and Community Informatics** (3) Theories and uses of ICT in public sector and community organizations.
Effective: Spring 2007
Prerequisite: IST 501

IST 541 **Qualitative Research in Information Sciences and Technology** (3) Assists IST researchers in their efforts to learn about and employ appropriate qualitative methods in their research.
Effective: Spring 2004
Prerequisite: IST 501

IST 552 **Data and Knowledge Management** (3) This course introduces the computational foundations, methodologies and tools for data and knowledge management.
Effective: Summer 2009

IST 554 **Network Management and Security** (3) Essential skills and knowledge for effectively utilizing networks and Internet technologies to facilitate, manage and secure data communications and applications.
Effective: Summer 2009

IST 555 **Intelligent Agents and Distributed Decision Making** (3) Distributed decision making theories and agent-based technologies, models and systems with applications in command and control, emergency and resource management.
Effective: Summer 2009

IST 557 (STAT 557) **Data Mining I** (3) This course introduces data mining and statistical/machine learning, and their applications in information retrieval, database management, and image analysis.
Effective: Summer 2009
Prerequisite: STAT 318 orSTAT 416 and basic programming skills

IST 558 (STAT 558) **Data Mining II** (3) Advanced data mining techniques: temporal pattern mining, network mining, boosting, discriminative models, generative models, data warehouse, and choosing mining algorithms.
Effective: Summer 2010
Prerequisite: STAT 557 orIST 557

IST 562 **Theoretical Foundations of Information Science** (3) This course introduces the theoretical foundations of information science, with applications in communication, signal processing, machine learning, and pattern recognition.
Effective: Summer 2009
Prerequisite: Familiarity with college-level linear algebra calculus and probability theory or consent of the instructor

IST 564 **Crisis, Disaster and Risk Management** (3) This course examines the fundamental elements of crisis, disaster, risk and emergency management.
Effective: Summer 2009

IST 571 (M I S 571) **Information Technology Strategy** (2) Examines link between firm's corporate strategy and vision, and information technology strategy; covers ho information technology transforms and enables business.
Effective: Summer 2002

IST 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2000

IST 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an indivdual or small group basis.
Effective: Fall 2001

IST 594C **Organized Research for IST Graduate Symposium** (1) Organized research activities related to identifying themes, external keynote speakers, and the panels of IST Graduate Symposium.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IST 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2000

IST 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2000

IST 597A **Simulation as a Summary of Human Behavior** (3) Models of users, develop user models, technology for creating user models, and implications for HCI design.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IST 597A **Emergent Topics in Computer Security** (3) This course will cover a number of emergent research issues in

network, system, and software security.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

IST 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2001

IST 600 **Thesis Research** (1-15) No description.
Effective: Fall 2001

IST 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 2001

IST 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) No description.
Effective: Fall 2001

IST 610 **Thesis Research Off-Campus** (1-15) No description.
Effective: Fall 2001

IST 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 2001

IST 841 **Search Engines & Information Retrieval** (3) Introductory course on search engines and information retrieval. Search, indexing, ranking, and search evaluation are formally defined, explained, and used.
Effective: Summer 2010

IST 885 **Introduction to Multisensor Data Fusion** (3) Understanding the concepts, techniques, and issues surrounding the fusion of information from multiple sensors and sources of data.
Effective: Summer 2009

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Information Systems (INFSY)

INFSY 430 **Programming for Business Applications** (3) Introduction to the syntax and grammar of COBOL language with emphasis on applications to business data processing.
Effective: Spring 2007
Prerequisite: IST 110 orMIS 204 andMIS 103 orCMPSC 203

INFSY 535 **Object-Oriented Design and Program Development in Business** (3) Overview of key concepts in object design and the application of these concepts in business software development.
Effective: Fall 2001
Prerequisite: admission to MBA or MSIS Program or Program approval

INFSY 540 **Information Technology and Knowledge Management** (3) Information systems management, enterprise models of information technology, information technology and knowledge management.
Effective: Spring 2005
Prerequisite: admission to M.B.A. or MS/IS program or program permission

INFSY 543 **Electronic Commerce** (3) Overview of key aspects of E-Commerce within an organizational context including coverage of managerial issues and supporting technology.
Effective: Spring 2004
Prerequisite: INFSY 540 or permission of the Program

INFSY 544 **Design, Development, and Management of E-business** (3) Advanced topics in e-business including effective design, development, and management of E-business.
Effective: Summer 2004
Prerequisite: INFSY 543

INFSY 545 **Program, Data, and File Structures** (3) Program, data, and file structures are studied as they relate to management of data in information systems.
Effective: Fall 2001
Prerequisite: INFSY 535

INFSY 547 **WEB Enabled Technologies** (3) Integrating design principles and applying technologies that support business related, web-based applications.
Effective: Fall 2001
Prerequisite: INFSY 535 or permission of the Program

INFSY 550 **Strategic Information Systems** (3) Comprehensive coverage of concepts, applications and management of strategic information systems in organizations.
Effective: Summer 1999
Prerequisite: INFSY 540

INFSY 554 **Master's Project** (3) Development of an original master's project in the student's field of interest and preparation of a paper.
Effective: Spring 1992
Prerequisite: last 6 credits of Master's in the Information Systems program

INFSY 555 **Data Management Systems** (3) Concepts and theory of database management systems explored through data modeling and planning techniques.
Effective: Fall 2001
Prerequisite: INFSY 535

INFSY 556 **Data Warehousing** (3) The study of the requirements collection, design, and development of data warehouses.
Effective: Fall 2001
Prerequisite: INFSY 555

INFSY 560 **Data Communications Systems and Networks** (3) Hardware and software concepts relevant to current communications and networking technology. The importance of telecommunications is emphasized.
Effective: Spring 1992
Prerequisite: INFSY 540

INFSY 562 **Network Protocols** (3) A study of several important network protocols such as TCP/IP and application protocols, emphasizing their common elements.
Effective: Summer 2004
Prerequisite: INFSY 535 andINFSY 560 or permission of program

INFSY 563 **Network Security** (3) This is a study of network security concepts, technology and issues. Authentication, privacy and integrity of messages are analyzed.
Effective: Summer 2004
Prerequisite: INFSY 535 andINFSY 560 or permission of program

INFSY 564 **Wireless Networks** (3) This course is a study of wireless network standards, technology and applications. Both local and wide area networks are covered.
Effective: Summer 2004
Prerequisite: INFSY 535 andINFSY 560 or permission of program

INFSY 565 **Intelligent Systems in Business** (3) This course will emphasize the analysis, design, and application of

intelligent systems within organizational settings.
Effective: Fall 2001
Prerequisite: INFSY 535

INFSY 566 **Data Mining and Knowledge Discovery** (3) The study and application of data mining techniques used to mine patterns in large transactional databases.
Effective: Fall 2001
Prerequisite: INFSY 565

INFSY 570 **Software Engineering in the Analysis and Design of Information Systems** (3) Software engineering concepts, specifically the analysis and design of structured information systems using computer-aided software engineering (CASE).
Effective: Spring 2001
Prerequisite: INFSY 535

INFSY 575 **Seminar in Information Technology Management** (3) Examination of selected topics relevant to current and future managerial and organizational issues of information technology.
Effective: Spring 1992
Prerequisite: INFSY 555 orINFSY 570

INFSY 578 **Information Technology and Life Sciences** (3) The application of technology to biological problems such as genomic or protein structure and function, or genetic techniques.
Effective: Summer 2004
Prerequisite: 3 credits in life sciencesINFSY 556 andINFSY 566

INFSY 585 **Applications in Medical Informatics** (3) Analysis of complex systems specific to the support of healthcare management and delivery applications.
Effective: Summer 2004
Prerequisite: INFSY 540 andINFSY 556

INFSY 587 **Global Information Technology** (3) Comprehensive coverage of components, applications, and issues of global information technology management in organizations worldwide.
Effective: Summer 1997
Prerequisite: INFSY 555 orINFSY 570

INFSY 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2009

INFSY 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experience, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 1997

INFSY 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1992

INFSY 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1999

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Instructional Systems (INSYS)

INSYS 411 **Orientation to Instructional Systems** (2-3) An orientation to selection, utilization, and curricular integration of instructional media.
Effective: Summer 1996
Prerequisite: EDPSY 014

INSYS 412 **Developing Effective Training Presentations** (3) The design, development, and presentation of effective training presentations for business and industry.
Effective: Summer 1996
Prerequisite: senior standing

INSYS 413 **Designing Instructional Manuals and Text** (3) Designing textual materials for information retrieval, performance, and learning using job aids, manuals, programmed instruction, information mapping, etc.
Effective: Fall 2001

INSYS 415 **Systematic Instructional Development** (3) Preparation in the use of a nine-step model for systematically analyzing instructional problems and developing validated, practical solutions.
Effective: Summer 1996

INSYS 425 **Corporate Instructional Systems** (3) Provides an overview of the applications and applicability of Instructional Systems Design in business/corporate environment.
Effective: Spring 1996
Prerequisite: INSYS 415

INSYS 441 **Design, Development, and Evaluation of Internet Resources** (3) Design, production, and evaluation of instructional materials for delivery on the Internet.
Effective: Fall 2001

INSYS 442 **Innovative Instructional Applications of Microcomputer Technology** (3) Educators experience and develop innovative instructional applications of text-processing, database management, spreadsheet, and telecommunication software in their classrooms.
Effective: Fall 2008
Prerequisite: EDTEC 440

INSYS 443 **Educational Applications of Logo** (3) Prepares educators to use and to teach the Logo programming language on microcomputers. Students write programs and develop course materials.
Effective: Fall 2008
Prerequisite: EDTEC 440

INSYS 447 **Instructional Design for Multimedia Technologies** (3) State of the art multimedia technology hardware such as interactive video, CD-ROM and digitizing audio and video.
Effective: Fall 2001

INSYS 471 **Introduction to Educational System Design** (3) Investigates systems theory and how components of educational systems interact; develops insights on current issues and models in Educational System Design.
Effective: Summer 1996

INSYS 472 **Communication and Educational Systems Design** (3) Develops communication and technology-based presentation skills in educational systems designers.
Effective: Spring 2001
Prerequisite: INSYS 471

INSYS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

INSYS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1996

INSYS 497B **Social Networking and Media** (3) Introduction to social networking tools including blogs, wikis, podcasts, and social bookmarking.
Effective: Summer 2010 Ending: Summer 2010

INSYS 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1996

INSYS 498A **Internet Safety for Educators** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

INSYS 498A **Internet Safety for Educators** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

INSYS 498A **Internet Safety for Educators** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

INSYS 498B **Colloquium on Learning and Instruction for Individual Classroom Settings** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

INSYS 498B **Social Media and Learning** (3) This course introduces students to social media and Web 2.0 technologies with the intent of having them evaluate applications to learning in formal settings.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

INSYS 498C **Social Media and Learning** (3) This course introduces students to social media and Web 2.0 technologies with the intent of having them evaluation applications to learning in formal settings.
Effective: Summer 2010 Ending: Summer 2010

INSYS 511 **Organization and Administration of Instructional Systems** (3) Procedures and considerations necessary for the effective organization, management, and evaluation of instructional systems.
Effective: Summer 1996
Prerequisite: INSYS 411

INSYS 521 **Instructional Systems Analysis** (3) Conducting needs analysis, performance analysis, task analysis, learner analysis, and environmental analysis in preparation for instructional design.
Effective: Fall 2001
Prerequisite: INSYS 415

INSYS 522 **Analyzing Outcomes and Learners** (3) Analyzing instructional outcomes, analyzing tasks, and writing objectives for the instructional design; analyzing learners characteristics.
Effective: Summer 1998
Prerequisite: INSYS 415

INSYS 525 **Instructional Design Models, Strategies, and Tactics** (3) Application of instructional design models and design of appropriate instructional strategies and tactics.
Effective: Spring 1999
Prerequisite: EDPSY 421, INSYS 415

INSYS 527 **Designing Constructivist Learning Environments** (3) Designing learning environments based on constructivist principles of learning that provide modeling, coaching, and scaffolding.
Effective: Summer 1996
Prerequisite: EDPSY 421, INSYS 415

INSYS 540 **Methods and Models of Interactive Design** (3) Instructional design principles and practices related to creating interactive learning environments for computerized and multimedia instruction.
Effective: Summer 1996
Prerequisite: INSYS 441

INSYS 542 **Evaluating Authoring Systems** (3) Evaluation and selection of current authoring systems based on instructional design requirements.
Effective: Spring 1996
Prerequisite: INSYS 441

INSYS 543 **Designing Information Systems** (3) The design and production of information systems that go beyond traditional instructional systems, such as performance support systems.
Effective: Summer 1996
Prerequisite: INSYS 415, INSYS 521

INSYS 544 **Designing Video for Instruction and Training** (3) The application of theory to the design of visual instruction for multimedia instruction.
Effective: Summer 1996
Prerequisite: INSYS 447

INSYS 545 **Research in Instructional Computing** (3) The critical analysis of research in instructional computing and the application of research methodologies in instructional computing research.
Effective: Fall 2001
Prerequisite: EDPSY 475 orINSYS 575

INSYS 547 **Artificial Intelligence in Education and Training** (3) Designing computer based instructional and informational systems based upon principles of artificial intelligence.
Effective: Summer 1996
Prerequisite: EDPSY 421, INSYS 415

INSYS 549 **Current Topics in Emerging Technologies** (3) An in-depth seminar on the instructional and training design implications of specific new technologies as they emerge.
Effective: Fall 2001
Prerequisite: INSYS 415

INSYS 551 **Performance Technology for Instructional Designers** (3) Methods of identifying human performance problems in organizations and developing instructional and non-instructional interventions.
Effective: Summer 1996
Prerequisite: INSYS 415

INSYS 553 **Managing and Consulting for Instructional Development** (3) Knowledge and skills in managing and coordinating an instructional development project and consulting with subject matter experts and clients.
Effective: Summer 1996
Prerequisite: INSYS 525

INSYS 571 **Advanced Educational Systems Design** (3) In depth investigation of the process of designing innovative educational systems.
Effective: Spring 1999
Prerequisite: INSYS 471

INSYS 574 **Applied Qualitative Research for Work Practice, Innovation, and Systems Design** (3) Investigates qualitative research paradigms and methodologies; develops skills in use of ethnographic methods in work practice, innovation and systems design.
Effective: Summer 2000
Prerequisite: any introductory research design course or with instructor permission for example: ADTED 550

INSYS 575 **Designing Experimental Research in Instructional Systems** (3) Designing research studies in Instructional Systems of a quantitative and experimental nature. Will result in a research proposal.
Effective: Spring 2007

INSYS 581 **Theoretical Foundations of Instructional Systems** (3) Analysis of theoretical foundations of the instructional systems (systems and cybernetics, communications, cognitive psychology, sociological, construc- tivist, ecological) for doctoral students.
Effective: Summer 1996
Prerequisite: PH.D. or D.ED. candidacy

INSYS 582 **Comparative Instructional Design Models** (3) Analyzing different instructional design models, such as elaboration theory, component design theory, Gagne-Briggs, algorithmic, conversation theory, cognitive flexibility theory.
Effective: Summer 1996
Prerequisite: PH.D. or ED.D. candidacy

INSYS 583 **Survey of Research in Instructional Systems and Technology** (3) Analysis and evaluation of research in domains of instructional systems and technology.
Effective: Summer 1996
Prerequisite: PH.D. or ED.D. candidacy

INSYS 586 **Diffusion and Adoption of Innovations** (3) Understanding change process in educational contexts, comparing various models, tailoring them to individual needs, and creating personalized model of change.
Effective: Summer 1998
Prerequisite: admission into INSYS doctoral program

INSYS 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1996

INSYS 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Fall 2003

INSYS 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1996

INSYS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

INSYS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1996

INSYS 597A (C I 597C) **Technology in Teacher Education, A Critical Consideration** (3) This seminar has been designed to consider how technologies have been used in teacher preparation programs and what we as teacher educators can do to take more control over the use of appropriate technologies in our classrooms.
Effective: Summer 2010 Ending: Summer 2010

INSYS 597A **Design Based Research Methods Applications for Educational Research** (3) This course is designed to acquaint students with methods of research collectively referred to as design-based research. One of the distinguishing features of design-based research is that development and deployment are active components of a research agenda. Whereas many research methods seek to minimize researcher "intrusion" in the sites of research (e.g., the adoption of an observational stance), design-based researchers actively and purposively engage in the construction of learning environments in which their research is conducted. This course is intended to understand the strengths and limitations of design base research methods in educational settings.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

INSYS 597B **Advanced Informal Learning & Design** (3) Designing informal learning environments, like museum exhibits, based on empirical design principles. How to conduct research on design effectiveness.
Effective: Summer 2010 Ending: Summer 2010

INSYS 597B **Design Based Studio** (3) Designing and developing multimedia projects for education.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

INSYS 600 **Thesis Research** (1-15) No description.
Effective: Summer 1996

INSYS 601 **PH.D. DISSERTATION FULL-TIME** (0) NO DESCRIPTION.
Effective: Summer 1996

INSYS 602 **SUPERVISED EXPERIENCE IN COLLEGE TEACHING** (1-3 PER SEMESTER, MAXIMUM OF 6) NO DESCRIPTION.
Effective: Summer 1996

INSYS 610 **THESIS RESEARCH OFF-CAMPUS** (1-15) NO DESCRIPTION.
Effective: Summer 1996

INSYS 611 **PH.D. DISSERTATION PART-TIME** (0) NO DESCRIPTION.
Effective: Summer 1996

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Insurance (INS)

INS 400 **Estate Planning** (3) Creation, conservation, and distribution of property rights, emphasizing investments, insurance, wills, trusts, and taxation.
Effective: Spring 1996
Prerequisite: B A 301 orINS 301

INS 401 **Fundamentals of Private Pensions** (3) Analysis of pension regulation, funding, vesting, retirement annuities under insured and self-insured plans, actuarial cost analysis, plan termination insurance.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: ACCTG 211, B A 301, ECON 002, SCM 200

INS 401 **Fundamentals of Private Pensions** (3) Analysis of pension regulation, funding, vesting, retirement annuities under insured and self-insured plans, actuarial cost analysis, plan termination insurance.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: ACCTG 211;B A 301 orFIN 301;ECON 002 ; andSCM 200 orSTAT 200

INS 405 **Corporate Risk Management** (3) Insurance management for corporate organizations; self-insurance, risk transfer, and other alternatives to insurance.
Effective: Spring 1996 Ending: Fall 2010
Prerequisite: B A 301 orINS 301

INS 405 **Corporate Risk Management** (3) Insurance management for corporate organizations; self-insurance, risk transfer, and other alternatives to insurance.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: B A 301, FIN 301 orINS 301

INS 410 **Compound Interest and Annuities--Certain** (3) Compound interest and annuity functions; equations of value; determination of yield rates; construction of tables.
Effective: Spring 2001
Prerequisite: MATH 141

INS 411 **Life Contingencies I** (3) A study of the mathematical theory of life contingencies; single-life functions and their applications.
Effective: Fall 1989
Prerequisite: INS 410, STAT 414

INS 412 **Life Contingencies II** (3) Joint-life and survivor-life functions, population life tables, and multiple decrement theory, with applications to disability and retirement problems.
Effective: Summer 1984
Prerequisite: INS 411

INS 427 **Optimization for Business Decisions** (3) Optimization models quickly and efficiently analyze a large number of scenarios to find the best course of action for business applications.
Effective: Spring 2008
Prerequisite: MATH 110 orMATH 140 and eitherSCM 200 orSTAT 200

INS 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2003

INS 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2008

INS 496 **Independent Studies** (1-18) Creative Projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

INS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

INS 497A **Basic Property & Casualty Ratemaking** (3) This course is intended to give a basic introduction to actuarial methods and concepts used to develop manual rates for property and casualty insurance.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

INS 497B **Financial Models for Actuarial Science** (3) This course covers material in the Society of Actuaries Actuarial Models - FE exam, such as interest rate models, valuation of derivative securities, and risk management techniques, and particularly their application to insurance, pensions, and investments.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

INS 497C **The Economics of Biotechnology, Phamaceuticals and Health Insurance** (3) The course provides an overview of the economic and management issues facing the biotechnology and pharmaecutical industries. Topics covered will include R&D, financing, alliances and joint ventures, M&A, production, marketing and the important role of public and private medical insurance on product development, pricing and product demand.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

INS 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

INS 500 **Management of the Insurance Enterprise** (3) Management planning associated with risk bearing; pricing, reserving, reinsurance, and regulation; Lloyds and other significant world insurance markets; insurance intermediaries.
Effective: Fall 1983

INS 504 **Problems in Insurance** (3) Planned individual projects involving library, laboratory, or field work.
Effective: Winter 1978

INS 510 **Risk Management** (3) Analysis of managerial problems and responsibilities of risk analysis, removal or reduction, and allocation of corporate resources to provide indemnity.
Effective: Winter 1978

INS 575 **Risk Management** (2) Develop an understanding of the risks facing corporations and the methods available to deal with those risks.
Effective: Summer 2002
Prerequisite: B A 531

INS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

INS 599 (IL) **Foreign Study--Insurance** (1-12) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in establsihed exchange program

INS 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

INS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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Integrative Arts (INART)

INART 401 **Applications in Digital Imaging** (4) An advanced digital photography course that explores new methods in the creation and presentation of images using the latest technologies.
Effective: Fall 2006
Prerequisite: PHOTO 400

INART 410 (AM ST 410) **Early Pennsylvania Decorative Arts and Furniture** (3) The study of Pennsylvania and related furniture, pottery, paintings, and decorative arts of the seventeenth, eighteenth, and early nineteenth centuries.
Effective: Spring 2008

INART 415 (AM ST 415) **Nineteenth Century Pennsylvania Architecture and Restoration** (3) Interior and exterior design of early Pennsylvania architecture; understanding and evaluation of and experience in restoration.
Effective: Spring 2008
Prerequisite: INART 410

INART 494 **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 1996

INART 494H **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

INART 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1995
Prerequisite: prior approval of proposed assignment by instructor

INART 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an indivdual basis and which fall outside the scope of formal courses.
Effective: Spring 1996

INART 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1996

INART 497A **Ivyside Pride Advanced** (3) Exploration and performance of choral music in a variety of genres. By audition only.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

INART 497B **Management of Historic Sites and Museums** (3) Students will gain experience in the development, installation, promotion, and documentation of exhibits as they work within a budget.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

INART 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1996

INART 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Integrative Biosc (IBIOS)

IBIOS 450 **Molecular and Cellular Toxicology** (3) The course provides an in-depth coverage of the processes by which drugs and chemicals interact with biological systems.
Effective: Spring 2000
Prerequisite: B M B 401 orB M B 437 or consent of instructor

IBIOS 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 1997

IBIOS 511 (BMMB 511, VB SC 511) **Molecular Immunology** (2) The study of molecular and biochemical events that influence immune responses and define current questions in immunology.
Effective: Spring 2008
Prerequisite: B M B 400, MICRB 410

IBIOS 530 (VB SC 530) **Regulation of gene expression by xenobiotics** (3) The mechanisms by which foreign chemicals alter gene expression and the techniques used to examine this effect are examined.
Effective: Spring 2008
Prerequisite: B M B 401 or equivalent vb sc 433/b m b 433 recommended

IBIOS 532 (VB SC 532) **Developmental and Reproductive Toxicology** (3) Effects of environmental chemicals, nutrients and drugs on embryo/fetal development and maternal/paternal toxicity.
Effective: Spring 2008
Prerequisite: B M B 402

IBIOS 551 (BMMB 551) **Genomics** (3) Stucture and function of genomes including use of some current web-based tools and resources for studies and research in genomics.
Effective: Summer 2007

IBIOS 570 **Molecular Toxicology Seminar Series** (2) This course provides an opportunity for students in the Cellular and Molecular Mechanisms of Toxicity program to interact with leading scientists.
Effective: Spring 1999

IBIOS 571 **Current Issues in Biotechnology** (2) Lecture-discussion series by academic and industry experts on the cutting-edge of science, business, intellectual property, legal, social, and ethical issues in biotechnology. The course also requires a group project, involving case studies or market research on various areas of biotechnology.
Effective: Spring 2006

IBIOS 572 **Benchmark Papers** (2) Discussion of current literature on molecular, cellular and developmental biology.
Effective: Summer 2007

IBIOS 580 **Critical Reading in Immunobiology** (1) Literature review of cellular, molecular, genetic and biochemical analysis of in vitro and in vivo immunology.
Effective: Summer 2004
Prerequisite: Past or concurrent enrollment in:MICRO 554

IBIOS 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1997

IBIOS 591 **Ethics in the Life Sciences** (1) An examination of integrity and misconduct in life sciences research, including issues of data collection, publication, authorship, and peer review.
Effective: Spring 1999

IBIOS 592 **Current Research Seminar** (2) This course uses a weekly biological seminar as a springboard for discussion of a research topic of high current interest.
Effective: Spring 1999

IBIOS 593 **Molecular biology Laboratory** (3) An intensive laboratory course on the principles and techniques of nucleic acid purification.
Effective: Spring 2000

IBIOS 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2000

IBIOS 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1997

IBIOS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1997

IBIOS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1997

IBIOS 597B (BB H 597B) **Neurobiology of Addiction** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IBIOS 597C **Advances in Lab Techniques** (1-3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IBIOS 597C **Advanced Laboratory Techniques** (1-3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

IBIOS 597E (NUTRN 597E, PHSIO 597E) **Nutritional Neurosciences** (3) This course provides overviews of nutrition and neuroscience and how they interact to influence brain function, physiology, and behavior. semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IBIOS 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1999

IBIOS 598A **Neuroscience Seminar** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IBIOS 598A **Neuroscience Seminar** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

IBIOS 598C **Current Topics in Neuroscience** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IBIOS 598C **Current Topics in Neurosciences** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

IBIOS 598E **Genomics Journal Club** (1) This is a course run in journal club format that is open to the PSU community. The class meets weekly to discuss current papers. The course focuses on understanding advanced in genomics and bioinformatics, although specific topics vary.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IBIOS 598E **Genomics Journal Club** (1) This is a course run in journal club format that is open to the PSU community. The class meets weekly to discuss current papers. The course focuses on understanding advanced in genomics and bioinformatics, although specific topics vary.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

IBIOS 600 **Thesis Research** (1-15) No description.
Effective: Spring 1998

IBIOS 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 1998

IBIOS 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in

teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Summer 1997

IBIOS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 2002

IBIOS 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 2002

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Interdisciplinary Humanities (I HUM)

I HUM 400 **Expressions in the Humanities** (3) Capstone course for School of Humanities majors: students synthesize and apply approaches to a topic in creative expression and knowledge.
Effective: Fall 2001
Prerequisite: I HUM 300W seventh-semester standing

I HUM 410 (IL) **Religion and Culture** (3) A comparative examination of several world religions in their social and cultural contexts.
Effective: Summer 2005
Prerequisite: sixth-semester standing

I HUM 430 **Philosophy and Literature** (3) The study of philosophical viewpoints in literature.
Effective: Spring 2002
Prerequisite: fifth-semester standing

I HUM 453 **Texts and Culture** (3) Study of art, literature, film, and other creative genres to illustrate the interrelationships between creative expression and cultural practices.
Effective: Spring 2002
Prerequisite: fifth-semester standing

I HUM 460 **Thematic Studies** (3) Analysis of a group of related ideas in art, music, literature, and/or philosophy. (May be repeated for credit.)
Effective: Spring 2002
Prerequisite: fifth-semester standing

I HUM 461 (IL) **Selected Periods in the Humanities** (3) Interdisciplinary studies dealing with selected periods of world culture. (May be repeated for credit.)
Effective: Summer 2005
Prerequisite: fifth-semester standing

I HUM 491 **Seminar in Interdisciplinary Humanities** (3) Interdisciplinary studies dealing with selected periods of world culture. (May be repeated for credit.)
Effective: Fall 2001
Prerequisite: I HUM 300W seventh-semester standing

I HUM 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2002

I HUM 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

I HUM 495 **Internship** (1-6) Supervised internship for undergraduate or graduate Humanities majors in state offices, educational institutions, arts agencies, community organizations, or humanities councils.
Effective: Spring 2002
Prerequisite: senior-level status for undergraduate students; 18 credits of course work for graduate students; approval of program required

I HUM 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2002

I HUM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2002

I HUM 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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International Agriculture (INTAG)

INTAG 481 **Problems in Agriculture in Tropical Areas** (3) Students apply their "expertise" to problems in agriculture. An integral component is a trip to tropical areas at their expense.
Effective: Spring 1983
Prerequisite: completion of six credits in applicant's major and successful completion of interview

INTAG 495 **Internship in International Agriculture** (1-3) Observation of and participation in the operation and management of a University-approved international agricultural firm or international agricultural development agency.
Effective: Spring 1986
Prerequisite: Prior approval of proposed internship plan

INTAG 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1986

INTAG 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1986

INTAG 497A **Comparing US/French Agricultural Systems** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

INTAG 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

INTAG 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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International Business (I B)

I B 403 **International Business and National Policies** (3) Evaluation of national economic policies in the light of international economic theory; their impacts on operations of the international business firm.
Effective: Spring 2008
Prerequisite: ACCTG 211, B A 301 orFIN 301

I B 404 **Contemporary Issues in International Business** (3) Investigation of issues in international business practice interpreted from the foundations of the social sciences. Topics will be chosen from contemporary issues in global business and economics.
Effective: Spring 2008
Prerequisite: ACCTG 211, B A 301 orFIN 301

I B 411 **International Business** (3) Analysis of business firms in international environments; effect of international economic, political, and sociocultural factors on multinational business operations.
Effective: Spring 2008
Prerequisite: MGMT 301, SCM 310, MKTG 301

I B 440 (US;IL) (AAA S 440, PL SC 440) **Globalization and Its Implications** (3) This course explores the socioeconomic implications of globalization.
Effective: Spring 2008
Prerequisite: AAA S 100 orAAA S 110 orPL SC 003 orPL SC 014 orPL SC 020 orPL SC 022

I B 450 **The Business Enviornment of Europe** (3) This course provides an overview of the economic, institutional, and regulatory environment in Europe at the EU and national levels.
Effective: Summer 2007
Prerequisite: ACCTG 211, B A 301 orFIN 301

I B 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2002

I B 496H **International Business Honors Thesis Research** (0-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

I B 496H **International Business Honors Thesis Research** (0-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

I B 497 **Special Topics** (1-9) Formal courses given infrequently to explore in depth, a comparatively narrow subject interest.
Effective: Fall 1991

I B 497A **International Business in Emerging Nations** (3) This course provides an overview of the international business strategy and economic environment of emerging Asian nations with special focus on China, India and South East Asia. It uses a selective group of other geographic areas and the United States as a basis for comparing these emerging business models.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

I B 497B **Urban Property Rights and Land Use Issues** (3) International perspectives on real estate as property, evaluation of land use regulations, and differences in real estate markets across countries.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

I B 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

I B 500 **International Business Management** (3) Concepts and institutions affecting the international conduct of business; interface between nations and international firms; alternative policies businesses employ internationally.
Effective: Fall 1991

I B 501 **Comparative Business Systems** (3) Conceptual approach analyzing and predicting influences of social, political, and economic norms and values upon diverse societies' managerial decision making.
Effective: Fall 1991

I B 502 **International Business Macro Analysis** (3) International economic, trade, political, and monetary tools are applied to national policy issues and international business operations.
Effective: Fall 1991

Prerequisite: I B 500

I B 503 **International Business Policy** (3) Analysis of the internal operations of multinational firms; design of optimal strategies of operation under varying environmental conditions.
Effective: Fall 1991
Prerequisite: I B 500

I B 504 **Seminar in International Business** (3-6) Seminar in techniques applied to selected topics; market structures; capital budgeting, investment; comparisons of foreign norms and values; multinational organization characteristics.
Effective: Fall 1991

I B 505 (FIN 505) **Multinational Managerial Finance** (3) Analysis of the international aspects of managerial finance. Emphasis on the environmental and institutional factors influencing capital acquisition and allocation.
Effective: Fall 1991
Prerequisite: B A 531

I B 515 (R EST 515) **Property Rights in a Global Economy** (2) Analysis of economic, financial, legal, and political factors affecting international real estate decision making.
Effective: Spring 2009

I B 518 (MKTG 518) **Global Marketing** (3) Role of international marketing in the global business environment; development of marketing plans and implementation strategies under differing socio-economic conditions.
Effective: Fall 1991
Prerequisite: MKTG 500

I B 555 (FIN 555) **Global Finance** (1-3) Analyze international business finance problems, impact of evolving inter- national payment systems on business, financial management in modern multi- national enterprise.
Effective: Fall 2008
Prerequisite: FIN 550

I B 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1991

I B 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1991

I B 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 1991

I B 599 (IL) **Foreign Study--International Business** (1-12) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in established exchange program

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Internship (INTSP)

INTSP 495A **Internship in Business for non-Business Students** (1-6) Supervised off-campus, non-group instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 2004
Prerequisite: senior standing; minimum 2.0 GPA;ENGL 015, MATH 021, ECON 002 orECON 004, MGMT 301, MKTG 301, INTSP 370, ACCTG 211 or substitute approved by the instructor; prior approval of proposed assignment(s) by instructor

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Intl Studies (INTST)

INTST 400 (IL) **Seminar in International Studies** (3) An upper-division seminar focusing on one or two critical international issues from an interdisciplinary perspective; individual projects.
Effective: Spring 2007
Prerequisite: INTST 100

INTST 493 **International Studies** (3) Selected topics in International Studies.
Effective: Spring 2008
Prerequisite: prior participation in an Education Abroad program or international work experience and enrollment in the International Studies major

INTST 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 1994

INTST 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

INTST 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written or oral critique of activity required.
Effective: Spring 2008
Prerequisite: Approval by International Studies or Global Studies Advisor

INTST 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 1994

INTST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1994

INTST 497A **Community Based Learning: Writing Local Jewish History** (3) Students in this course will participate in community-based learning (CBL) in Berks County, PA and will slo conduct and report research about CBL.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Italian (IT)

IT 412 **Theory and Practice of Translation** (3) Advanced practicum in Italian explores the technical, artistic, and practical applications of translation between Italian and American cultures.
Effective: Summer 2004
Prerequisite: any 300-level course in Italian

IT 415 **Dante** (3) Readings in the Divina Commedia and the related lesser works of Dante Alighieri.
Effective: Winter 1978
Prerequisite: IT 350

IT 422 **Topics in the Italian Renaissance** (3) Topics vary by year and may include "Theories of Love," "Magic, Witchcraft, Alchemy, and the Emergence of Modern Science," etc.
Effective: Fall 2005
Prerequisite: any Italian course at the 300-level

IT 450 **Nineteenth-Century Italian Literature** (3) Italian romanticism, Verismo and neoclassicism, their origin and development in the novel, poetry, and drama.
Effective: Winter 1978
Prerequisite: IT 351

IT 460 **Twentieth-Century Italian Literature** (3) Modern and contemporary Italian prose, drama, and poetry.
Effective: Winter 1978
Prerequisite: IT 351

IT 475 **Modern Italian Literature and Cinema** (3) Focus on silent films, fascism, WWII, Resistance, Neorealism, and reactions against Neorealism.
Effective: Spring 2003

IT 480 **Italian Women Writers Through the Centuries** (3) Analysis of the works of women authors in their historical and literary contexts.
Effective: Spring 2005
Prerequisite: any 300-level Italian course

IT 485 **Italian-American Cultural Studies** (3) In-depth exploration of Italian-American cultural contributions.
Effective: Spring 2005
Prerequisite: any 300-level Italian course

IT 490 **Dante in Translation** (3) The reading of Dante's Divine Comedy and selected minor works.
Effective: Fall 1983
Prerequisite: junior standing or permission of instructor

IT 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

IT 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

IT 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

IT 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

IT 497A **Boccaccio and His Influence** (3) Emphasis on gender issues raised in Boccaccio's oeuvre juxtaposed with retreatments of these in later work influenced/inspired by Boccaccian writing. Conducted in English.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

IT 588 **Seminar in Italian Literature** (3-12) Common and individual research in special problems.
Effective: Winter 1978

IT 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

IT 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered

infrequently.
Effective: Summer 1988

IT 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

IT 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

IT 801 **Fundamentals of Reading Italian for Research** (3) This course provides the fundamental skills for reading Italian prose to graduate students with special interests in conducting research using Italian materials.
Effective: Spring 2010

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Japanese (JAPNS)

JAPNS 401 (IL) **Advanced Japanese I** (4) Further acquisition of the four language skills in Japanese--reading, writing, speaking and listening comprehension.
Effective: Spring 2010 Ending: Fall 2010
Prerequisite: JAPNS 110

JAPNS 401 (IL) **Level Three Japanese A** (4) Further acquisition of the four language skills in Japanese--reading, writing, speaking and listening comprehension.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: JAPNS 110

JAPNS 402 (IL) **Advanced Japanese II (Post Study Abroad)** (4) Exclusively for study abroad returnees. To further develop Japanese proficiency in speaking, listening, reading, and writing.
Effective: Spring 2010 Ending: Fall 2010
Prerequisite: JAPNS 401

JAPNS 402 (IL) **Level Three Japanese B** (4) Exclusively for study abroad returnees. To further develop Japanese proficiency in speaking, listening, reading, and writing.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: JAPNS 401

JAPNS 403Y (IL) **Practical Written Communication: Japanese for Professional and Academic Purposes I** (3) Discussions, presentations, readings, and compositions emphasizing written styles used in newspapers, magazines, business reports, academic writing, and other texts.
Effective: Spring 2010
Prerequisite: JAPNS 402

JAPNS 404 (IL) **Practical Written Communication: Japanese for Professional and Academic Purposes II** (3) Continuation of emphasis on written styles used in newspapers, magazines, business reports, academic writing, and other texts; aspects of translation.
Effective: Spring 2010
Prerequisite: JAPNS 403Y

JAPNS 452 (IL) **Contemporary Japan: Cultures, Lifestyles, Trends** (3 per semester/maximum of 6) Survey of aspects of modern Japanese society; includes readings from Japanese newspapers, magazines, and fiction; topics may vary each semester.
Effective: Spring 2010
Prerequisite: JAPNS 401

JAPNS 453 (IL) **Japanese Film** (3 per semester/maximum of 6) Selected films and directors representing various aspects of Japanese culture and cinema; topics may vary each semester.
Effective: Spring 2010
Prerequisite: JAPNS 401

JAPNS 454 (IL) **Japanese Literature** (3 per semester/maximum of 6) Selected works from important Japanese texts representing genres such as autobiography, poetry, fiction, and drama; topics may vary each semester.
Effective: Spring 2010
Prerequisite: JAPNS 401

JAPNS 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2010

JAPNS 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2010

JAPNS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2010

JAPNS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1995

JAPNS 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2010

JAPNS 499 (IL) **Foreign Study--Advanced Japanese** (1-15) Small group instruction in spoken and written modern Japanese at the advanced level.

Effective: Spring 2010
Prerequisite: JAPNS 110 orJAPNS 299

JAPNS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1997

JAPNS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2003

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Jewish Studies (J ST)

J ST 401 (IL) (HIST 401) **Ancient Technologies and Socio-cultural History in the Ancient Levant** (3) Social and intellectual development in the Ancient Levant as they affected and were affected by technological development.
Effective: Spring 2006
Prerequisite: RL ST 110

J ST 409Y (IL) (HIST 409Y, RL ST 407Y) **European Anti-Semitism from Antiquity to the Present** (3) Surveys the history of anti-Semitism in Europe from antiquity through the Middle Ages to the present.
Effective: Summer 2005

J ST 410 (US;IL) (HIST 410, RL ST 410) **Jews in the Medieval World** (3) Trends in medieval Jewish society under Islam and Western Christendom.
Effective: Spring 2006

J ST 411 (US;IL) (RL ST 411) **Jewish Studies** (3) Study of the life and thought of a particular period or movement in the history of Judaism.
Effective: Spring 2006
Prerequisite: 3 credits in religious studies

J ST 412 (RL ST 412) **American Judaism** (3) The development of Jewish religion and culture in America from the colonial era to the present.
Effective: Summer 1999
Prerequisite: HEBR 010 orJ ST 010

J ST 416 (HIST 416) **Zionist History 1890-1948** (3) History of Zionist thought and politics to the foundation of Israel 1948.
Effective: Summer 1997

J ST 420 (ANTH 420) **Archaeology of the Near East** (3) Culture of the Near East and India from Paleolithic times through the Bronze Age.
Effective: Spring 1999
Prerequisite: ANTH 008, ANTH 009, ANTH 011 orANTH 012

J ST 424H (HIST 424H, PHIL 434H, RL ST 424H) **Monotheism and the Birth of the West** (3) The birth of monotheism and its relation to social organization, the idea of individuality, and science.
Effective: Spring 2002
Prerequisite: J ST 004, J ST 102, J ST 110 orJ ST 120

J ST 426 (US) (ADM J 426, HIST 426) **Jewish/American Organized Crime in New York City** (3) History of Jewish/American organized crime in New York City from 1890 through the Great Depression.
Effective: Spring 2006

J ST 427 (ENGL 427) **Topics in Jewish American Literature** (3) An in-depth examination of important themes, writers, and/or historical developments in Jewish Literature of the United States.
Effective: Spring 2009
Prerequisite: ENGL 015 orENGL 030;J ST 132 orCMLIT 110

J ST 457 (US;IL) (ANTH 457, SOC 457) **Jewish Communities: Identity, Survival, and Transformation in Unexpected Places** (3) Examines the global array of smaller Jewish communities that have flourished outside the main urban centers of Jewish settlement.
Effective: Summer 2006
Prerequisite: ANTH 001 orANTH 045, HEBR 010, J ST 010, SOC 001, SOC 005, SOC 007, SOC 015

J ST 468 (PHIL 468) **Modern Jewish Philosophy** (3) Explores the major figures in modern Jewish philosophy and their influences on contemporary philosophy.
Effective: Summer 2004
Prerequisite: one course in Philosophy and/or Jewish Studies

J ST 478 (PHIL 478, RL ST 478) **Ethics After the Holocaust** (3) Explores the philosophical effects of the Holocaust for thinking about the primary question: Is ethics possible?
Effective: Spring 2005
Prerequisite: one course in Jewish Studies or Philosophy

J ST 480 (CAMS 480) **Greeks and Persians** (3) Development and achievements of the Achaemenid kingdom; relationships between Persians and Greeks.
Effective: Spring 2001
Prerequisite: CAMS 010, CAMS 025 orCAMS 100

J ST 484 **Interdisciplinary Approaches in Jewish Studies** (3) An interdisciplinary approach to problems in Jewish Studies, including Art History, Literature, and Sociology.
Effective: Fall 1999
Prerequisite: J ST 010

J ST 494 **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1998

J ST 494H **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

J ST 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 1998
Prerequisite: prior approval of proposed assignment by instructor

J ST 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 1994

J ST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1994

J ST 497A (GER 497A) **Yiddish Reading** (3) This course is an introduction to the Yiddish language, focusing on grammar, vocabulary, and reading skills.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

J ST 497A **Chaning Lives and the World: Introduction to Philanthropy and Fundraising** (3) Study will first focus on the historical context of U.S. philanthropy and nonprofits.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

J ST 497B (RL ST 497B) **Cultural History of Food From Biblical Times to the Modern Era** (3) Historical exploration of the Jewish food traditions in the Bible as they now find expression in modern "food movements."
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

J ST 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1998

J ST 499 (IL) **Foreign Studies** (12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

J ST 499C (IL) (CAMS 499C, HIST 499C) **Archaeological Field School** (3-6) This course introduces students to the basics of archaeological field methods.
Effective: Summer 2010 Ending: Summer 2010

J ST 499D (IL) (CAMS 499D, HIST 499D, ANTH 499D) **Conservation and Public Archaeology** (3) The conservation and public archaeology option will entail hands-on conservation of on-site architectural remains.
Effective: Summer 2010 Ending: Summer 2010

J ST 505 (HIST 505) **Biblical Historiography in its Ancient Setting** (3 per semester/maximum of 6) Methods of historical reconstruction in Biblical and other historiography from the earliest Mesopotamian records through those of the 6th century B.C.E.
Effective: Spring 1995
Prerequisite: HIST 102

J ST 508 (HIST 508) **Antisemitisms in Historical Context** (3) Historical and comparative analysis of occurrences of antisemitism from antiquity to the present.
Effective: Spring 1995

J ST 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1998

J ST 597 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1998

J ST 597C (ENGL 597C) **Avant-Jew: Jewish American Literature and the Theory of U.S. Identity** (3) This course will examine key texts from the canon of Jewish American literature (mostly from the 20th century).
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Kinesiology (KINES)

PROFESSIONAL COURSES

The following courses are designed for the major in Kinesiology and related disciplines as designated in the various curricular programs. They are pedagogically oriented and do not fulfill the Health Sciences and Physical Education (GPE) component of General Education.

KINES 400 **Adapted Physical Education** (3) Basic concepts of planning and conducting physical education programs for children with physical, sensory, and/or intellectual impairments.
Effective: Fall 2001
Prerequisite: KINES 202

KINES 402 **Physical Activities for Children in Special Education** (3) Study of physical and intellectual disabilities peculiar to students in special education programs and activities that may benefit them.
Effective: Summer 1996
Prerequisite: 6 credits in special education

KINES 403 **Emergency Medical Technology** (4) Theoretical and practical aspects of emergency medical techniques as applied in the pre-hospital environment.
Effective: Spring 1998
Prerequisite: KINES 303 and/or current advanced first aid and cardiopulmonary resuscitation certification

KINES 404 **Emergency Medical Technology Instructor** (2) Educational concepts and skills necessary to present instruction in emergency care; lesson planning, methods of instruction, and evaluation techniques.
Effective: Summer 1997
Prerequisite: KINES 403 with current Pennsylvania Emergency Medical Technician certification

KINES 409 **Inflammatory Responses to Injury and Environmental Stress** (3) An examination of mechanisms involved in the inflammatory response and their relationship to general health, injury, and environmental adaptation.
Effective: Spring 1996
Prerequisite: B M B 251

KINES 420 **Psychosocial Dimensions of Physical Activity** (3) Discussion of theoretical and empirical findings, structuring a frame of reference for exploring man's involvement in physical activity.
Effective: Spring 2001
Prerequisite: KINES 321 or 3 credits in psychology or sociology

KINES 421 **Exercise Psychology** (3) Psychological antecedents and consequences of physical activity behaviors.
Effective: Spring 2008
Prerequisite: KINES 321 orPSYCH 100

KINES 422 **Physical Activity Interventions** (3) Principles of designing, planning, and implementing theory- and evidence-based physical activity interventions.
Effective: Spring 2008
Prerequisite: KINES 321 orPSYCH 100

KINES 423 **Psychology of Sports Injuries** (3) Psychological causes and consequences of sports related injuries in athletes.
Effective: Spring 2008
Prerequisite: KINES 321

KINES 424 (US) (WMNST 424) **Women and Sport** (3) An interdisciplinary approach to contemporary issues related to women and sport from historical, physiological, psychological, and sociological perspectives.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 231, PSYCH 479, SOC 001 orWMNST 001

KINES 427 (HD FS 427) **Developmental Sport & Exercise Psychology** (3) Developmental changes in the antecedents and consequences of physical activity across the lifespan.
Effective: Spring 2008
Prerequisite: PSYCH 100 andKINES 321 orHD FS 129 orPSYCH 212

KINES 428 **Motivation and Emotion in Movement** (3) Theories of motivational and emotional processes and their applications in movement settings.
Effective: Spring 2008
Prerequisite: KINES 321 orPSYCH 100

KINES 429 **Psychology of Sport Performance** (3) Psychological theories of talent development and performance enhancement in sport.
Effective: Spring 2008
Prerequisite: KINES 321 orPSYCH 100

KINES 434 **Rehabilitation of Injuries to the Lower Extremities** (3) Theoretical foundation and laboratory experience in manual therapy techniques and therapeutic exercises for the lower extremities.
Effective: Fall 2006
Prerequisite: KINES 334 Concurrent: KINES 335 KINES 395F

KINES 435 **Rehabilitation of Injuries to the Trunk and Upper Extremitie** (3) Theoretical foundation and laboratory experience in manual therapy techniques and therapeutic exercises for the trunk and upper extremities.

Effective: Fall 2006
Prerequisite: KINES 434 Concurrent: KINES 336 KINES 435 KINES 395G

KINES 436 **Therapeutic Modalities in Athletic Training** (4) Lecture and laboratory course exploring physiological principles and clinical evidence to the use of therapeutic modalities in athletic training.
Effective: Fall 2006
Prerequisite: KINES 434 Concurrent: KINES 336 KINES 435 ; KINES 395G

KINES 438W **Administration and Issues in Athletic Training** (3) Theoretical and practical aspects for management of an Athletic Training professional practice and identifying contemporary issues related to the profession.
Effective: Fall 2006
Prerequisite: KINES 436 Concurrent: KINES 395I

KINES 439W **Ethics in Sport and Sport Management** (3) Analysis of moral dilemmas in sport and sport management utilizing the tools of ethics.
Effective: Spring 2001
Prerequisite: KINES 345 or 3 credits in humanities

KINES 440 **Philosophy and Sport** (3) An examination of human nature from the perspective of our participation in sport.
Effective: Spring 2001
Prerequisite: KINES 345 or 3 credits in philosophy

KINES 441 (US) (AM ST 441) **History of Sport in American Society** (3) Background, establishment, and growth of sport in America from colonial times to the present.
Effective: Fall 2007
Prerequisite: KINES 141 or 3 credits of United States history

KINES 442 (IL) (CAMS 442) **Sport in Ancient Greece and Rome** (3) An examination of the continuity of sport in ancient Greek and Roman societies.
Effective: Spring 2008
Prerequisite: CAMS 025, CAMS 033, CAMS 140, CAMS 150, CAMS 100, CAMS 101 orKINES 141

KINES 443 (IL) **The Modern Olympic Games** (3) An analysis of the modern Olympic Games from their inception through the current festival.
Effective: Spring 2006
Prerequisite: KINES 141 or 3 credits of history or philosophy

KINES 444 (US) **History of Athletics in Higher Education** (3) Origin and development of athletics in American higher education from colonial times to the present.
Effective: Spring 2006
Prerequisite: KINES 141 or 3 credits of American history

KINES 445 **Alcohol and Drug Education** (3) Principles of integration and coordination of alcohol and drug education programs for health education and other health related professions.
Effective: Spring 1998
Prerequisite: 9 credits of health science and/or psychology

KINES 446 (IL) **History of Sport in the Modern World** (3) History of sport in modern world, ca. A.D. 1500 to present; concentrates on role of sport in societies outside United States.
Effective: Summer 2005
Prerequisite: KINES 141 or 3 credits of non-United States history

KINES 448 **Coping with Life After Sport** (1) Psychosocial concerns affecting student-athletes as they enter the transition period following sport disengagement, focusing on coping interventions.
Effective: Summer 2002
Prerequisite: seventh-semester standing or higher; major or minor in Kinesiology or intercollegiate sport participation

KINES 450 **Physiological Limits in Exercise** (3) This course examines physiological function during the stress of maximal or prolonged exercise in conjunction with environmental stress.
Effective: Summer 2000
Prerequisite: KINES 350

KINES 451 **Worksite Health Promotion** (3) Nature of drug use, misuse, and abuse in the athletic setting with implications for counseling and controls.
Effective: Spring 1998

KINES 452 **Applied Cardiovascular Physiology** (3) In-depth study of cardiovascular regulation during postural, environmental, and exercise stress.
Effective: Spring 2010
Prerequisite: KINES 350

KINES 454 **Women's Health and Exercise Across the Lifespan** (3) In-depth study of the physiological role of exercise in modulating the health of girls and women during different phases of the lifespan.
Effective: Summer 2010
Prerequisite: KINES 350

KINES 456 **Physical Fitness Appraisal** (4) The basic components of physical fitness, how it can be measured, and how it can be developed.
Effective: Summer 1996
Prerequisite: or concurrent:KINES 350 3 credits in statistics

KINES 457 **Exercise Prescription and Case Studies** (3) Principles of exercise prescription; application of fitness appraisal based on current practices using evaluation and discussion of case studies.
Effective: Spring 2002
Prerequisite: KINES 350, KINES 456

KINES 459 **Laboratory Experience in Physical Fitness Assessment** (3) A hands-on experience in a fitness assessment laboratory. Prepares students for certification and employment in the fitness industry.
Effective: Spring 2005
Prerequisite: KINES 456

KINES 460 **Movement Disorders** (3) Major peripheral and central movement disorders and methods of their treatment.
Effective: Summer 1999
Prerequisite: KINES 360, KINES 384

KINES 461W **Preparation for Research Project** (2) Planning and preparation for research project.
Effective: Fall 2006
Prerequisite: KINES 180, KINES 260, STAT 200, KINES 321, KINES 345, KINES 350, KINES 360, KINES 384

KINES 462W **Research Project** (2) Completion of research topic.
Effective: Fall 2006
Prerequisite: KINES 461W

KINES 463 **Acquisition of Motor Skills** (3) Examination of principles of motor learning; the application of strategic factors such as: practice types, schedules, augmented information, and motivation.
Effective: Summer 2000
Prerequisite: KINES 360

KINES 464 **Children's Physical Education Curriculum and Practicum** (3) Curriculum for elementary school physical education emphasizing the skill theme approach.
Effective: Fall 2006
Prerequisite: KINES 362, KINES 364, KINES 366

KINES 466 **Assessment and Evaluation in Physical Education and Health Education** (2) Explores measurement as an important and distinct component in a variety of physical education and health education contexts.
Effective: Spring 2006
Prerequisite: KINES 362, KINES 364, KINES 366

KINES 468 **Health Instruction in the School--Content and Method** (3) Methods, materials, and units of instruction.
Effective: Fall 2006
Prerequisite: KINES 362, KINES 364 andKINES 366

KINES 469W **Curriculum Development in Health and Physical Education** (3) The content and process of K-12 school health and physical education curriculum development for public school students.
Effective: Fall 2006
Prerequisite: KINES 362, KINES 364, KINES 366

KINES 481W **Scientific Basis of Exercise for Older Adults** (3) Study of age-associated physical changes and the effects of exercise on the aging process.
Effective: Spring 2001
Prerequisite: KINES 350

KINES 483 **Motor Patterns of Children** (3) Development of motor patterns. Fundamentals of movement, basic motor skills, and adaptation of the body to external forces.
Effective: Summer 1996
Prerequisite: KINES 202

KINES 484 **Advanced Biomechanics** (3) The use of advanced biomechanics to provide an in-depth understanding of the principles which underpin human movement.
Effective: Spring 1999
Prerequisite: KINES 384

KINES 485 **Science of Training Athletes** (3) Application of scientific data knowledge to analyze sport training.
Effective: Fall 1996
Prerequisite: KINES 350, KINES 384

KINES 486 **Legal Issues in Sport** (3) Contemporary legal issues in sport and their implications for sport managers.
Effective: Summer 1996
Prerequisite: seventh-semester standing

KINES 488 **Mechanics of Locomotion** (3) This course examines the forces and motions characteristic of locomotion, with emphasis on walking, the most common human activity.
Effective: Summer 2002
Prerequisite: KINES 384 or previous coursework in biomechanics (or mechanics) and musculoskeletal anatomy

KINES 489 **Intramural Athletics** (3) Programs of activities, types of competition, scoring, awards, schedules, organization, publicity, and other topics related to intramural athletics in schools and colleges.
Effective: Summer 1996
Prerequisite: 4 credits of activities or teaching experience

KINES 492W **Programming for Business and Agencies** (3) Fundamentals of program development applied to corporate and private physical fitness businesses.

Effective: Fall 2006
Prerequisite: KINES 395B

KINES 493 **Principles and Ethics of Coaching** (3) Integration of the practical and theoretical knowledge necessary for effective coaching through classroom and field experiences.
Effective: Fall 2006
Prerequisite: KINES 180 orKINES 366

KINES 494H **Senior Honors Thesis** (1-6) Independent study directed by a faculty supervisor that culminates in the production of a thesis.
Effective: Summer 2008
Prerequisite: Approval of honors thesis advisor

KINES 495A **Practicum in Student Teaching** (12) Supervised teaching of health and physical education in K-12 public schools with seminars focused on transition from student to professional.
Effective: Fall 2006
Prerequisite: A grade of C or higher in all required courses in the Teacher Preparation Option

KINES 495B **Field and/or Research Practicum in Kinesiology** (6) Participation under supervision in a field or research practicum.
Effective: Fall 2006
Prerequisite: KINES 395B seventh-semester standing 9 credits of 400-level KINES courses 2.00 cumulative GPA

KINES 495C **Exercise Science Practicum** (3 per semester/maximum of 6) Participation under supervision in a health and fitness setting.
Effective: Fall 2006
Prerequisite: KINES 141, KINES 180, KINES 200, KINES 202 and fifth semester standing

KINES 495D **Expanded Field and/or Research Practicum in Kinesiology** (1-6) Additional participation under supervision in a field or research practicum.
Effective: Spring 2006
Concurrent: KINES 495B

KINES 495F **Field Practicum in Athletic Training** (3) Participation under supervision in a field practicum.
Effective: Summer 1996
Prerequisite: KINES 395I

KINES 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 1996

KINES 496A **Independent Study Athletic Training** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496A **Independent Study Athletic Training** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 496A **Independent Study Athletic Training** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 496B **Independent Study Biomechanics** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496B **Independent Study Biomechanics** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 496B **Independent Study Biomechanics** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 496C **Independent Study Exercise Physiology** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496C **Independent Study Exercise Physiology** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 496C **Independent Study Exercise Physiology** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 496D **Independent Study History & Philosophy** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496D **Independent Study History & Philosophy of Sport** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 496D **Independent Study History and Philosophy** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 496E **Independent Study Motor Control** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496E **Independent Study Motor Control** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 496E **Independent Study Motor Control** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 496F **Independent Study Psychology of Movement** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496F **Independent Study Psychology of Movement** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 496F **Independent Study Psychology of Movement and Sport** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 496G **Independent Study Teaching/Coaching** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496G **Independent Study Teaching/Coaching** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 496G **Independent Study Teaching/Coaching** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 496I **Independent Study Teaching and Coaching** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496K **Independent Study Applied Kinesiology** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 496K **Independent Study Applied Kinesiology** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 496K **Independent Study Applied Kinesiology** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1996

KINES 497A **Sports Sciences for Coaches** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

KINES 497A **Genetics and Human Performance** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 497A **Muscluloskeletal Dysfunctional for Allied Health and Fitness Professionals** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 497B **Environmental Physiology** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 497B **Exercise Medicine** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 497C **Women's Health and Exercise Across the Lifespan** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: KINES 350, BIOL 141

KINES 497C **Special Topics in Kinesiology** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 497D **Ergogenic Aids** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: KINES 345, KINES 350

KINES 497D **Ergogenic Aids** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 497E **Bone Health and Exercise** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 497E **Growth and Body Composition** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 497F **Physical Activity and Public Health** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 497F **Physical Activity and Public Health** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 497G **Sporting Hollywood** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 497G **Sporting Hollywood** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow

subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 497K **Marathon** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1996

KINES 498A **EMS Assistant Instructor** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 498B **EMS Teaching Practicum** (1-2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 498C **Introduction to Ambulance Operations** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 498D **EVOC** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 498E **EMS Field Practicum** (1-2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 498F **ALS Assistant Technology** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 509 (PHSIO 509) **Inflammatory Responses to Injury and Environmental Stress** (3) An examination of mechanisms involved in the inflammatory response and their relationship to general health, injury, and environmental adaptation.
Effective: Summer 1996
Prerequisite: B M B 221, BIOL 472, BIOL 473

KINES 530 **Experimental Design and Methodology in Kinesiology** (3) Research techniques, including methods, research design, techniques for data collection, as applied to relevant problems in Kinesiology.
Effective: Spring 1999
Prerequisite: 3-credit 400-level statistics course

KINES 531 **Issues in Athletic Training** (3) Analysis of professional/academic issues related to athletic training; includes medical considerations, legal and professional developments, and current research.
Effective: Spring 2000

KINES 532 **Pathoetiology of Musculoskeletal Injuries** (3) In-depth study of physiological, mechanical, and neuromuscular mechanisms of common musculoskeletal injuries with applications for injury prevention, evaluation, and treatment.
Effective: Summer 2000
Prerequisite: KINES 202

KINES 562 **Motor Control: A Behavioral Approach** (3) An analysis of the theoretical and empirical basis for the psychological mechanisms underlying movement control.
Effective: Fall 1996
Prerequisite: KINES 463

KINES 563 **Motor Learning** (3) Analysis of research evidence related to motor skills; characteristics of beginning and advanced performers; relevant learning principles.
Effective: Fall 1996

KINES 564 **Multidisciplinary Approaches in Motor Control** (3) The course introduces major theoretical advances to questions of motor control, both by a general overview and a paper-based discussion.
Effective: Spring 2002

KINES 565 **Neurophysiological Basis of Movement** (3) The basic understanding of neurophysiological structures and

mechanisms involved in the generation of human voluntary movement.
Effective: Spring 1997

KINES 566 **Psychophysiology of Movement** (3) Basic concepts and principles of psychophysiology and their application for analyses of human movements.
Effective: Summer 1997

KINES 567 (PHSIO 567) **Advanced Exercise Physiology** (3) Physiological changes during exercise with emphasis on the effects of physical conditioning and training.
Effective: Fall 1996
Prerequisite: BIOL 472, KINES 480

KINES 574 **Modeling in Biomechanics** (3) Examination of the philosophies and tools used in biomechanical modeling and the insights into the musculo-skeletal system these provide.
Effective: Spring 2000
Prerequisite: KINES 484

KINES 575 **Experimental Methods in Biomechanics and Motor Control** (3) Introduces the theory and practice behind the primary experimental methods used in biomechanics and motor control.
Effective: Summer 2005
Prerequisite: 3-credit 400-level biomechanics or motor control class

KINES 577 (PHSIO 577) **Cardiovascular Physiology** (3) In-depth study of the heart and circulatory system with emphasis on the effects of exercise on cardiovascular function.
Effective: Fall 1997
Prerequisite: KINES 484

KINES 578 (PHSIO 578) **Physiology and Mechanical Behavior of Skeletal Tissues** (3) In-depth examination of the structure, composition, and material behavior of the basic skeletal tissues, including bone, cartilage, tendon, and ligament.
Effective: Spring 1999
Prerequisite: BIOL 421, BIOL 472

KINES 579 **Advanced Biomechanics of Human Motion** (3) Biomechanical foundation of human movement and injury prevention.
Effective: Summer 1997
Prerequisite: KINES 484;MATH 141 orMATH 220

KINES 588 **Scientific Writing in Kinesiology** (3) Instruct students in writing grant proposals, abstracts, manuscripts, and effective presentations in their respective scientific fields of study in Kinesology.
Effective: Spring 2005

KINES 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students or outside speakers.
Effective: Fall 1996

KINES 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

KINES 594F **Research Readings** (1) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 596 **Individual Studies** (1-9) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1996

KINES 596A **Independent Study in Athletic Training** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 596A **Independent Study in Athletic Training** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 596A **Independent Study in Athletic Training** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 596B **Independent Study in Biomechanics** (1-18) Creative projects, nonthesis research, which are supervised on

an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 596B **Independent Study in Biomechanics** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 596B **Idependent Study in Biomechanics** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 596C **Independent Study in Exercise Physiology** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 596C **Independent Study in Exercise Physiology** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 596C **Independent Study in Exercixe Physiology** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 596D **Independent Study in History & Philosophy of Sport** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 596D **Independent Study in History & Philosophy of Sport** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 596D **Independent Study in History and Philosophy of Sport** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 596E **Independent Study in Motor Control** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 596E **Independent Study in Motor Control** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 596F **Independent Study in Psychology of Movement & Sport** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

KINES 596F **Independent Study in Psychology of Movement & Sport** (1-18) Creative projects, nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 597 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1996

KINES 597A **Noll Colloquium** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 597A **Noll Colloquium** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

KINES 597B **Topics in Exercise Psychology** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.

Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 597D **History of Sport Seminar** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

KINES 600 **Thesis Research** (1-15) No description.
Effective: Fall 1996

KINES 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1996

KINES 602 **Supervised Experience in College Teaching** (1-2 per semester, maximum of 6) Preparation and presentation of materials in lecture and laboratory classes under the supervision of a full time faculty member.
Effective: Fall 1996
Prerequisite: appointment as a Graduate Teaching Assistant in Health and Physical Education

KINES 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1996

KINES 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1996

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Korean (KOR)

KOR 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2010

KOR 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2010

KOR 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2010

KOR 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2010

KOR 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2010

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Labor, Emplym Relati (LER)

LER 400 (IL) **Comparative Employment Relations Systems** (3) Analysis of structure and elements of employment relations systems in developed and developing areas.
Effective: Spring 2008
Prerequisite: 3 credits in Labor and Employment Relations

LER 401 **The Law of Labor-Management Relations** (3) Development of Anglo-American law regulating collective bargaining, with emphasis on American labor-management relations under Wagner, Taft-Hartley, and other acts.
Effective: Spring 2008
Prerequisite: 3 credits in Labor and Employment Relations or Political Science

LER 404 **Trends in Employment Relations** (3) Examines contemporary trends and developments in employment relations and collective bargaining.
Effective: Spring 2008
Prerequisite: ECON 315 orLER 100

LER 411 **Employment Relations Organizations** (3) Organizational factors in the actions of trade unions, other employee organizations, and their consequences for workers and society.
Effective: Spring 2008
Prerequisite: LER 100

LER 414W **Labor and Employment Relations Theory** (3) Content and implications of major and minor theories of Labor and Employment Relations.
Effective: Spring 2008
Prerequisite: 6 credits in Labor and Employment Relations

LER 424 **Employment Compensation** (3) Development and management of employee compensation systems.
Effective: Spring 2008
Prerequisite: LER 201 and sixth-semester standing

LER 425 **Employee Benefits** (3) The examination of employee benefits programs used by employers to meet the welfare needs of employees and their families.
Effective: Spring 2008
Prerequisite: LER 201 and 6th semester standing

LER 426 **Staffing and Training Strategies in Organizations** (3) This course focuses on the theory and practice of human resource staffing and training in organizations.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: LER 201, STAT 200 or any other 200 level Statistics course

LER 426 **Staffing and Training Strategies in Organizations** (3) This course focuses on the theory and practice of human resource staffing and training in organizations.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: 3 credits in Labor and Employment Relations (LER) or Human Resources and Employment Relations (HRER)

LER 434 **Collective Bargaining and Contract Administration** (3) Theory, practice, and economic impact of collective bargaining, including administration of the collective bargaining agreement.
Effective: Spring 2008
Prerequisite: LER 100

LER 435 **Labor Relations in the Public Sector** (3) Analysis of labor relations problems within different areas of public employment.
Effective: Spring 2008
Prerequisite: 3 credits in Labor and Employment Relations

LER 437 **Workplace Dispute Resolution** (3) Dispute resolution practices and procedures used in the workplace and employment law settings.
Effective: Spring 2008
Prerequisite: LER 100

LER 437W **Work Dispute Resolution** (3) Dispute resolution practices and procedures used in the workplace and employment law settings.
Effective: Spring 2008
Prerequisite: LER 100

LER 444 **Occupational Health: Policy and Practice** (3) The role of employees, unions, employers, and government in dealing with work-related health issues.
Effective: Spring 2008
Prerequisite: LER 100 or sixth-semester standing

LER 445Y (US) (AAA S 445Y, PL SC 445Y) **Politics of Affirmative Action** (3) Examines history, politics, and economics of the use of special programs to advance racial interests in the U.S.
Effective: Spring 2008
Prerequisite: AAA S 100 level course andPL SC 001 orPL SC 007

LER 458Y (US) (HIST 458Y) **History of Work in America** (3) A study of selected problems in the history of work in the

United States, especially since 1877.
Effective: Spring 2008
Prerequisite: HIST 021, HIST 156 orLER 100

LER 460 **Human Resources Ethics** (3) Ethics of human resources management.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: ARMY 402, H P A 460, HRIM 466, MGMT 341, MANGT 341, MANGT 441, MANGT 463, NAVSC 402, NURS 432 orPSYCH 281

LER 460 **Human Resources Ethics** (3) Ethics of human resources management.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: Take one of the following courses:ARMY 402, H P A 460, HRIM 466, MGMT 341, MGMT 441, NAVSC 402, NURS 432, PSYCH 281 3 credits in Labor and Employment Relations (LER) or Human Resources and Employment Relations (HRER)

LER 464 **Communication Skills for Leaders in Groups and Organizations** (3) Theory-and research-based communication skills for leaders dealing with work-related problems in contemporary groups and organizations.
Effective: Spring 2008

LER 465 **Collective Decision Making** (3) Application of theories of decision making to work-related issues in groups and organizations requiring collective resolution and action.
Effective: Spring 2008

LER 470 **Employee Involvement** (3) Historical, theoretical, legal, and industrial relations aspects of employee involvement in the United States and other countries.
Effective: Spring 2008
Prerequisite: LER 100

LER 472 (WMNST 472) **Work-Life Practices and Policies** (3) Explore the causes and consequences of conflicts between work, family, and other life commitments, and how these may be resolved.
Effective: Spring 2008
Prerequisite: 3 credits of LER

LER 475H (GEOG 475H) **Labor in the Global Economy: U.S. and South African Perspectives** (3) This course focuses on how the nature of work is changing in the global economy, and the implications for economic opportunity and inequality in both .
Effective: Spring 2008
Prerequisite: A minimum of 12 GEOG or LER credits before taking the course (or the permission of the program).

LER 480 **Current Issues in Human Resources** (3) Examines current issues in the field of human resource management, including innovative work schedules, telecommuting, non-traditional office environments, etc.
Effective: Spring 2008
Prerequisite: 3 credits of LER

LER 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

LER 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

LER 495 **Labor Studies Internship** (1-12) Supervised practicum in labor relations setting with union, management, or government agency.
Effective: Spring 2008
Prerequisite: prior approval by department

LER 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2008

LER 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2008

LER 499 (IL) **Foreign Studies** (12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2008

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Landscape Architecture (LARCH)

LARCH 400 **Introduction to Design and Theory (IUG)** (5) Introductory landscape architectural design and applied theory for IUG students.
Effective: Summer 1998
Prerequisite: admission to the IUG program Concurrent: LARCH 400A

LARCH 400A **Introduction to Design Theory Seminar (IUG)** (1) Introductory landscape architectural design theory seminar for IUG students.
Effective: Spring 2001
Prerequisite: admission to the IUG program Concurrent: LARCH 400

LARCH 414 **Design and Theory V: Advanced Landscape Architectural Design** (5 per semester/maximum of 15) Review of landscape architectural theories and issues; supports development of comprehensive design study and/or independent honors (Thesis-Based) design projects. LARCH Majors only.
Effective: Spring 2007
Prerequisite: LARCH 312, LARCH 322

LARCH 424 **Design Theory Seminar** (1-3 per semester/maximum of 3) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 414.
Effective: Spring 2007
Prerequisite: LARCH 312, LARCH 322

LARCH 450 **Interactive Digital Design: Information Technology for Designers** (3) A student centered paperless interactive digital design studio.
Effective: Spring 2007

LARCH 455 **Design and Theory IX (IUG)** (6) Integrated urban design and implementation studio for IUG students.
Effective: Spring 2007
Prerequisite: admission to the BLA/MLA program;LARCH 332, LARCH 414

LARCH 472 **Planning and Public Policy** (3) A review of design and planning movements of this century, with emphasis on the contemporary planning techniques and future trends.
Effective: Summer 1984

LARCH 495 **Internship** (1-13) Supervised off-campus, non-group instruction including individual field experiences, practicums or internships. Written and oral critique of activity required.
Effective: Fall 1981
Prerequisite: prior approval of proposed assignment by instructor

LARCH 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

LARCH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

LARCH 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

LARCH 499A (IL) **Design Theory Seminar** (1) Inquiry-based reading and discussion of design theory literature relevant to the focus and content of the associated design studio course, LARCH 499B. LARCH majors only.
Effective: Spring 2007
Prerequisite: LARCH 361W Concurrent: LARCH 499B LARCH 499C LARCH 499D

LARCH 499B (IL) **Design and Theory VI: Contemporary/International Landscape Architectural Design Issues** (4) Study of and design for sites, programs, and social groups associated with ongoing contemporary landscape architectural concerns. LARCH majors only.
Effective: Spring 2007
Prerequisite: LARCH 361W Concurrent: LARCH 499A LARCH 499C LARCH 499D

LARCH 499D (IL) **Contemporary/International Special Topics** (4) Special topics related to, and study in conjunction with, LARCH 499A, 499B, and 499C. Landscape Architecture majors only.
Effective: Spring 2007
Prerequisite: LARCH 361W Concurrent: LARCH 499A LARCH 499B LARCH 499C

LARCH 499E (IL) **Seminar: People and Protected Areas** (3) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010 Ending: Summer 2010

LARCH 499F (IL) **Studio: Community Design in the Vicinity of Udzungwa Mountains National Park** (5) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010 Ending: Summer 2010

LARCH 499G (IL) **Colloquium: Student-directed Readings and Discussion: The Contribution of Service-learning to Students and Community** (1) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010 Ending: Summer 2010

LARCH 500 **Environmental and Ecological Conditions in Regional Landscape** (1) Landscape architectural field trips within the Centre Region.
Effective: Summer 1996
Prerequisite: graduate standing in the department of landscape architecture

LARCH 501 **Research and Writing in Landscape Architecture** (3) Landscape architectural research methods and writing techniques.
Effective: Fall 2009

LARCH 502 **Intellectual History and Theory of Landscape Architecture** (3) Introductory theory seminar covering the intellectual history of landscape architecture and theoretical contributions from related disciplines.
Effective: Spring 2009

LARCH 510 **Graduate Seminar in Landscape Architecture** (1 per semester, maximum of 6) Landscape architectural theory exploration through readings and discussions.
Effective: Summer 1996
Prerequisite: graduate standing in the department of landscape architecture

LARCH 520 **Graduate Studio I** (4) Landscape architectural research and design inquiry.
Effective: Spring 1997
Prerequisite: admission to program

LARCH 530 **Graduate Studio II** (4) Landscape architectural research or research and design inquiry.
Effective: Summer 1996
Prerequisite: LARCH 520

LARCH 531 **Option Studio I** (4) Studio inquiry in community and urban design.
Effective: Spring 2006
Prerequisite: LARCH 520

LARCH 532 **OPTION INQUIRY I** (1) Independent study in community and/or urban design, the first in a series of three independent inquiry courses in the CUD Option.
Effective: Spring 2006
Prerequisite: LARCH 520

LARCH 540 **Graduate Studio III** (4) Landscape architectural research or research and design inquiry.
Effective: Summer 1996
Prerequisite: LARCH 530

LARCH 541 **OPTION STUDIO II** (4) Continued studio inquiry in community and urban design.
Effective: Spring 2006
Prerequisite: LARCH 531 andLARCH 532

LARCH 542 **Option Inquiry II** (1) Independent study in community and/or urban design, the second in a series of three independent inquiry courses in the Option.
Effective: Spring 2006
Prerequisite: LARCH 531 andLARCH 532

LARCH 550 **Graduate Studio IV** (7) Landscape architectural research or research and design inquiry.
Effective: Summer 1996
Prerequisite: LARCH 540

LARCH 552 **Option Inquiry III** (5) Capstone independent study in community and/or urban design, the last in a series of three unquiry courses in the CUD Option.
Effective: Spring 2006
Prerequisite: LARCH 541 andLARCH 542

LARCH 560 **Landscape Architecture Inquiry** (1-9) Research, planning, and/or design inquiry into landscape architectural issues.
Effective: Summer 1996
Prerequisite: graduate standing in landscape architecture and approval of a member of the landscape architecture graduate faculty

LARCH 590 **Colloquium** (1-3 per sememster/maximum of 6) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1988

LARCH 596 **Independent Studies** (1-9) Independent study opportunities open for graduate students covering topics

which fall oustide the scope of formal courses (non thesis).
Effective: Spring 2009

LARCH 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

LARCH 597A **Design and Theory I: Introduction to the Principles of Landscape Architecture** (5) This course is the first of a four-class sequence of design studios at the core of the professional MLA design program. The design studio is an active learning setting where principles discovered in lecture or seminar classes are subject to experiments in the form of design projects. In this setting, solutions to complex problems are synthesized and tested, based on information gathered in earlier and concurrent classes.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: graduate standing in LARCH

LARCH 597C **Design and Theory III: Site Planning and Design, Design and Theory III** (5) This course considers the broader landscape and systems within the landscape so as to make informed planning, design and management recommendations at that level, and to enlighten site-scale design with a regional perspective. Students begin exploring ways to understand and address issues of regional context before focusing on local-scale site design in the spring semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: graduate standing in LARCH.

LARCH 599 **Foreign Studies** (1-2 per semester/maximum of 4) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2006

LARCH 599E **Seminar: People and Protected Areas** (3) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010 Ending: Summer 2010

LARCH 599F **Studio: Community Design in the Vicinty of Udzungwa Mountains National Park** (5) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010 Ending: Summer 2010

LARCH 599G **Colloquium: Student-directed Readings and Discussion: The Contribution of Service-Learning to Students and Community** (1) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010 Ending: Summer 2010

LARCH 600 **Thesis Research (On Campus)** (1-15) No description.
Effective: Spring 1988

LARCH 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Opportunity for students to obtain supervised and graded teaching experience.
Effective: Spring 1988

LARCH 610 **Thesis Research (Off Campus)** (1-15) No description.
Effective: Spring 1988

1 Students may take only one course for General Education credit from LARCH 003 GA or 060 GA.

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Language and Literacy Education (LL ED)

LL ED 400 **Teaching Reading in the Elementary School** (3) Introduction to the reading program; acquaintance with materials and techniques; observations of reading instruction; correlation with human growth and development.
Effective: Spring 2007
Prerequisite: C I 295 for EK ED majors;EDPSY 014, PSYCH 212;EDTHP 115 or EDTHP selection Concurrent: LL ED 401 LL ED 402 for EK ED majors

LL ED 401 **Teaching Language arts in Elementary School** (3) Principles, problems, materials, and techniques involved in teaching speaking, listening, writing, and reading in the elementary school.
Effective: Spring 2007
Prerequisite: C I 295 for EK ED majors;EDPSY 014, PSYCH 212;EDTHP 115 or EDTHP selection Concurrent: LL ED 400 LL ED 402 for EK ED majors

LL ED 402 **Teaching Children's Literature** (3) Survey of children's literature with an emphasis on the importance of literature in the development of the elementary school curriculum.
Effective: Spring 2007
Prerequisite: C I 295 for EK ED majors;EDPSY 014, PSYCH 212;EDTHP 115 or EDTHP selection. Concurrent: LL ED 400 LL ED 401 for EK ED majors.

LL ED 411 **Teaching Language Arts in Secondary Schools I** (3) Exploration of language, literacy, and culture and development of curricular designs for teaching language arts in secondary schools.
Effective: Spring 1994
Prerequisite: ENGL 200 or 200-level literature courseENGL 444 Concurrent: LL ED 420

LL ED 412W **Teaching Language Arts in Secondary Schools II** (3) Exploration of language, literacy, and culture and development of curricular designs for teaching language arts in secondary schools.
Effective: Summer 2010
Prerequisite: LL ED 411 Concurrent: C I 412W

LL ED 420 **Adolescent Literature and Literacy** (3) Exploration of adolescent literacy and curricular designs for using the diversity of cultural voices in adolescent literature in secondary schools.
Effective: Spring 1992
Concurrent: LL ED 411

LL ED 445 **Teaching English in Bilingual/Dialectal Education** (3) Theories, techniques, materials for teaching English speaking, reading, and writing to bilingual and nonnative speakers in elementary and secondary schools.
Effective: Spring 1992
Prerequisite: WL ED 422 orWL ED 414

LL ED 446 **Remedial Reading in the Classroom** (3) Exploration of reading difficulties in the regular classroom; use of assessment information in the design and delivery of appropriate instruction.
Effective: Spring 1992
Prerequisite: LL ED 440 orLL ED 500

LL ED 450 **Content Area Reading** (3) Study of reading skills and materials for specific content areas; diagnostic and instructional procedures for classroom teachers.
Effective: Spring 2007
Prerequisite: EDPSY 014 orPSYCH 212 or teaching experience

LL ED 462 **The Art of the Picturebook** 3 An in-depth study of picturebooks as art objects providing aesthetic experiences and contributing to our aesthetic development in literacy education.
Effective: Summer 2009
Prerequisite: ENGL 015 and 5th semester standing or higher

LL ED 465 **Fantasy Literature for Children** (3) A study of fantasy literature for children looking at a variety of fantasy stories and examining them from different perspectives.
Effective: Summer 2010
Prerequisite: ENGL 015 and 5th semester standing or higher

LL ED 467 **Children's Literature in the Classroom** (3) Study of the theory and practice of using children's literature in the elementary school classroom.
Effective: Spring 1992
Prerequisite: LL ED 400 orLL ED 402

LL ED 480 **Media Literacy in the Classroom** (3) Exploration of media languages and literacy in classrooms, learning in an electronic age; issues, ideas, and teaching strategies.
Effective: Spring 2005
Concurrent: LL ED 411 LL ED 420

LL ED 495 **School Practicum in Reading** (1-18) Supervised practicum providing field experiences at any grade level, with opportunities to assume various teaching roles.
Effective: Spring 1992
Prerequisite: LL ED 400

LL ED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

Effective: Spring 1992

LL ED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1992

LL ED 497A **Art and Literacy Block** (15) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

LL ED 497A **Elementary Education Literacy Block** (15) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LL ED 497A **Elementary Education Literacy Block** (15) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

LL ED 497B (AAA S 497A) **Children's/Young Adult Africana Literature and Literacy** (3) Students will read and respond to a selection of children's/adolescent texts from/about Africa and the Africa diaspora to gain an understanding of how authors contruct Black identities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LL ED 497D **Formative Literacy Assessments** (3) Emphasis is on literacy assessments (reading, writing, spelling) and follow- up instruction in primary grades at Easterly Parkway School.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

LL ED 497K **Fantasy Literature for Children** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

LL ED 497K **Fantasy Literature for Children** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LL ED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

LL ED 498A **AP English Literature and Composition** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

LL ED 498B **AP Spanish Language** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

LL ED 498C **Summer Invitational Writing Institute** (3-6) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

LL ED 500 **The Reading and Writing Classroom** (3) Analysis of reading and writing processes and the development of integrated language arts programs for elementary schools.
Effective: Summer 1993
Prerequisite: LL ED 400

LL ED 501 **Teaching Writing in Elementary and Secondary Schools** (3) In depth examination of writing development and the development of writing components of language arts programs K-12.
Effective: Summer 1993
Prerequisite: LL ED 500 orLL ED 512

LL ED 502 **Studies in Literature for Children** (3) Study of various genres of children's literature from various critical perspectives; emphasis on role of literature in children's lives.
Effective: Summer 1992
Prerequisite: LL ED 402

LL ED 503 (ENGL 503) **Research Methods in Composition** (3) Introduction to the issues and methods of empirical research in composition.

Effective: Fall 1993

LL ED 512 **Teaching Language, Literacy, and Literature in Secondary Schools** (3) Collaborative inquiry into the curricular design and experience of language, literacy, media, and literature in adolescents' personal and social lives.
Effective: Summer 2010
Prerequisite: LL ED 412W

LL ED 520 **Literature for Adolescents** (3) Critical study of adolescent literature, its diversity of cultural voices, and designs for its use in secondary school classrooms.
Effective: Summer 1992
Prerequisite: LL ED 420

LL ED 526 (EDPSY 526) **The Psychology of Reading** (3) Psychological principles underlying the process of reading and comprehending, with application to instruction.
Effective: Spring 1993
Prerequisite: EDPSY 421

LL ED 541 **Adolescent and Children's Literature Related to Ethnic and Social Issues** (3) Literature, K-12; study of literary symbolism, ethnic literature, issues, e.g., sex, death, adoption, divorce in trade books.
Effective: Summer 1993
Prerequisite: LL ED 402

LL ED 542 (CI ED 542) **Issues in Literacy Education** (3 per semester/maximum of 6) Discussion of philosophical, sociological, historical, and curricular issues in literacy education.
Effective: Fall 1997

LL ED 544 **Cross-Cultural Research in Bilingual Education** (3) Analysis of cross-cultural research methodology in bilingual education.
Effective: Spring 1993
Prerequisite: 12 credits in education and/or psychology; 3 credits in statistics

LL ED 545 **LITERACY AND LANGUAGE ASSESSMENT FOR INSTRUCTIONAL DECISIONS** (3) Diagnosis of reading difficulties; genesis of reading problems; achievement, diagnostic, and capacity tests; application in simulation activities.
Effective: Summer 1993
Prerequisite: EDPSY 450, LL ED 500

LL ED 550 **Theory and Practicum in Assessment and Remediation of Reading Difficulties** (3) Links theory and practice in supervised practicum involving design and analysis of appropriate assessment and instructional procedures for elementary and secondary students.
Effective: Fall 1993
Prerequisite: LL ED 500, LL ED 545

LL ED 560 (ADTED 560) **Teaching Reading to College Students and Adults** (3) Reading literacy for adults, including college reading, Adult Basic Education (ABE), and General Educational Development (GED) programs.
Effective: Spring 1993
Prerequisite: LL ED 500 or teaching experience

LL ED 563 **Myths and Folktales in Children's Literature** (3) An in-depth study of myths and folktales shared with children and how these stories are remade and disseminated today.
Effective: Spring 2010
Prerequisite: LL ED 402

LL ED 565 **Analysis of Theory and Practice in Bilingual Education Program** (3) Classroom analysis, observation, and research of instructional procedures, materials, and evaluation strategies used in bilingual education.
Effective: Spring 1993
Prerequisite: WL ED 422 ; 12 credits in education and psychology

LL ED 566 **Bilingual Education and the Hispanic Child** (3) Anaylsis of the research and literature related to teaching bilingual Hispanic students; examines problems, issues, and strategies.
Effective: Spring 1993
Prerequisite: 12 credits in education and/or psychology

LL ED 567 **Politics of Bilingual Education** (3) To critically analyze the contemporary and historical political context of an education that is bilingual and bicultural.
Effective: Spring 2000

LL ED 568 **Doing Research in Children's Literature** (3) An examination of research traditions used to frame research in children's literature studies and preparation to write the master's paper.
Effective: Summer 2010
Prerequisite: LL ED 402

LL ED 577 (C I 577) **Multicultural Issues in Literacy Education** (3) Explores research questions, and theoretical frameworks, and analyzes multicultural issues in popular media in the context of American schools.
Effective: Spring 1997
Prerequisite: LL ED 542

LL ED 580 (C I 580) **Media Literacy, Language, and Literacy in Schools** (3) Theories of media literacy, issues of non-print technology in language and literacy.

Effective: Spring 1997
Prerequisite: LL ED 480

LL ED 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1996

LL ED 594 **Research in Language and Literacy Education** (3) Cooperative design and study of research in language and literacy education.
Effective: Spring 1993
Prerequisite: C I 400 orEDPSY 400

LL ED 595A **Practicum: Remedial Procedures and Diagnosis** (3-6) Advanced practicum; diagnostic testing and remedial instruction of more severe types of reading disability; supervisory experiences, if appropriate.
Effective: Summer 1993
Prerequisite: LL ED 545

LL ED 595B **Advanced Practicum in Bilingual Education** (1-6) Advanced internship in curriculum, supervision, and instruction in a bilingual education setting.
Effective: Spring 1993
Prerequisite: 12 credits in education and/or psychology; 12 credits in bilingual education

LL ED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1993

LL ED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1993

LL ED 597A **Readings in LL ED** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2010 Ending: Summer 2010

LL ED 597B **Readings in LL ED 2** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2010 Ending: Summer 2010

LL ED 597C **Research in Children's Literature** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2010 Ending: Summer 2010

LL ED 597C **Research in Children's Literature** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LL ED 597D **Differentiated Instruction with Digital Learning Tools** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2010 Ending: Summer 2010

LL ED 597D **Cultural Pluralism in Children's & Adolescent Literature** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LL ED 597I **Theories of Childhood** (3) The study of childhood from cultural, historical, psychological and philosophical perspectives.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LL ED 597I **Theories of Childhood** (3) The study of childhood from cultural, historical, psychological and philosophical perspectives.
Effective: Summer 2011 Ending: Summer 2011 Future: Summer 2011

LL ED 597I **Theories of Childhood** (3) The study of childhood from cultural, historical, psychological and philosophical perspectives.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

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Languages (LANG)

LANG 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2007

LANG 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2007

LANG 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2007

LANG 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2007

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Latin (LATIN)

Knowledge of Greek or Latin not required. See also CLASSICS AND ANCIENT MEDITERRANEAN STUDIES and GREEK.

LATIN 400 **Latin Syntax and Stylistics** (3) Latin style and stylistics as examined and appreciated through standard exercises in composition and parallel selected prose readings.
Effective: Fall 2005
Prerequisite: LATIN 003 or 12th-credit level of proficiency

LATIN 402 **Republican Literature** (3-12) Selected works by Plautus, Lucretius, Catullus, Cicero (content varies).
Effective: Summer 1995
Prerequisite: LATIN 003

LATIN 403 **Augustan Age Literature** (3-12) Selected works by Virgil, Horace, Propertius, Tibullus, Ovid, Livy (content varies).
Effective: Summer 1995
Prerequisite: LATIN 003

LATIN 404 **Silver Age Literature** (3-12) Selected works by Petronius, Seneca, Tacitus, Juvenal, Martial, Pliny the Younger (content varies).
Effective: Summer 1995
Prerequisite: LATIN 003

LATIN 420 **Medieval Latin Literature** (3-6) Survey of Medieval Latin literature.
Effective: Spring 1995
Prerequisite: LATIN 003

LATIN 450W **History of Latin** (3) History of the Latin language and its speakers, from their origins to the 2nd century C.E.
Effective: Summer 1994
Prerequisite: LING 102;LATIN 401, LATIN 402 orLATIN 403

LATIN 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

LATIN 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

LATIN 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

LATIN 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

LATIN 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

LATIN 510 **Latin Seminar** (3-6) No description.
Effective: Winter 1978

LATIN 518 **Latin Research** (1-6) Prosecution of an assigned problem under the guidance of a member of the department.
Effective: Winter 1978

LATIN 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2000

LATIN 599 (IL) **Foreign Studies** (1-12 per semester, maximum of 24) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005

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Latin American Studies (LATAM)

No courses for department code **LATAM** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Latina/O Studies (LTNST)

LTNST 403 (US) (CMLIT 403) **Varieties of Latina/o Cultural Expression** (3) Literary and other forms of cultural expression (film, music, art, and theater) are compared across different Latina/o communities.
Effective: Summer 2006 Ending: Fall 2010
Prerequisite: 3 credits in the humanities or in any LTNST course or 4th-semester proficiency in Spanish

LTNST 403 (US) (CMLIT 403) **Latina/o Literature and Culture** (3) Literary and other forms of cultural expression (film, music, art, and theater) are compared across different Latina/o communities.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: 3 credits in the humanities or in any LTNST course or 4th-semester proficiency in Spanish

LTNST 426 (US) (ENGL 426) **Chicana and Chicano Cultural Production: Literature, Film, Music** (3) An in-depth study of Chicana/Chicano literature, film, and music from the inception of the Chicano Movement (1965-1975) to the present.
Effective: Spring 2007
Prerequisite: 3 credits in English

LTNST 467 (US;IL) (HIST 467) **Latin America and the United States** (3) Historical development of policies of the United States with regard to Latin- American affairs from colonial times to the present.
Effective: Fall 2008

LTNST 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 2006

LTNST 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2006

LTNST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2006

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Liberal Arts (L A)

L A 400 **Changing Life-Styles** (1) Guest lecturers address the subject of futurism and impact of changes on individuals and society from different academic perspectives.
Effective: Winter 1979

L A 401 **Professional Development for the Liberal Arts Student** (1) Provides Liberal Arts students with the techniques and information necessary to specify and implement postgraduation educational and career plans.
Effective: Fall 1983

L A 494 **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis. (No course under L A 294/494 may be offered without approval of the associate dean of liberal arts. All courses must have a specific title and letter suffix.)
Effective: Spring 1994

L A 494H **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis. (No course under L A 294/494 may be offered without approval of the associate dean of liberal arts. All courses must have a specific title and letter suffix.)
Effective: Fall 2007

L A 495 **Undergraduate Field Experience or Practicum** (1-12) Approved experience, related to student career objectives, in agencies external to University.
Effective: Fall 1981

L A 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

L A 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

L A 497A **Children's Theatre** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

L A 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1994

L A 498H **Honors Leadership Mentor** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

L A 499 (IL) **Foreign Study--Liberal Arts** (1-9) Study in selected foreign countries of the cultural, institutional, and/or social development of the host country.
Effective: Summer 2005

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Library Studies (L ST)

L ST 490 (HIST 490) **Archival Management** (1-3) Introduction to the principles and procedures in the management of archives and historical manuscripts.
Effective: Fall 1978

L ST 495 **Internship** (1-9) Directed internship in library studies, archival administration, rare books curation and/or preservation.
Effective: Summer 1995
Prerequisite: L ST 490 orL ST 496

L ST 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses. Students may not register for these courses without prior written approval of a faculty member in the department in which the courses are listed.
Effective: Fall 1983

L ST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

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Linguistics (LING)

LING 401 **Introduction to Linguistic Theory** (3) A survey of the principles of modern linguistic analysis; current approaches to phonological, morphological, and syntactic methods and analyses.
Effective: Fall 2001

LING 402 **Syntax I** (3) Principles of grammatical analysis in the generative framework; an overview of syntactic structures across languages.
Effective: Fall 2001

LING 404 **Phonology I** (3) The analysis of the sound systems of human languages; focus on common phonological processes across languages and on phonetics-phonology interface.
Effective: Fall 2001

LING 429 (PSYCH 426) **Language and Thought** (3) Relations between language and cognition; cognitive implications of normal and impaired language development; cognition and bilingualism.
Effective: Spring 2007
Prerequisite: PSYCH 100, LING 001 orLING 100

LING 446 (PSYCH 427) **L1 Acquisition** (3) How children learn their first language; psycholinguistic aspects of lexical, syntactic, semantic, and phonological development.
Effective: Spring 2010
Prerequisite: LING 100 orPSYCH 002 or permission of program

LING 447 **Bilingualism** (3) Explores the social and psychological aspects of bilingualism; topics include languages in contact, transference, maintenance, and loss.
Effective: Fall 2001

LING 448 **Sociolinguistics** (3) Issues in the study of language in its sociocultural context; analysis of social dialects and speech styles.
Effective: Fall 2001

LING 449 **Semantics I** (3) The study of meaning in human language; methods of analysis; study of sense, reference, compositionality, quantification, presupposition, and sentence- level meaning.
Effective: Fall 2001

LING 493 **Field Methods** (3) Primary linguistic investigation of a language different from English; field work with a native speaker; data gathering; linguistic analysis.
Effective: Fall 2001

LING 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

LING 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

LING 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

LING 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be taught in one year or semester.
Effective: Fall 1983

LING 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be taught in one year or semester.
Effective: Fall 1992

LING 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

LING 500 **Syntax II** (3) Advanced topics in syntactic analysis and theory.

Effective: Spring 2002

LING 502 **Historical Linguistics** (3) Principles of comparative linguistics; language families; reconstruction of lost languages.
Effective: Spring 2002

LING 504 **Phonology II** (3) Advanced topics in phonological analysis and theory.
Effective: Spring 2002

LING 520 (PSY 520) **Seminar in Psycholinguistics** (3 per semester/maximum of 9) Consideration of theoretical and research issues relevant to psychological aspects of language sounds, syntax and semantics, and other cognitive support.
Effective: Spring 2004

LING 521 **Proseminar in the Language Science of Bilingualism** (3) This course provides a cross-disciplinary overview of language science approaches to bilingualism and second language learning.
Effective: Spring 2010

LING 522 **Proseminar in Professional Issues in Language Science** (3) This course addresses issues of professional development in the language sciences with special attention to cross-disciplinary research.
Effective: Spring 2010

LING 525 **Experimental Research Methods in Psycholinguistics** (3) This course provides an overview of experimental research techniques used in langugage science.
Effective: Spring 2010

LING 529 (PHIL 529) **Philosophy of Language Seminar** (3 per semester/maximum of 6) Examines topics in the philosophy of language including the nature of meaning, and semantic theories, pragmatics, interpretation, and poetic language.
Effective: Spring 2002

LING 545 **Morphology** (3) The study of word-formation in the world's languages; examines interaction of phonological, structural, and semantic aspects of the lexicon.
Effective: Spring 2002

LING 548 **Sociolinguistics** (3) Study of social and linguistic aspects of language change, varieties, policy, social inequality, language communities, language, society, and thought.
Effective: Spring 2002

LING 570 **History of Modern Linguistics** (3) A historical survey of views on language; examination of linguistic thought in various historical periods.
Effective: Spring 2002

LING 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

LING 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

LING 597A (GER 597A) **Sound Change in Germanic Languages** (3) This course examines sound change by tracing the development of the sound systems of the Germanic languages from Proto-Indo-European to the present.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LING 597C (SPAN 597C) **Pidgin and Creole Languages** (3) This course will study pidgins and creole languages, principally derived from Spanish and Portuguese, and also from French and English.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LING 597D **Advanced Studies in Child Language Acquisition** (3) This course focuses on children's native language acquisition with special attention to: research methods, crosslinguistic data, and explanations from linguistic theory.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

LING 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

LING 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

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Literature (LIT)

LIT 440 **Literary Genres** (3) The study of one of the major literary genres. (May be repeated for credit.)
Effective: Spring 1994

LIT 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

LIT 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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Management (MGMT)

MGMT 400 **Organization Development** (3) A study of organizational change and methodologies related with change and improvement. Examination of planned change on processes, strategies, people and culture in organizations.
Effective: Spring 2008
Prerequisite: MGMT 301

MGMT 401 **Contemporary Issues in Management** (3) Advanced treatment of topics of current managerial significance. Issues examined will differ by instructor, section, and semester. Consult departmental office.
Effective: Spring 2008
Prerequisite: MGMT 321, MGMT 331 ; orMGMT 326

MGMT 402 **Experiences in Organizational Relations** (3) An experiential approach to study of behavior in organizations, applying concepts and theories of management to interpersonal situations.
Effective: Spring 2008
Prerequisite: MGMT 301

MGMT 409 **Project Management for Engineers** (3) The course provides a real-time experience to students in engineering and engineering technology in project management with a focus on leadership behavior and decision making.
Effective: Spring 2008
Prerequisite: 7th semester standing

MGMT 410 **Project Management** (3) A problem-based, interdisciplinary course in project management skills and techniques needed to manage projects in a modern business environment.
Effective: Spring 2008
Prerequisite: MGMT 301, SCM 310

MGMT 420 **Conflict Management** (3) An exploration of the sources of interpersonal conflict and strategies of resolution in the managerial context.
Effective: Spring 2010 Ending: Summer 2010
Prerequisite: MGMT 301 orB A 304

MGMT 420 **Negotiation and Conflict Management** (3) An exploration of the sources of interpersonal conflict and strategies of resolution in the managerial context.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MGMT 301 orB A 304

MGMT 424 **Interpersonal Relationships in Organizations** (3) Developing individual skills in interpersonal and group settings and experience-based and conceptual training in relating effectively to other people.
Effective: Spring 2008
Prerequisite: MGMT 321 orMGMT 326

MGMT 425 (IST 425, ENGR 425) **New Venture Creation** (3) Via problem-based learning, teams define new business ventures to meet current market needs, develop business plans, and present to investors.
Effective: Spring 2007
Prerequisite: ECON 002 orECON 004 orECON 014;CAS 100

MGMT 426 (ENGR 426, IST 426) **Invention Commercialization** (3) Working with Penn State inventions selected by the Intellectual Property Office, student teams define an optimum commercialization path each technology.
Effective: Spring 2007
Prerequisite: ECON 002 orECON 004 orECON 014;CAS 100

MGMT 427 **Managing an Entrepreneurial Start-Up Company** (3) Exploration of the tensions and experiences of starting and growing a new company.
Effective: Spring 2009
Prerequisite: ECON 002 orECON 004 orECON 014;CAS 100 ; 5th semester standing

MGMT 431 **Entrepreneurship and Small Business Management** (3) Entrepreneurship, new ventures, and management of small firms.
Effective: Spring 2008
Prerequisite: ACCTG 211, MGMT 301, MKTG 301

MGMT 432 **Small Business Field Study** (3) Supervised field study with a small firm.
Effective: Spring 2008
Prerequisite: MGMT 431

MGMT 433 **Leadership and Team Building** (3) Team-based learning approach to developing conceptual knowledge, skills sets, and personal competencies needed for leading and managing organizations.
Effective: Spring 2008
Prerequisite: MGMT 301

MGMT 440 **Advanced Human Resource Management** (3) In depth study of human resource management and personnel administration functions and processes.
Effective: Spring 2008
Prerequisite: MGMT 341

MGMT 441 **HRM Professional Seminar (Part 1): Staffing and Development** (3) This course focuses on the skills and

methods managers need to manage staffing and development activities in organizations.
Effective: Summer 2001 Ending: Fall 2010
Prerequisite: MGMT 341 Concurrent: MGMT 442

MGMT 441 **Organizational Staffing and Development** (3) This course focuses on the skills and methods managers need to manage staffing and development activities in organizations.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MGMT 341

MGMT 443 **HRM Professional Seminar (Part 2): Performance Management** (3) This course focuses on skills and methods managers need to enhance the contribution of employees to organizational performance and effectiveness.
Effective: Fall 2001 Ending: Fall 2010
Prerequisite: MGMT 341 Concurrent: MGMT 444

MGMT 443 **Performance Management** (3) This course focuses on skills and methods managers need to enhance the contribution of employees to organizational performance and effectiveness.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MGMT 341

MGMT 445 (US) **Managing Differences in Organizations** (3) This course focuses on developing knowledge and skills for dealing with demographic, functional, occupational and identity-based differences within and among organizations.
Effective: Spring 2008
Prerequisite: B A 304 orMGMT 301;MGMT 341

MGMT 450 **Labor Management Relations** (3) Study of the key concepts and processes involved in current American labor/management relations.
Effective: Spring 2008
Prerequisite: MGMT 301

MGMT 451W **Business, Ethics, and Society** (3) Advanced examination of social, ethical, legal, economic, equity, environmental, public policy, and political influences on managerial decisions and strategies.
Effective: Spring 2004
Prerequisite: B A 241 andB A 242 orB A 243

MGMT 453 **Creativity and Innovation** (3) Analysis of the process of innovation in organzations and of how creativity and other variables influence the process.
Effective: Summer 2007
Prerequisite: MGMT 301

MGMT 461 (IL) **International Management** (3) Examines issues of nations and cultures including motivation, communication, negotiation, leadership, ethics and social responsibility, and women in management.
Effective: Spring 2008
Prerequisite: B A 304 orMGMT 301

MGMT 466 **Organizational Learning and Knowledge Management** (3) Examination of the social processes through which organizations continuously develop, acquire, interpret, and apply information and knowledge for performance enhancement and continuous improvement.
Effective: Spring 2008
Prerequisite: MGMT 301

MGMT 471 **Strategic Management** (3) Issues that influence the competitive performance of the firm are identified and examined.
Effective: Spring 2004
Prerequisite: MGMT 326, B A 411 or taken concurrently

MGMT 471W **Strategic Management and Business Policy** (3) Study of strategic management and business policy formulation and implementation processes.
Effective: Spring 2008
Prerequisite: MGMT 301, MKTG 301, FIN 301, SCM 301

MGMT 475W **Strategic Product Development** (3) Study of an organization, industry, and evaluation of the introduction to a new product. Preparation of proposal for industry product.
Effective: Summer 2008
Prerequisite: 7th semester standing;MGMT 300;FIN 301;SCM 310;MKTG 301;M E 300 orMET 330;MCH T 213 orE MCH 213;EET 101 orE E 211

MGMT 476 **Product Realization Capstone** (3) Study of an organization, industry, and evaluation of the introduction of a new product. Preparation of proposal for industry product.
Effective: Summer 2008
Prerequisite: MGMT 475W ; 8th semester standing

MGMT 483 **Compliance and Fairness in Organizations** (3) Compliance with employment laws with respect to managing human resources and fair treatment in employer-employee relationships.
Effective: Summer 2007
Prerequisite: MGMT 341

MGMT 489 **Seminar in Management** (3) A capstone course in management for students of high academic achievement. Emphasis on in-depth research of current interest.
Effective: Spring 2008
Prerequisite: MGMT 301 and at least senior status

MGMT 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2003

MGMT 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

MGMT 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2008
Prerequisite: prior approval of proposed assignment by instructor

MGMT 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1989

MGMT 496A **Gambling Regional Comparison** (3) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

MGMT 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1989

MGMT 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2003

MGMT 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

MGMT 501 **Behavioral Science in Business** (3) Application of behavioral science concepts and analytical methods to problems in business organizations. Analysis of administrative behavior and decision making.
Effective: Fall 1989

MGMT 505 **Management of Advanced Technology** (3) An analysis of the strategic, organizational, and human resource issues firms must face in order to implement advanced manufacturing technology and practices.
Effective: Spring 1990

MGMT 511 **Engagement and Project Management** (2) Basic techniques and skills for organizing, defining, and conducting a consulting project.
Effective: Summer 2002
Prerequisite: B A 501

MGMT 520 **Team Facilitation** (2) To gain an in-depth understanding of team dynamics and develop skills for facilitating teams to achieve effective performance.
Effective: Summer 2002

MGMT 521 **Complex Negotiations** (2) Develop concepts and strategies for analyzing and conducting multiparty negotiations.
Effective: Spring 2003

MGMT 523 **Organizational Change: Theory and Practice** (3) Analysis of research, theory, and practice in dynamics of organizational change. Research literature reviewed for evaluation of concepts and methods.
Effective: Fall 1989

MGMT 528 **Seminar in Organizational Behavior** (3) Current theoretical and research issues applicable to the study of individual and group behavior within organizational settings.
Effective: Fall 1989

MGMT 531 **Strategy Implementation and Organizational Change** (2) Assess gap between current organization and that needed to implement new strategy or execute change; identify process for closing gap.
Effective: Summer 2002

MGMT 534 **Leadership and Change in Organizations** (2) Understanding yourself as a leader, particularly as a leader in organizations and especially a leader of organizations undergoing change.

Effective: Summer 2008

MGMT 535 **The Upper Echelons Perspective: Theory and Research** (3) To learn to evaluate and conduct research on top executives and their influence on organizational strategy, structure and performance.
Effective: Summer 2004
Prerequisite: admission to a doctoral program at PSU

MGMT 538 **Seminar in Organization Theory** (3) Current theoretical and research issues applicable to the study of design and management of complex organizations.
Effective: Fall 1989

MGMT 539 **Seminar in Organizational Social Networks** (3) Learn theory, concepts and methods for research on organizational social networks.
Effective: Summer 2004
Prerequisite: admission to a doctoral program at PSU

MGMT 541 **Human Resource Management** (3) An in-depth examination of the strategic planning and implementation of human resource management, including staffing, development, appraisal, and rewards.
Effective: Summer 1990

MGMT 548 **Seminar in Human Resource Management** (3) Current theoretical and methodological issues applicable to the design, implementation, and evaluation of human resource practices and programs.
Effective: Summer 1990

MGMT 551 **Growth and Innovation Strategy** (2) Identify opportunities for growth and profitability through technological and organizational innovations and market independently or with strategic partners.
Effective: Summer 2002
Prerequisite: B A 571

MGMT 558 **Seminar in Organizational Decision Making** (3) An in-depth examination of decision making, including bounded rationality, political behaviors, choice and post-decision processes.
Effective: Spring 1990

MGMT 561 **Global Strategy and Organization** (1-3) Course focuses on three major aspects of international business: competitive strategy, organization design, and management processes.
Effective: Fall 2008
Prerequisite: second year of MBA Program or graduate status in another program

MGMT 565 **Power and Influence** (2) Provides a pragmatic and ethical framework for analyzing the sources of power in organizations and its effective use.
Effective: Summer 2008

MGMT 570 **Consulting Practicum** (2) Conduct a strategic consulting project engagement from initial contact through to final recommendations and acceptance.
Effective: Summer 2002
Prerequisite: MGMT 511, MGMT 531 permission of program Concurrent: MGMT 520

MGMT 571 **Strategic Management** (3) This capstone course provides analysis and application of strategy concepts and techniques in business organizations.
Effective: Spring 2002
Prerequisite: only available to students enrolled in the M.B.A. program

MGMT 573 **Corporate Innovation Strategies** (3) Survey of managerial issues involved in formulating and implementing a corporate innovation or technology strategy.
Effective: Summer 1991

MGMT 578 **Seminar in Corporate Strategy** (3) Current theoretical and research issues applicable to the study of corporate strategy formulation and implementation.
Effective: Fall 1989

MGMT 588 **Seminar in Multi-Level Organizational Research** (3) The seminar addresses theory, research, and methodological issues surrounding the multi-level integration of micro- and macro-organizational concepts.
Effective: Spring 1990
Prerequisite: MGMT 528, MGMT 538 or equivalent

MGMT 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1989

MGMT 591 **Organizational Research Design** (3) Experience in designing research for organizational science, to maximize the validity of eventual conclusions; methodological choices, constraints, and compromises (tradoffs).
Effective: Summer 2004

Prerequisite: admission to a doctoral program at Penn State; graduate-level statistics (linear model) course (e.g. STAT 501: Applied Regression Analysis).

MGMT 592 **Qualitative Research Methods** (3) This course provides students with an introduction to and experience with qualitative research methods employed in organizational contexts.
Effective: Summer 2004
Prerequisite: admission to a doctoral program at Penn State

MGMT 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1989

MGMT 597 **Special Topics** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1989

MGMT 597B **Team Facilitation Team Labs** (1) Lab to work with 1st Year Teams.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MGMT 599 (IL) **FOREIGN STUDY--MANAGEMENT** (1-12) Full-yime graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in established exchange program

MGMT 600 **Thesis Research** (1-15) No description.
Effective: Fall 1989

MGMT 601 **PH.D. DISSERTATION FULL-TIME** (0) NO DESCRIPTION.
Effective: Summer 1991

MGMT 602 **SUPERVISED EXPERIENCE IN COLLEGE TEACHING** (1-3 PER SEMESTER, MAXIMUM OF 6) COURSE INVOLVES SERVING AS A TEACHING ASSISTANT IN A SPECIFIED UNDERGRADUATE COURSE UNDER THE SUPERVISION OF A FACULTY MEMBER. REQUIRES PLANNING, DISCUSSION, AND APPLICATION OF ITS APPROACH.
Effective: Spring 1991

MGMT 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1989

MGMT 611 **PH.D. DISSERTATION PART-TIME** (0) NO DESCRIPTION.
Effective: Summer 1991

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Mangt Info Systems (MIS)

MIS 404 **Introduction to ERP and Business Processes** (3) A problem-based, interdisciplinary course on Enterprise Resource Planning (ERP) concepts and business processes.
Effective: Summer 2010
Prerequisite: MIS 204 or 1st Level Programming Course or with the permission of the program

MIS 405 **Supply Chain Information Systmes with Oracle** (3) Strategic design and implementation of Oracle supply chain management information systems in an ERP environment.
Effective: Summer 2010
Prerequisite: SCM 301, MIS 204

MIS 406 **Customer Information Systems with Oracle** (3) A technology-based exploration of the various Oracle Order Management and Customer Relationship Management tools.
Effective: Summer 2010
Prerequisite: MIS 405

MIS 407 **Enterprise Integration with Oracle** (3) This is a technology course focusing on software development in an Oracle eBusiness ERP Environment.
Effective: Summer 2010
Prerequisite: MIS 336 andMIS 405

MIS 413 **Interface design for Information Systems Applications** (3) The study of interface design emphasizing application and user requirements, development and testing techniques, and information processing issues.
Effective: Spring 2007
Prerequisite: MIS 307, MIS 465

MIS 430 **Systems Analysis** (3) Information analysis and the logical specification of the system.
Effective: Spring 2007
Prerequisite: Prerequisite or concurrent:MIS 336

MIS 431 **Business Data Management** (3) The architecture of business information processing systems and technical aspects of database management.
Effective: Spring 2007
Prerequisite: MIS 204 Concurrent: SCM 302

MIS 432 **Business Information System Analysis** (3) The analysis of business information systems and the requirements specifications of redesigned systems.
Effective: Spring 2007
Prerequisite: MIS 431

MIS 434 **Internet Technologies** (3) Technical foundations of the eBusiness environment and web applications development to support internet-based commerce.
Effective: Spring 2007
Prerequisite: MIS 431 Concurrent: M I S 432

MIS 435 **Systems Design and Implementation** (3) Logical and physical design of information systems and implementation.
Effective: Spring 2010
Prerequisite: MIS 430 and a second-level programming course

MIS 436 **Business Data Communications** (3) Introduction to the principles and techniques of business data communication encompassing transmission concepts, network analysis, design, implementation, and administration.
Effective: Spring 2007
Prerequisite: MIS 431

MIS 440 **Expert Systems** (3) Introduction to expert systems technology; course covers expert system concepts, techniques, development, and management.
Effective: Spring 2007
Prerequisite: 3 credits of programming

MIS 442 **Business Information Systems Design** (3) Object-oriented concepts such as: object, instance, class, inheritance, polymorphism; application of these methodologies and design patterns to business system analysis.
Effective: Summer 2007
Prerequisite: MIS 432

MIS 445 **Management Reporting Systems** (4) Develops insights and skills required to analyze current management reporting systems, propose improvements, and develop reports using a report generator.
Effective: Fall 2009
Prerequisite: MIS 336

MIS 446 **Information Technology and Business Strategy** (3) Strategic use and management of information technology in digital global economy.
Effective: Spring 2008
Prerequisite: MIS 390

MIS 448 **Business Telecommunications** (3) Introduces telecommunication concepts, its evolution, and present

applications in business. Discusses the software and hardware components of telecommunication networks.
Effective: Spring 2007
Prerequisite: MIS 390

MIS 450 **System Design Project** (3) A project in the design, specification, and programming of a system in an application area.
Effective: Spring 2009
Prerequisite: MIS 307, MIS 465;MIS 448 ; 3 additional credits of MIS at the 300- or 400-level; seventh or eighth semester standing

MIS 460 **Object Oriented Design in Business** (3) Object oriented programming concepts and analysis and design methodologies with an emphasis on business applications.
Effective: Spring 2007
Prerequisite: MIS 307

MIS 461 **Web Technologies** (3) Fundamentals of Web development for e-business and related project management.
Effective: Spring 2007
Prerequisite: MIS 307 andMIS 465

MIS 465 **DataBase Management** (3) Provides a comparison of techniques, methodology of systems, limitatins, and applications of various data base management systems.
Effective: Spring 2008
Prerequisite: CMPSC 102 orCMPSC 101 orCMPSC 121 andMIS 390

MIS 466 **Business Programming for the WEB** (3) Advanced programming for WEB-based applications.
Effective: Spring 2007
Prerequisite: MIS 307

MIS 470 **Advanced Applications Development** (4) Focus on concepts and practice of advanced tools and techniques such as application generators, object-oriented methods, and client/server development.
Effective: Fall 2009
Prerequisite: MIS 435 orCMPSC 122 orCMPSC 302

MIS 479 **Management of Operations Information/ERP** (3) Management and implementation of enterprise information systems for business integration and supply chain management.
Effective: Summer 2007
Prerequisite: MIS 390 orMIS 431

MIS 479W **Management of Operations Information/ERP** (3) Management and implementation of enterprise information systems for business integration and supply chain management.
Effective: Spring 2008
Prerequisite: MIS 390 orMIS 431

MIS 489 **Seminar in Information Systems** (3) Covers new trends and concepts in information/processing technology and their applications and impact on computer information systems.
Effective: Spring 2007
Prerequisite: MIS 307 andMIS 465

MIS 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2007

MIS 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

MIS 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2007
Prerequisite: prior approval of proposed assignment by instructor

MIS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2007

MIS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2007

MIS 497A **Enterprise Integration with Oracle** (1-6) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MIS 497B **Supply Chain Information System with Oracle** (1-6) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MIS 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2007

MIS 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

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Manufacturing Technology (MFTBD)

No courses for department code **MFTBD** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Manufacturing/Engineering Technology (MFET)

No courses for department code **MFET** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Marketing (MKTG)

MKTG 410 **Personal Selling** (3) Principles underlying the selling process and practical application of these principles to selling situations.
Effective: Spring 2008
Prerequisite: MKTG 301

MKTG 420 **Direct Marketing** (3) Applies principles of marketing management to the direct marketing of products by mail, telephone, print, and broadcast media.
Effective: Spring 2002
Prerequisite: MKTG 330, MKTG 342

MKTG 422 **Advertising and Sales Promotion Management** (3) Perspectives and models of the key decisions involved in managing advertising and sales promotion campaigns.
Effective: Spring 2008
Prerequisite: MKTG 330 orMKTG 342

MKTG 426 **Business Marketing** (3) Developing marketing strategies and programs. The course emphasizes the special nature of the business and organizational markets.
Effective: Spring 2002
Prerequisite: MKTG 330, MKTG 342

MKTG 428 **Advanced Sales Management** (3) Approaches to planning, organizing, staffing, training, directing, and controlling the sales force in support of marketing objectives.
Effective: Spring 2008
Prerequisite: MKTG 330, MKTG 342

MKTG 435 **Marketing and Society** (3) Analysis of marketing's impact on and obligation to social and environmental issues, marketing and ethics, and the regulation of marketing.
Effective: Spring 2002
Prerequisite: MKTG 330, MKTG 342

MKTG 437 **Advanced Retailing and Merchandise Management** (3) Analyzing planning and controlling the retail merchandising effort, including procurement, resource selection, vendor relations, product presentation, inventory control.
Effective: Spring 2002
Prerequisite: MKTG 330, MKTG 342

MKTG 440 **Services Marketing** (3) Marketing theory and methods applied to profit and nonprofit service industries such as health care, finance, transportation, tourism, arts and consulting.
Effective: Spring 2002
Prerequisite: MKTG 330, MKTG 342

MKTG 443 **Sports Marketing** (3) This course will focus on how companies develop, execute and measure marketing strategies and tactics to use sports teams, familities, leagues and other organizations to market their products and services domestically and internationally to consumers and business partners. The course will examine the marketing strategies employed by sports teams and leagues.
Effective: Summer 2010
Prerequisite: B A 303 orMKTG 301

MKTG 445 (IL) **Global Marketing** (3) Role of international marketing in the global environment; political, economic, geographic, historical, cultural conditions; developing and implementing international marketing strategies.
Effective: Spring 2008
Prerequisite: B A 303 orMKTG 301

MKTG 450W **Marketing Strategy** (3) Market-oriented problems of the firm; identification and selection of market opportunities; formulation of competitive strategies; marketing policies and programs.
Effective: Spring 2008
Prerequisite: MKTG 330, MKTG 342

MKTG 476 **Sales Management** (3) Application of modern management principles to field sales force planning, organization, and administration; selection, training, and compensation plans.
Effective: Spring 2008
Prerequisite: MKTG 301 andMGMT 301

MKTG 478 **Services Marketing Management** (3) Conceptual understanding of services and the analytical tools that are used in solving strategic services marketing problems.
Effective: Spring 2008
Prerequisite: MKTG 301

MKTG 485 **Business-to-Business Marketing** (3) Application of marketing principles to commercial enterprises, industrial firms, government, and other non-profit institutions.
Effective: Spring 2008
Prerequisite: MKTG 301

MKTG 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.

Effective: Summer 2003

MKTG 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2008

MKTG 495 **Internship** (1-18) Supervised off campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2008
Prerequisite: B A 303 ORMKTG 301

MKTG 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

MKTG 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

MKTG 497A **Sports Marketing** (3) MKTG 497A focuses on how companies develop, execute and measure marketing strategies and tactics to use sports teams, facilities, leagues and other organizations to market their products and services domestically and internationally to consumers and business partners. Case studies would be developed and guest speakers and a seminar would be included, along with internship opportunities. The Penn State Athletic Department has committed to interview and place some of the internships to students who complete this course as interns in their extensive sports operation.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: B A 303

MKTG 497A **Retail Institutions** (3) Management of marketing institutions in distribution channels from producters to consumers. Emphasis on retail institutions: location, personnel, merchandising, control and promotion.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: MKTG 330 orMKTG 342

MKTG 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2003

MKTG 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

MKTG 500 **Marketing Management** (3) Development of a marketing management focus, including market analysis, competition analysis, and decisions in pricing, product, promotion, and distribution channels.
Effective: Spring 2002
Prerequisite: ACCTG 511 orACCTG 512;B A 533

MKTG 510 **Planning Marketing Strategy and Programs** (3) Development of marketing strategy consistent with corporate plans, including integrated marketing mix programs based on environmental, customer, and competitive analysis.
Effective: Fall 1983
Prerequisite: MKTG 500

MKTG 511 **Quantitative Analysis for Marketing Decisions** (3) Application of quantitative and analytical tools for marketing decisions in forecasting, new product development, advertising, promotions, pricing, and personal selling.
Effective: Fall 1983
Prerequisite: MKTG 500

MKTG 512 **Consumer and Market Behavior** (3) Application of buyer behavior concepts from the behavioral sciences, including utility, culture, life cycle, personality, attitudes, learning, decision making.
Effective: Fall 1983
Prerequisite: MKTG 500

MKTG 513 **Market Research** (3) User-oriented analysis of marketing research process, including problem definition, design, data collection, data analysis, interpretation, and presentation.
Effective: Fall 1983
Prerequisite: MKTG 500

MKTG 514 **Management of Marketing Communications** (3) Management of advertising, sales promotion, and personal selling programs. Topics: segmentation; copy, media, budget decisions; sales territory; and management issues.
Effective: Fall 1983
Prerequisite: MKTG 500

MKTG 515 **Business Marketing** (3) Study of marketing of goods and services to business, institutions, and government. Focus on organizational buying, market planning and analysis, and development of marketing mix.
Effective: Summer 1984
Prerequisite: MKTG 500

MKTG 516 **Product Development and Management** (3) Marketing and product strategies for new and old products are covered in this course.
Effective: Fall 1987
Prerequisite: MKTG 500

MKTG 517 (MS&IS 517) **Bargaining and Procurement in a Market Context** (3) Bargaining and procurement arrangements between purchasers of goods and services and potential suppliers; includes discussion of government procurement.
Effective: Spring 1998
Prerequisite: first year MBA core requirements

MKTG 518 (I B 518) **Global Marketing** (3) Role of international marketing in the global business environment; development of marketing plans and implementation strategies under differing socio-economic conditions.
Effective: Spring 1991
Prerequisite: MKTG 500

MKTG 521 **Scientific Marketing Analysis and Implementation** (2) An introduction to the tools used, rationale for, and the practice and implementation of a variety of current marketing techniques.
Effective: Spring 2003
Prerequisite: B A 500

MKTG 531 **Gathering and Using Information for Marketing Decisions** (2) Tools and techniques required to carry out a marketing research project.
Effective: Summer 2002
Prerequisite: B A 500

MKTG 532 **Brand Management** (2) To examine and understand the processes of building, designing, measuring, and maintaining brand equity.
Effective: Summer 2002
Prerequisite: B A 500

MKTG 533 **Business Marketing** (2) Study of marketing of goods and services to business, institutions, and government.
Effective: Summer 2002
Prerequisite: B A 500

MKTG 534 **Integrated Market Communications** (2) Provides the frameworks for thinking, tools, language, and skills for strategic management of integrated market communications.
Effective: Summer 2002
Prerequisite: B A 500

MKTG 541 **Consumer Behavior** (2) Introduce theories and concepts from psychology, sociology, economics, and other disciplines that are useful in understanding and marketing to consumers.
Effective: Summer 2002
Prerequisite: B A 500

MKTG 542 **New Product Development and Management** (2) Identify business opportunity, understand potential customer needs, and develop a new product from concept to virtual prototype.
Effective: Summer 2002
Prerequisite: B A 500

MKTG 543 (EBIZ 543) **e-Marketing** (2) Using the Internet and related technologies to enhance and transform marketing functions and processes.
Effective: Summer 2002
Prerequisite: EBIZ 501

MKTG 551 **Theoretical Perspectives on Buyer Behavior** (3) Review of marketing and social sciences research related to understanding consumer and market behavior.
Effective: Fall 1983

MKTG 552 **Marketing Theory** (3) Theory building in marketing; the intricate relation of theory and research.
Effective: Fall 1983

MKTG 553 **Development of Marketing Thought** (1) Analysis of major contributions to the development of marketing thought.
Effective: Fall 1983

MKTG 554 **Research Methods in Marketing** (3) Philosophical, methodological, and measurement issues involved in designing, conducting, analyzing, and interpreting research in marketing.
Effective: Fall 1983

MKTG 555 (MS&IS 555) **Marketing Models** (3) Topics in the model building approach to marketing decision making, focusing on current research issues.
Effective: Spring 1998

MKTG 556 **Marketing Management** (3) To explore the conceptual and applied dimensions of marketing management.
Effective: Summer 2008
Prerequisite: MKTG 551 Concurrent: MKTG 555

MKTG 571 **Marketing Strategy** (2) Examines business-level marketing issues and solutions to problems in competitive business environments.
Effective: Summer 2002
Prerequisite: B A 500

MKTG 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 2008

MKTG 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

MKTG 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

MKTG 597A **Marketing in Challenging Times** (3) This course focuses on marketing strategies and tactics that promote effective and efficient decision-making in uncertain environments. Today's difficult economic environment requires superior knowledge and decision-making skills. It's imperative that managers find and capitalize on market opportunities. This course will enhance and expand students' knowledge of key marketing concepts. Topics include understanding the customer base, managing customer relationships, leveraging the organization for marketing effectiveness, managing marketing resources and managing marketing effectiveness in the context of social networking.
Effective: Summer 2010 Ending: Summer 2010

MKTG 597A **Simply Bayesian** (3) This course focuses on two aspects of Bayesian Statistics: hierarchicial model building and inference using the Markov chain Monte Carlo algorithm.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MKTG 597B **Marketing 2.0** (3) Marketing and the environment in which it operates is rapidly changing. New ideas, concepts and technologies are permeating the company-customer relationship, which is forcing marketing into new territories. This special topics course will focus on understanding some of the current trends in marketing while also considering what the future will hold. It will enhance student knowledge as well as provide practical applications for use in real-world situations. Topics include social media, communities, sustainability, brand transformation, and new marketing tactics, among others.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MKTG 599 (IL) **Foreign Study--Marketing** (1-12) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in established exchange program

MKTG 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

MKTG 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1983

MKTG 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) No description available.
Effective: Fall 1982

MKTG 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

1 Smeal College of Business Administration course numbered 150 to 199 are not acceptable for the B.S. degree in Business at the University Park program.

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Materials Engineering Technology (MAE T)

No courses for department code **MAE T** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Materials Science and Engineering (MATSE)

MATSE 400 **Crystal Chemistry** (3) Principles of crystal chemistry applied to structures, structural defects and properties of organic, inorganic, intermetallic, and metallic crystals.
Effective: Summer 2007
Prerequisite: CHEM 112, CHEM 113, MATH 231, MATH 251, PHYS 214

MATSE 401 **Thermodynamics of Materials** (3) Review of equilibrium thermodynamics and applications to metallurgical and material systems.
Effective: Summer 2007
Prerequisite: CHEM 112, PHYS 214

MATSE 402 **Materials Process Kinetics** (3) A treatment of process kinetics including chemical reaction kinetics and momentum, energy and mass transport.
Effective: Spring 2001
Prerequisite: MATH 251, PHYS 214

MATSE 403 (BIOE 443) **Biomedical Materials** (3) Describe properties of materials and composites and their in vivo interactions.
Effective: Spring 2007
Prerequisite: MATSE 201

MATSE 404 (IL) (BIOE 444) **Surfaces and the Biological Response to Materials** (3) Focus is on the special properties of surfaces as an important causative and mediating agent in the biological response to materials.
Effective: Summer 2007
Prerequisite: CHEM 111, CHEM 113

MATSE 409 (NUC E 409) **Nuclear Materials** (3) Nuclear reactor materials: relationship between changes in material properties and microstructural evolution of nuclear cladding and fuel under irradiation.
Effective: Summer 2002
Prerequisite: PHYS 214

MATSE 410 **Phase Relations in Materials Systems** (3) Phase rule; construction and interpretations of equilibrium diagrams; importance of nonequilibrium in materials.
Effective: Fall 2006
Prerequisite: MATSE 201, MATSE 401 Concurrent: MATSE 201 MATSE 400 MATSE 430

MATSE 411 **Processing of Ceramics** (3) Principles of ceramic processing, including powder preparation and characterization, forming operations, and the basic phenomena underlying these operations.
Effective: Fall 2005
Prerequisite: MATSE 400, MATSE 402

MATSE 412 **Thermal Properties of Materials** (3) Generation of high temperatures, measurement of temperature, heat transfer and furnace design, thermal stability of ceramic materials, applied thermodynamics.
Effective: Fall 2005
Prerequisite: MATSE 259 orMATSE 201 Concurrent: MATSE 401

MATSE 413 **Solid-State Materials** (3) Structures of metallic, ionic, and covalent solids, amorphous materials, and surfaces; electronic structure; electronic properties of solids and their manipulation.
Effective: Spring 2001
Prerequisite: or concurrent:MATSE 201

MATSE 414 **Mechanical Properties of Ceramics** (3) This course will give students a fundamental understanding and appreciation for the relationship between the structure and mechanical behavior of ceramic materials.
Effective: Summer 2002
Prerequisite: E MCH 210, MATH 220, MATSE 201, MATSE 400, MATSE 430 Concurrent: MATSE 401

MATSE 415 **Introduction to Glass Science** (3) Composition, melting, fabrication, properties, and uses of glass; combinations of glass with metals and other materials.
Effective: Summer 2002
Prerequisite: MATSE 400, MATSE 401, MATSE 402, MATSE 462

MATSE 417 (E SC 417) **Electrical and Magnetic Properties** (3) Electrical conductivity, dielectric properties, piezoelectric and ferroelectric phenomena; magnetic properties of ceramics.
Effective: Spring 2007
Prerequisite: MATSE 400, MATSE 402, PHYS 214

MATSE 420 **Corrosion and Degradation of Engineering Materials** (3) General principles and forms of corrosion/degradation, preventative measures and designs which avoid corrosion and environmental degradation, failure analysis.
Effective: Summer 2002
Prerequisite: PHYS 212

MATSE 421 **Corrosion Engineering** (3) Industrial forms of corrosion and preventive methods, and their description in terms of basic thermodynamic and kinetic considerations.
Effective: Summer 2007
Prerequisite: CHEM 112, PHYS 212

MATSE 422 **Thermochemical Processing** (3) Physico-chemical aspects of high temperature extraction and processing of metals and alloys. Design and evaluation of processes and process options.
Effective: Summer 2002
Prerequisite: MATSE 401, MATSE 402

MATSE 424 **Materials Selection and Design** (1) Introduction to the selection and design of materials for structural applications.
Effective: Summer 2002
Prerequisite: MATSE 201 orMATSE 259

MATSE 425 **Processing of Metals** (3) Modern methods of shaping metals in liquid and solid states: casting, joining, powder and deformation processing. Design of new technology.
Effective: Fall 2006
Prerequisite: MATSE 402, MATSE 410

MATSE 426 (MN PR 426) **Aqueous Processing** (3) A study of the chemical and engineering principles pertinent to metal processing in aqueous systems: hydrometallurgical extraction, plating, materials preparation.
Effective: Fall 2009
Prerequisite: EME 301 orMATSE 401

MATSE 427 **Ferrous Physical Metallurgy** (3) Phase transformations in, and mechanical properties of ferrous systems; heat treatment principles.
Effective: Fall 2006
Prerequisite: MATSE 410, MATSE 424

MATSE 428 (E SC 455) **Electrochemical Methods in Corrosion Science and Engineering** (3) The objective of the course is to give students hands-on experience in assessing environmental degradation of engineering materials.
Effective: Summer 2002
Prerequisite: E SC 414M orMATSE 259;MATSE 420 orMATSE 421

MATSE 430 **Materials Characterization** (3) Elements of crystallography and the characterization of crystalline and non-crystalline materials using x-ray diffraction, electron microscopic, and other instrumental techniques.
Effective: Spring 2001
Prerequisite: PHYS 214

MATSE 435 **Optical Properties of Materials** (3) Electromagnetic spectrum, interaction of light with materials, color, thin film optical coatings, electro-, integrated and nonlinear optics.
Effective: Spring 1996
Prerequisite: MATSE 400

MATSE 436 **Mechanical Properties of Materials** (3) Fundamental relationships between structure and mechanical behavior of materials.
Effective: Summer 2002
Prerequisite: MATH 231, MATH 250 orMATH 251, PHYS 214, MATSE 201 orMATSE 259 orE SC 314

MATSE 440 (E MCH 440) **Nondestructive Evaluation of Flaws** (3) Methods and limitations of nondestructive evaluation of mechanical flaws; optical, acoustical, electromagnetic, x-ray, radiography, thermography, and dye techniques.
Effective: Spring 2008
Prerequisite: E MCH 213 orE MCH 210H orE MCH 210

MATSE 441 **Polymeric Materials I** (3) Manufacture of industrially significant polymers together with discussion of their major chemical, physical, and mechanical properties.
Effective: Summer 2007
Prerequisite: CHEM 210, MATH 231, PHYS 214

MATSE 442 **Polymer Synthesis** (3) Preparation of commercially useful polymers and their molecular structure characterization.
Effective: Fall 2002

MATSE 443 **Introduction to the Materials Science of Polymers** (3) Introduction to the nature and structure of high polymers. Characteristics of polymers and polymer systems.
Effective: Summer 2007
Prerequisite: CHEM 210, MATH 231, PHYS 214

MATSE 443H **Introduction to the Materials Science of Polymers** (3) Introduction to the nature and structure of high polymers. Characteristics of polymers and polymer systems.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: CHEM 210, MATH 231, PHYS 214

MATSE 444 **Solid State Properties of Polymeric Materials** (3) Structure/property relationships in the bulk solid state of polymers. Characterization of bulk properties and structure.
Effective: Spring 2003
Prerequisite: MATSE 443

MATSE 445 **Thermodynamics, Microstructure, and Characterization of Polymers** (3) The properties of individual polymer chains. Theoretical and experimental techniques pertaining to the characterization of polymeric microstructure.
Effective: Fall 2002
Prerequisite: MATSE 443

MATSE 446 **Mechanical and Electrical Properties of Polymers and Composities** (3) The mechanical (viscoelastic) and electric properties of polymers and poly-based composites.
Effective: Spring 2003
Prerequisite: MATSE 443

MATSE 447 **Rheology and Processing of Polymers** (3) This course deals with the fluid mechanics, rheology, and processing of polymeric materials.
Effective: Fall 2002
Prerequisite: MATSE 443

MATSE 448 (CH E 442) **Polymer Processing Technology** (3) Basic principles of polymer melt processing are reviewed and subsequently applied to the most important industrial processing operations.
Effective: Spring 2006
Prerequisite: MATSE 447 orCH E 302A

MATSE 450 (E SC 450) **Synthesis and Processing of Electronic and Photonic Materials** (3) The materials science of applying thin film coatings, etching, and bulk crystal growth; includes materials transport, accumulation, epitaxy, and defects.
Effective: Fall 2005
Prerequisite: MATSE 201 orE SC 414H sixth semester standing

MATSE 455 **Properties and Characterization of Electronic and Photonic Materials** (3) Materials characterization in general; electrical properties of crystals, contacts, films; optical properties of single phase materials, waveguide, and multilayer stacks.
Effective: Fall 2005
Prerequisite: MATSE 201 orE SC 414M, E SC 314

MATSE 460 **Introductory Laboratory in Materials** (1) An introduction to comparative physical properties and characteristics of various materials including mechanical, electrical thermal, and structure/ morphology.
Effective: Spring 2001
Prerequisite: or concurrent:MATSE 201

MATSE 461 **Introduction to Electronic and Photonic Materials Laboratory** (1) An introductory lab course to demonstrate important physical, thermal, and electronic properties of materials, as well as, methods of materials characterization.
Effective: Summer 2007
Prerequisite: CHEM 112, PHYS 214 Concurrent: MATSE 400

MATSE 462 **General Properties Laboratory in Materials** (1) An introduction to comparative physical properties of various materials including mechanical, thermal electrical properties and the measurement of said properties.
Effective: Spring 2005
Prerequisite: MATSE 460

MATSE 463 **Characterization and Processing of Electronic and Photonic Materials Laboratory** (1) Provides experience with key processing methods for EPM materials and advanced characterization methods for EPM materials and simple device structures.
Effective: Spring 2009
Prerequisite: MATSE 400, MATSE 430, MATSE 450, MATSE 455, MATSE 460 Concurrent: MATSE 450 MATSE 455

MATSE 468 **Ceramics Laboratory III** (1) Cermaic processing and powder characteristics.
Effective: Spring 2009
Prerequisite: MATSE 462

MATSE 471 **Metallurgy Laboratory I** (1) A laboratory integrating experimental aspects of material contained in MATSE 402, 413, and 410, e.g. phase diagram determination, solidification micro- structures, etc.
Effective: Fall 2005
Prerequisite: MATSE 430

MATSE 472 **Metallurgy Laboratory II** (1) Application of principles of mechanical metallurgy, pyroprocessing, corrosion and metal processing.
Effective: Fall 2006
Prerequisite: MATSE 410, MATSE 471

MATSE 473 **Polymeric Materials Laboratory--Synthesis** (1) Principles and practices of polymerization, including condensation, free radical (bulk, solution, suspension, emulsion), ionic, and Zeigler-Natta procedures.
Effective: Spring 2003
Prerequisite: MATSE 443

MATSE 474 **Polymeric Materials Laboratory--Characterization** (1) Principles and practices involved in determination of properties, structure and morphology, employing thermal, mechanical, spectroscopic, viscometric and computer techniques.
Effective: Spring 2003
Prerequisite: MATSE 443

MATSE 475 (E SC 475) **Particulate Materials Processing** (3) Fundamentals of processing particulate materials including production, characterization, handling, compaction, and sintering of metal, carbide, intermetallic, and composite powders.
Effective: Spring 2008
Prerequisite: E MCH 315, E SC 414 orMATSE 259

MATSE 483 (E SC 483) **Simulation and Design of Nanostructures** (3) Introduction to computer simulation techniques and their applications at the physical/life sciences interface.

Effective: Fall 2007
Prerequisite: PHYS 214 orE SC 312, MATH 230

MATSE 484W (IL) **International Internship in Materials: Research Definition and Methodology** (3) A course focused on international research, specific design and methodology, facilitated through the International Internship in Materials and Program.
Effective: Summer 2006
Prerequisite: Sixth-semester standing in Materials Science and Engineering;MATSE 201, MATSE 460, MATSE 492W satisfactory completion of cultural class from Office of Education Abroad

MATSE 485W (IL) **International Internship in Materials: Experimentation and Documentation** (3) A course focused on international research, specifically experimentation and documentation, facilitated through the International Internship in Materials Program.
Effective: Summer 2006
Prerequisite: Seventh-semester standing in Materials Science and Engineering;MATSE 484W ; satisfactory completion of cultural class from Office of Education Abroad

MATSE 492W **Materials Engineering Methodology and Design** (3) Designed to familiarize students with the literature and technology developments in the use of, and design with, materials in industrial applications.
Effective: Fall 2005
Prerequisite: sixth semester standing in Materials Science and Engineering

MATSE 494M **Research and Design Senior Project** (1-3) Continuation of a research problem in materials culminating in a bound thesis describing the work.
Effective: Fall 2007

MATSE 494W **Research and Design Senior Project** (1-3) Continuation of a research problem in materials culminating in a bound thesis describing the work.
Effective: Spring 2006

MATSE 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1994

MATSE 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1994

MATSE 497A **Physical Metallurgy of Structural Metals** (3) Understanding the physical metallurgy principles of steel, titanium, and aluminum, and using this knowledge for alloy selection and design.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MATSE 501 **Thermodynamics of Materials** (3) Application of thermodynamics to materials equilibria and processes, including solution theory, electrochemical processes, capillarity, and the effect of stresses.
Effective: Spring 2004
Prerequisite: MATSE 401 or equivalent

MATSE 503 **Kinetics of Materials Processes** (3) Introduction to application of transition state theory and mass transfer to the kinetics of materials and mineral processes.
Effective: Summer 2007
Prerequisite: MATH 250, CHEM 450;GEOSC 521 orMATSC 501

MATSE 505 **Irreversible and Statistical Thermodynamics of Materials** (3) Introduction to statistical and irreversible thermodynamics as applied to chemical and materials systems.
Effective: Spring 2007
Prerequisite: MATSE 401, MATSE 501 or instructor's permission

MATSE 506 **Interfacial Electrochemical Processes** (3) Survey of thermodynamic and kinetic fundamentals of electrochemical processes at interfaces.
Effective: Spring 2006

MATSE 507 (BIOE 517) **Biomaterials Surface Science** (3) Special properties of surfaces as an important causative and mediating agent in the biological response to materials.
Effective: Fall 2003

MATSE 508 (BIOE 508) **Biomedical Materials** (3) Properties and methods of producing metallic, ceramic, and polymeric materials used for biomedical applications.
Effective: Spring 2003

MATSE 511 **Instrumental Techniques Applied to Materials and Mineral Sciences Problems** (1-7) See units A through G for description.
Effective: Spring 2007

MATSE 511A (GEOSC 511A) **Powder X-Ray Diffraction** (1) Compound identification, lattice parameter measurement, and other applications of the powder diffraction method.
Effective: Spring 2005

MATSE 511B (GEOSC 511B) **Transmission Electron Microscopy** (1) Principles and practice of transmission electron microscope operation. Students undertake individual projects.
Effective: Spring 2005

MATSE 511C (GEOSC 511C) **Spectroscopy** (1) Emission spectrographic analysis of powders and atomic absorption analysis of solutions.
Effective: Spring 2005

MATSE 511D (GEOSC 511D) **Electron Microprobe Analysis** (1) Qualitative and quantitative elemental analysis of microvolumes within solids. Emphasis on individual student project.
Effective: Spring 2005

MATSE 511E (GEOSC 511E) **Scanning Electron Microscopy** (1) Principles and practice of scanning electron microscope operation. Students undertake individual projects.
Effective: Spring 2005

MATSE 511G (GEOSC 511G) **Analytical Electron Microscopy** (1) Modern analytical electron microscope techniques: scanning transmission electron microscopy; electron energy loss spectroscopy; energy dispersive analysis of x-rays.
Effective: Spring 2005
Prerequisite: MATSE 511B

MATSE 512 (GEOSC 512) **Principles of Crystal Chemistry** (3) Relation of structure to ionic size and nature; influence of pressure and temperature on structure; chemical-structural defects, crystalline solutions, phase-transitions.
Effective: Spring 2004

MATSE 514 **Characterization of Materials** (3) Classical and new (microprobe, scanning microscope, magnetic resonance, and Mossbauer) techniques for the characterization of composition, structure, defects, and surfaces.
Effective: Fall 2003

MATSE 518 **Wetting Properties of Materials: Theory and Practice** (3) Fundamentals of water wetting phenomenon are developed with special emphasis on thermodynamics of absorption and adhesion.
Effective: Summer 2004

MATSE 519 **Environmental Degradation of Materials in Nuclear Power Plants** (3) Degradation of materials performance when exposed to the combination of high temperature, neutron irradiation and aggressive electrochemistry found in nuclear reactors.
Effective: Fall 2003
Prerequisite: MATSE 409 orMATSE 420

MATSE 523 (NUC E 523) **Environmental Degradation of Materials in Nuclear Power Plants** (3) Degradation of materials performance when exposed to the combination of high temperature, neutron irradiation, and aggressive electrochemistry found in nuclear reactors.
Effective: Spring 2007
Prerequisite: MATSE 409 orMATSE 420

MATSE 526 (E E 526) **Nonlinear Optical Materials** (3) Mechanisms of polarization nonlinearity, nonlinearity, nonlinear optical processes and analyses, optoelectronic materials and their device application.
Effective: Spring 2006
Prerequisite: E E 420 orMATSE 435

MATSE 530 **X-Ray Crystallography and Diffraction** (3) Reciprocal lattices and the Ewald sphere construction; crystal structure determination by powder and single crystal techniques; space groups.
Effective: Fall 2003
Prerequisite: MATSE 430

MATSE 531 **Transmission Electron Microscopy** (3) Diffraction pattern analysis and simple contrast theory applied to the structures of materials; analytical techniques in the microscope.
Effective: Fall 2003

MATSE 535 **Geometrical Crystallography** (3) Derivation of lattices, types, point groups, and space groups; and group theory applied to crystallography and spectroscopy.
Effective: Spring 2003

MATSE 536 **Techniques for Surface Analysis** (3) Electron spectroscopy, low-energy ion-beam techniques, high-energy ion-beam techniques, low-energy electron diffraction, and ellipsometry.
Effective: Spring 2007

Prerequisite: PHYS 203 orPHYS 204

MATSE 540 **Crystal Anisotropy** (3) Symmetry aspects of crystals and physical properties. Matrix and tensor methods.
Effective: Spring 2003
Prerequisite: PHYS 412

MATSE 542 **Polymeric Materials: The Solid State** (3) Introduction to the fundamental concepts necessary to understand solid state structure and properties of polymer materials.
Effective: Summer 2004
Prerequisite: MATSE 443 andMATSE 445 or equivalent

MATSE 543 (CHEM 543) **Polymer Chemistry** (3) This graduate course discusses recent advances in polymer chemistry that leads to new polymeric materials with interesting structures and properties.
Effective: Spring 2005
Prerequisite: MATSE 441 or approval of program

MATSE 544 **Computational Materials Science of Soft Materials** (3) Pursue applications of computational modeling methods to soft materials; explore use of these methods to different research areas.
Effective: Summer 2009

MATSE 545 **Mechanical Properties of Ceramics I** (3) Theoretical considerations of the crystallographic and microstructural aspects of the elastic properties and fracture characteristics of ceramics.
Effective: Spring 2003

MATSE 547 **Thermophysical Properties of Ceramics** (3) Heat capacity, heat of fusion, thermal conductivity, and thermal expansion in relation to macroscopic measurements and basic atomic concepts applied to ceramic materials.
Effective: Spring 2003

MATSE 548 **Dielectric and Other Electroceramics** (3) Preparation and properties of ceramic semiconductors, dielectrics, and magnetic materials.
Effective: Spring 2003

MATSE 549 **Composite Materials** (3) Manufacturing processes, atomic and molecular background, and topological relationships of macro- and microstructure to the physical properties of composites.
Effective: Spring 2003

MATSE 551 **Chemical Routes to Engineered Materials** (3) Formation of ceramics by reaction bonding, sol-gel processing, hydrothermal synthesis, controlled oxidation processes, biological mineralization; relevant multicomponent phase equilibria and interfacial phenomena.
Effective: Spring 2003

MATSE 552 **Sintering of Ceramics** (3) Design and interpretation of ceramic microstructures through an understanding of the physics and chemistry of sintering and grain growth.
Effective: Spring 2003
Prerequisite: MATSE 411

MATSE 554 **Electronic Spectra of Materials** (3) Crystallographic and thermodynamic applications of crystal field theory. Electronic spectra of crystals and glasses. Luminescent spectra and phosphor characterization.
Effective: Spring 2003
Prerequisite: PHYS 471

MATSE 555 (PHYS 555) **Polymer Physics I** (3) Introduction to the fundamental concepts needed to understand the physics applicable to polymer melts, solutions and gels.
Effective: Spring 2006

MATSE 560 (MN PR 507) **Hydrometallurgical Processing** (3) Fundamental physico-chemical factors underlying the aqueous extraction and recovery of metals and nonmetals from ores, minerals, and scrap metal.
Effective: Fall 2003
Prerequisite: MATSE 426

MATSE 561 **Metal Electrode Reactions** (2-3) Evaluation of electrode reaction mechanisms and kinetics at metal/electrolyte interfaces relevant to corrosion and industrial electrolyte processes.
Effective: Spring 2003
Prerequisite: MATSE 421

MATSE 562 **Solid to Solid Phase Transformations** (3) Mechanisms and rate-determining factors in solid-phase reactions in metals; diffusion processes, nucleation theory, precipitations from solid solution, eutectoid decomposition and order-disorder phenomena.
Effective: Spring 2003

MATSE 563 (E MCH 534) **Micromechanisms of Fracture** (3) Mechanisms of fracture and their relationship to loading conditions, environment, flow behavior, processing history, and microstructure.
Effective: Spring 2003

Prerequisite: E SC 414M, MATSE 424

MATSE 564 (E MCH 535) **Deformation Mechanisms in Materials** (3) Deformation of crystalline/amorphous solids and relationship to structure; elastic, viscoelastic and plastic response over a range of temperatures and strain rates.
Effective: Fall 2004
Prerequisite: E SC 414M orMATSE 436

MATSE 565 **Metals in Electronics** (3) Processing and performance of metals in electronics, covering electrical resistivity, metal film deposition, metal/semiconductor contacts, interconnects, and electronic packaging.
Effective: Summer 2002

MATSE 570 (EME 570) **Catalytic Materials** (3) Preparation and characterization of solid catalytic materials and the relationships between their surface, defect, and electronic properties and catalytic activity.
Effective: Fall 2008
Prerequisite: CHEM 452 or similar course in chemical materials or energy sciences and engineering

MATSE 575 **Functional Polymeric Materials** (3) In-depth discussions of structure/property relationships in functional polymers and modern concepts of polymerization methods.
Effective: Spring 2006

MATSE 580 **Computational Thermodynamics** (3) The integration of fundamental principles and advanced computational approaches in the thermodynamics of materials, including hands-on computation, theory and application.
Effective: Summer 2007
Prerequisite: MATSE 501 or equivalent

MATSE 581 **Computational Materials Science II: Continuum, Mesocale Simulations** (3) This course will focus on computational techniques and fundamentals of phase transformation simulations on the continuum, mesocale level.
Effective: Spring 2008
Prerequisite: MATSE 501 andMATSE 503

MATSE 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 2004

MATSE 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2004

MATSE 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2003

MATSE 597A **Precipitation of Particles from Solution** (3) The objective of this course is to provide a concise description of topics important to a fundamental understanding of the interactions of materials with solvents, particularly during the precipitation and particle formation in aqueous solution.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATSE 597A **Polymers in Energy Reserach** (3) The course covers fundamentals and current literature of chemistry, nanostructure, transport physics, and molecular design for ionic and electronic polymers.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MATSE 597B **Glass Colloquia** (1) This cooperative distance course will build on the Structure of Glass course (MATSE 597) by focusing on the physical properties of glass and their scientific correlation with structure and composition. The course will be presented by faculty at nine different Universities across the US using the Internet. The classes at each site will convene as a group to facilitate discussion.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATSE 597B **Dispersion of Inorganic Powders in Liquids** (3) Principles of colloid and interfacial science used to disperse ceramic and metal powders in liquids with practical examples.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MATSE 597C **Solid State Materials Physics** (3) Crystal Structure, Diffraction theory, Free-electron theory, electronic band structure, Semiconductors, Phonons, Magnetism, Optical properties, ferroelectricity, superconductivity.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATSE 597C (CH E 597C) **Surface and Interface Characterization** (3) This course studies the principles and applications of various types of surface and interface characterization techniques that are frequently used.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MATSE 597D (E SC 597A) **Microwave Processing of Materials: Theory and Practice** (3) It is the new developments (and

innovative ideas) in the area of materials processing which have had the most profound and wide-ranging impacts on satisfying the growing and challenging demands for better performing and cheaper products in various fields.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATSE 597D **Professional Development** (1) Professional principles in the conduct and ethics of research management, research dissemination/publication, and intellectual property.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MATSE 597E **Advanced Topics in Mechanical Behavior of Materials** (3) This course will explore advanced topics in mechanical behavior and how various length scales control deformation and failure of materials.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: E SC 414M orMATSE 436

MATSE 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 2003

MATSE 600 **Thesis Research** (1-15) No description.
Effective: Spring 2004

MATSE 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 2004

MATSE 602 **Supervised experience in college teaching** (1-3 per semester/maximum of 6) Supervised assistance with the teaching program in metallurgy.
Effective: Spring 2004

MATSE 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 2007

MATSE 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2008

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Mathematics (MATH)

MATH 401 **Introduction to Analysis I** (3) Review of calculus, properties of real numbers, infinite series, uniform convergence, power series. Students who have passed Math. 403 may not schedule this course.
Effective: Fall 1983
Prerequisite: MATH 230 orMATH 231

MATH 403 **Classical Analysis I** (3) Topology of Rn, compactness, continuity of functions, uniform convergence, Arzela-Ascoli theorem in the plane, Stone-Wierstrass theorem.
Effective: Spring 1996
Prerequisite: MATH 312

MATH 403H **Honors Classical Analysis I** (3) Development of a thorough understanding and technical mastery of foundations of classical analysis in the framework of metric spaces.
Effective: Spring 2010
Prerequisite: MATH 311M, MATH 312H

MATH 404 **Classical Analysis II** (3) Differentiation of functions from Rn to Rm, implicit function theorem, Riemann integration, Fubini's theorem, Fourier analysis.
Effective: Fall 1985
Prerequisite: MATH 403

MATH 405 **Advanced Calculus for Engineers and Scientists I** (3) Vector calculus, linear algebra, ordinary and partial differential equatinos. Students who have passed MATH 411 or 412 may not take this course for credit.
Effective: Spring 1994
Prerequisite: MATH 231;MATH 250 orMATH 251

MATH 406 **Advanced Calculus for Engineers and Scientists II** (3) Complex analytic functions, sequences and series, residues, Fourier and Laplace transforms. Students who have passed MATH 421 may not take this course for credit.
Effective: Spring 1994
Prerequisite: MATH 405

MATH 408 **Advanced Calculus** (3) Differential and integral calculus of functions of several variables, line and surface integrals, infinite series, series of functions, power series.
Effective: Spring 2007
Prerequisite: MATH 141

MATH 411 **Ordinary Differential Equations** (3) Linear ordinary differential equations; existence and uniqueness questions; series solutions; special functions; eigenvalue problems; Laplace transforms; additional topics and applications.
Effective: Fall 1983
Prerequisite: MATH 230 orMATH 231;MATH 250 orMATH 251

MATH 412 **Fourier Series and Partial Differential Equations** (3) Orthogonal systems and Fourier series; derivation and classification of partial differential equations; eigenvalue function method and its applications; additional topics.
Effective: Spring 2009
Prerequisite: MATH 230;MATH 250 orMATH 251

MATH 414 (STAT 414) **Introduction to Probability Theory** (3) Probability spaces, discrete and continuous random variables, transformations, expectations, generating functions, conditional distributions, law of large numbers, central limit theorems. Students may take only one course from MATH(STAT) 414 and 418 for credit.
Effective: Fall 2001
Prerequisite: MATH 230 orMATH 231

MATH 415 (STAT 415) **Introduction to Mathematical Statistics** (3) A theoretical treatment of statistical inference, including sufficiency, estimation, testing, regression, analysis of variance, and chi-square tests.
Effective: Fall 1989
Prerequisite: MATH 414

MATH 416 (STAT 416) **Stochastic Modeling** (3) Review of distribution models, probability generating functions, transforms, convolutions, Markov chains, equilibrium distributions, Poisson process, birth and death processes, estimation.
Effective: Spring 1984
Prerequisite: MATH 318 orMATH 414;MATH 230

MATH 417 **Qualitative Theory of Differential Equations** (3) Linear differential equations, stability of stationary solutions, ordinary bifurcation, exchange of stability, Hopf bifurcation, stability of periodic solutions, applications.
Effective: Spring 2009
Prerequisite: MATH 220;MATH 250 orMATH 251

MATH 418 (STAT 418) **Probability** (3) Fundamentals and axioms, combinatorial probability, conditional probability and independence, probability laws, random variables, expectation; Chebyshev's inequality. Students may take only one course from MATH(STAT) 414 and 418 for credit.
Effective: Fall 2001
Prerequisite: MATH 230 orMATH 231

MATH 419 (PHYS 419) **Theoretical Mechanics** (3) Principles of Newtonian, Lagrangian, and Hamiltonian mechanics of particles with applications to vibrations, rotations, orbital motion, and collisions.

Effective: Spring 2007
Prerequisite: MATH 230 orMATH 231;MATH 250 orMATH 251;PHYS 212, PHYS 213 andPHYS 214

MATH 420 **Elementary Introduction to Chaotic Dynamics and Fractal Geometry** (3) An introduction to the theory of fractals for undergraduates in mathematics, science, engineering, economics, and computer science.
Effective: Summer 2000
Prerequisite: MATH 140, MATH 141, MATH 220 orMATH 110, MATH 111, MATH 220

MATH 421 **Complex Analysis** (3) Infinite sequences and series; algebra and geometry of complex numbers; analytic functions; integration; power series; residue calculus; conformal mapping, applications.
Effective: Summer 1993
Prerequisite: MATH 230, MATH 232 orMATH 405;MATH 401 orMATH 403

MATH 422 **Wavelets and Fourier Analysis: Theory and Applications** (3) Fundamental mathematical issues of the theory of wavelets for senior undergraduate and graduate students in mathematics, engineering, physics, and computer science.
Effective: Summer 2000
Prerequisite: complete one of the following:MATH 312, MATH 401, MATH 403, MATH 405 orMATH 412

MATH 425 **Introduction to Operations Research** (3) Nature of operations research, problem formulation, model construction, deriving solution from models, allocation problems, general linear allocation problem, inventory problems.
Effective: Spring 2007
Prerequisite: MATH 141

MATH 426 **Introduction to Modern Geometry** (3) Plane and space curves; space surfaces; curvature; intrinsic geometry of surfaces; Gauss-Bonnet theorem; covariant differentiation; tensor analysis.
Effective: Spring 1994
Prerequisite: MATH 401 orMATH 403

MATH 427 **Foundations of Geometry** (3) Euclidean and various non-Euclidean geometries and their development from postulate systems. Students who have passed MATH 427 may not schedule MATH 471.
Effective: Spring 1994
Prerequisite: MATH 230 orMATH 231

MATH 428 **Geometry for Teachers** (1) Research in mathematics education using ideas from Euclidean and non-Euclidean geometry. Students who have passed MATH 471 may not schedule MTHBD 478.
Effective: Spring 2007
Prerequisite: MATH 311W . Prerequisite or concurrent:MATH 427

MATH 429 **Introduction to Topology** (3) Metric spaces, topological spaces, separation axioms, product spaces, identificaiton spaces, compactness, connectedness, fundamental group.
Effective: Spring 1994
Prerequisite: MATH 311W

MATH 430 **Linear Algebra and Discrete Models I** (3) Vector spaces, linear transformations, matrices determinants, characteristic values and vectors, systems of linear equations, applications to discrete models.
Effective: Spring 2010
Prerequisite: MATH 220

MATH 431 **Linear Algebra and Discrete Models II** (3) Vector spaces and linear transformations, matrices, determinants, characteristics values and vectors, systems of linear equations, applications to discrete models.
Effective: Spring 2007
Prerequisite: MATH 430

MATH 435 **Basic Abstract Algebra** (3) Elementary theory of groups, rings, and fields. Students who have passed MATH 435 may not schedule MATH 470.
Effective: Fall 1983
Prerequisite: MATH 311W

MATH 435 **Basic Abstract Algebra** (3) Elementary theory of groups, rings, and fields. Students who have passed MATH 435 may not schedule MATH 470.
Effective: Spring 2010
Prerequisite: MATH 311W orMATH 315

MATH 436 **Linear Algebra** (3) Vector spaces and linear transformations, canonical forms of matrices, elementary divisors, invariant factors; applications. Students who have passed MATH 436 may not schedule MATH 441.
Effective: Fall 1983
Prerequisite: MATH 311W

MATH 437 **Algebraic Geometry** (3) Study of curves in the plane defined by polynomial equations p(x,y)= 0. Projective equivalence, singular points, classification of cubics.
Effective: Spring 2009
Prerequisite: MATH 230 orMATH 231;MATH 311W

MATH 441 **Matrix Algebra** (3) Determinants, matrices, linear equations, characteristic roots, quadratic forms, vector spaces. Students who have passed Math 436 may not schedule this course.
Effective: Fall 1985
Prerequisite: MATH 220

MATH 444 **Mathematical Statistics and Applications I** (3) Distributions of random variables, special distributions, limiting distributions, sampling, statistical inference, point and interval estimation, orthogonal polynomials, and least squares.

Effective: Spring 2007
Prerequisite: MATH 141

MATH 445 **Mathematical Statistics and Applications II** (3) Further topics in point estimation, statistical hypotheses, other statistical tests, nonparametric methods.
Effective: Spring 2007
Prerequisite: MATH 444

MATH 446 **Introduction to Applied Statistics I** (3) Descriptive statistics, probability theory, discrete and continuous probability distributions, statistical inferences for means and proportions.
Effective: Spring 2007
Prerequisite: MATH 022 orMATH 040

MATH 447 **Introduction to Applied Statistics II** (3) Regression, correlation, analysis of variance, contingency tables, nonparametric methods, time series, index numbers.
Effective: Spring 2007

MATH 448 **Sampling Methods and Practice and Experimental Design** (3) An introduction to the procedures and techniques of statistical sampling methods and experimental design.
Effective: Spring 2007
Prerequisite: MATH 444, MATH 445

MATH 449 **Applied Ordinary Differential Equations** (3) Differential and difference equations and their application to biology, chemistry, and physics; techniques in dynamical systems theory.
Effective: Spring 2007
Prerequisite: MATH 250 orMATH 251

MATH 450 **Mathematical Modeling** (3) Constructing mathematical models of physical phenomena; topics include pendulum motion, polymer fluids, chemical reactions, waves, flight, and chaos.
Effective: Spring 2007
Prerequisite: MATH 315 andMATH 430 orMATH 405 orMATH 412

MATH 451 (CMPSC 451) **Numerical Computations** (3) Algorithms for interpolation, approximation, integration, nonlinear equations, linear systems, fast FOURIER transform, and differential equations emphasizing computational properties and implementation. Students may take only one course for credit from MATH 451 and 455.
Effective: Spring 2008
Prerequisite: 3 credits of programming;MATH 230 orMATH 231

MATH 455 (CMPSC 455) **Introduction to Numerical Analysis I** (3) Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems. Students may take only one course for credit from MATH 451 and MATH 455.
Effective: Spring 2008
Prerequisite: CMPSC 201, CMPSC 202 orCMPSC 121;MATH 220;MATH 230 orMATH 231

MATH 456 (CMPSC 456) **Introduction to Numerical Analysis II** (3) Polynomial and piecewise polynomial approximation, matrix least squares problems, numerical solution of eigenvalue problems, numerical solution of ordinary differential equations.
Effective: Spring 2008
Prerequisite: MATH 455

MATH 457 **Introduction to Mathematical Logic** (3) Propositional logic, first-order predicate logic, axioms and rules of inference, structures, models, definability, completeness, compactness.
Effective: Fall 1983
Prerequisite: MATH 311W orPHIL 212 ; 3 additional credits in philosophy

MATH 459 **Computability and Unsolvability** (3) An introduction to the theory of recursive functions; solvable and unsolvable decision problems; applications.
Effective: Fall 1983
Prerequisite: MATH 311W

MATH 461 (PHYS 461) **Theoretical Mechanics** (3) Continuation of Math.(Phys.) 419. Theoretical treatment of dynamics of a rigid body, theory of elasticity, aggregates of particles, wave motion, mechanics of fluids.
Effective: Fall 1986
Prerequisite: MATH 419

MATH 465 **Number Theory** (3) Elements, divisibility of numbers, congruences, residues, and forms.
Effective: Spring 2009
Prerequisite: MATH 311W

MATH 467 (CMPSC 467) **Factorization and Primality Testing** (3) Prime sieves, factoring, computer numeration systems, congruences, multiplicative functions, primitive roots, cryptography, quadratic residues. Students who have passed MATH 465 may not schedule this course.
Effective: Spring 1995
Prerequisite: MATH 311W

MATH 468 **Mathematical Coding Theory** (3) Shannon's theorem, block codes, linear codes, Hamming codes, Hadamard codes, Golay codes, Reed-Muller codes, bounds on codes, cyclic codes.
Effective: Fall 1983
Prerequisite: MATH 311W ; advanced calculus

MATH 469 **Mathematics of Algorithms** (3) Binomial identities; recurrence relations, operator methods; asymptotic methods.
Effective: Fall 1983
Prerequisite: advanced calculus

MATH 470 **Algebra for Teachers** (3) An introduction to algebraic structures and to the axiomatic approach, including the elements of linear algebra. Designed for teachers and prospective teachers. Students who have passed Math 435 may not schedule this course.
Effective: Fall 1988
Prerequisite: MATH 311W

MATH 471 **Geometry for Teachers** (4) Problem solving oriented introduction to Euclidean and non-Euclidean geometries; construction problems and geometrical transformations via "Geometer's Sketchpad" software. Intended primarily for those seeking teacher certification in secondary mathematics. Students who have passed MATH 427 may not schedule this course.
Effective: Spring 1996
Prerequisite: MATH 311W

MATH 475 (US;IL) **Introduction to the History of Mathematics** (3) A global survey of the history of mathematics as viewed as a human response to cultural, political, economic, and societal pressures.
Effective: Spring 2010
Prerequisite: CMATH 221 orMATH 141

MATH 475W (US;IL) **History of Mathematics** (3) A global survey of the history of mathematics as viewed as a human response to cultural, political, economic, and societal pressures.
Effective: Spring 2010
Prerequisite: MATH 141

MATH 479 (PHYS 479) **Special and General Relativity** (3) Mathematical description, physical concepts, and experimental tests of special and general relativity.
Effective: Spring 2007
Prerequisite: PHYS 237, PHYS 400, PHYS 419;MATH 250 orMATH 251;MATH 230 orMATH 231

MATH 481 **Life Contingencies I** (3) A study of the mathematical theory of life contingencies; single-life functions and their applications.
Effective: Spring 2007
Prerequisite: MATH 444, MATH 445, MATH 480

MATH 482 **Mathematical Methods of Operations Research** (3) Survey of linear and nonlinear programming; mathematics of optimization; queues; simulation.
Effective: Spring 2007
Prerequisite: MATH 220, MATH 230, STAT 301

MATH 483 **Applied Modern Algebra II** (3) Semigroups, groups, permutation groups, machines, Polya enumeration theory, switching functions, de Bruijn's theorem, fast adders.
Effective: Fall 1986
Prerequisite: MATH 311W

MATH 484 **Linear Programs and Related Problems** (3) Introduction to theory and applications of linear programming; the simplex algorithm and newer methods of solution; duality theory.
Effective: Spring 1987
Prerequisite: MATH 220;MATH 230 orMATH 231

MATH 485 **Graph Theory** (3) Introduction to the theory and applications of graphs and directed graphs. Emphasis on the fundamental theorems and their proofs.
Effective: Spring 1987
Prerequisite: MATH 311W

MATH 486 **Mathematical Theory of Games** (3) Basic theorems, concepts, and methods in the mathematical study of games of strategy; determination of optimal play when possible.
Effective: Spring 2006
Prerequisite: MATH 220

MATH 493 **Mathematics Recitation Instructor Training** (1 per semester/maximum of 3) Instruction and practice in the role of recitation instructor.
Effective: Fall 1983
Prerequisite: 18 credits in mathematics

MATH 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1995

MATH 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

MATH 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2007

Prerequisite: prior approval of proposed assignment by instructor

MATH 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

MATH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narow subject which may be topical or of special interest.
Effective: Fall 1983

MATH 497A **Function Field Arithmetic** (4) Formal courses given infrequently to explore, in depth, a comparatively narow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 497B **Differential Equations from an Algebraic Perspective** (4) Formal courses given infrequently to explore, in depth, a comparatively narow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 497C **Dynamics, Mechanics and Geometry** (4) Formal courses given infrequently to explore, in depth, a comparatively narow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 497D **MASS Interdisciplinary Seminar** (3) Formal courses given infrequently to explore, in depth, a comparatively narow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 497E **MASS Colloquium** (1) Formal courses given infrequently to explore, in depth, a comparatively narow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 497F **Complex Analysis for Mathematics and Engineering** (3) Complex analysis with applications to science and engineering, complex algebra, analytic functions, complex contour integrals, series representations, residue theory.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: MATH 230

MATH 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

MATH 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

MATH 501 **Complex and Real Analysis I** (3) Cauchy's theorem, Laurent expansion, residue calculus, harmonic functions, conformal mapping, measure and integration, convergence theorems, LP spaces, Hilbert spaces.
Effective: Spring 1994
Prerequisite: MATH 404

MATH 502 **Complex and Real Analysis II** (3) Fourier analysis, Fubini's theorem, Hahn-Banach theorem, open mapping theorem, uniform boundedness principle, dual spaces, selected topics from functional analysis.
Effective: Spring 1992
Prerequisite: MATH 501

MATH 503 **Functional Analysis** (3) Topological vector spaces, completeness, convexity, duality, banach algebras, bounded operators on Hilbert space, the spectral theorem, unbounded operators, applications.
Effective: Spring 1992
Prerequisite: MATH 502

MATH 504 **Analysis in Euclidean Space** (3) The Fourier transform in L1 and L2 and applications, interpolation of operators, Riesz and Marcinkiewics theorems, singular integral operators.
Effective: Spring 1992
Prerequisite: MATH 502

MATH 505 **Mathematical Fluid Mechanics** (3) Kinematics, balance laws, constitutive equations; ideal fluids, viscous flows, boundary layers, lubrication; gas dynamics.
Effective: Spring 1992
Prerequisite: MATH 402 orMATH 404

MATH 506 **Ergodic Theory** (3) Measure-preserving transformations and flows, ergodic theorems, ergodicity, mixing, weak mixing, spectral invariants, measurable partitions, entropy, ornstein isomorphism theory.
Effective: Spring 1992
Prerequisite: MATH 502

MATH 507 **Dynamical Systems I** (3) Fundamental concepts; extensive survey of examples; equivalence and classification of dynamical systems, principal classes of asymptotic invariants, circle maps.
Effective: Spring 1992
Prerequisite: MATH 502

MATH 508 **Dynamical Systems II** (3) Hyperbolic theory; stable manifolds, hyperbolic sets, attractors, Anosov systems, shadowing, structural stability, entropy, pressure, Lyapunov characteristic exponents and non-uniform hyperbolicity.
Effective: Spring 1992
Prerequisite: MATH 507

MATH 509 **Linear Analysis and Applications I** (3) Vector spaces, linear transformations, integration, Fourier and Laplace transforms, distributions, differential operators.
Effective: Spring 1992
Prerequisite: MATH 401, MATH 411 orMATH 412

MATH 510 **Linear Analysis and Applications II** (3) Integral equations, compact operators, variational methods, partial differential equations.
Effective: Spring 1992
Prerequisite: MATH 509

MATH 511 **Ordinary Differential Equations I** (3) Existence and uniqueness, linear systems, series methods, Poincare-Bendixson theory, stability.
Effective: Spring 1992
Prerequisite: MATH 411 orMATH 412

MATH 512 **Ordinary Differential Equations II** (3) Floquet theory, regular and singular boundary value problems, Green's functions, eigenfunction expansions.
Effective: Spring 1992
Prerequisite: MATH 511

MATH 513 **Partial Differential Equations I** (3) First order equations, the Cauchy problem, Cauchy-Kowalevski theorem, Laplace equation, wave equation, heat equation.
Effective: Spring 1992
Prerequisite: MATH 411 orMATH 412

MATH 514 **Partial Differential Equations II** (3) Sobolev spaces and Elliptic boundary value problems, Schauder estimates. Quasilinear symmetric hyperbolic systems, conservation laws.
Effective: Spring 1992
Prerequisite: MATH 502, MATH 513

MATH 515 **Classical Mechanics and Variational Methods** (3) Introduction to the calculus of variations, variational formulation of Lagrangian mechanics, symmetry in mechanical systems, Legendre transformation, Hamiltonian mechanics, completely integrable systems.
Effective: Spring 1992
Prerequisite: MATH 401, MATH 411 orMATH 412

MATH 516 **Stochastic Processes** (3) Markov chains; generating functions; limit theorems; continuous time and renewal processes; martingales, submartingales, and supermartingales; diffusion processes; applications.
Effective: Summer 1995
Prerequisite: MATH 416

MATH 517 (STAT 517) **Probability Theory** (3) Measure theoretic foundation of probability, distribution functions and laws, types of convergence, central limit problem, conditional probability, special topics.
Effective: Summer 2000
Prerequisite: MATH 403

MATH 518 (STAT 518) **Probability Theory** (3) Measure theoretic foundation of probability, distribution functions and laws, types of convergence, central limit problem, conditional probability, special topics.
Effective: Fall 1983
Prerequisite: STAT 517

MATH 519 (STAT 519) **Topics in Stochastic Processes** (3) Selected topics in stochastic processes, including Markov and Wiener processes; stochastic integrals, optimization, and control; optimal filtering.
Effective: Fall 1984
Prerequisite: STAT 516, STAT 517

MATH 521 **Complex Analysis: Theory and Applications I** (3) Conformal mappings, Schwarz-Cristoffel transformations, Dirichlet and Neumann problems, electrostatics and fluid flow, transform methods, asymptotic methods, Runge approximation theorems.
Effective: Spring 1992
Prerequisite: MATH 502

MATH 522 **Compled Analysis: Theory and Applications II** (3) Factorization theorems, prime number theorem, Mittag-Leffler theorem, Nevanlinna theory, Riemann surfaces, Hartog's theorems holomorphic mappings and automorphisms of bounded domains.
Effective: Spring 1992
Prerequisite: MATH 521

MATH 523 **Numerical Analysis I** (3) Approximation and interpolation, numerical quadrature, direct methods of numerical linear algebra, numerical solutions of nonlinear systems and optimization.
Effective: Summer 2002

Prerequisite: MATH 456

MATH 524 **Numerical Analysis II** (3) Iterative methods in linear algebra, numerical solution of ordinary and partial differential equations.
Effective: Summer 2002
Prerequisite: MATH 523

MATH 525 **Theory of Functions of Several Complex Variables** (3) Fundamental properties of holomorphic functions, reproducing kernels, integral representations, domain of holomorphy and pseudoconvexity, Weierstrass preparation theorem, complex manifolds.
Effective: Spring 1992
Prerequisite: MATH 502

MATH 527 **Geometry and Topology I** (3) Topological spaces and continuous mappings, connectedness, compactness and separation, fundamental groups, Jordan curve theorem, singular homology, Brouwer fixed point theorem.
Effective: Spring 1992
Prerequisite: MATH 429

MATH 528 **Geometry and Topology II** (3) Manifolds, differentiable structures, implicit function theorem, vector fields and differential equations, differential forms, Poincare Lemma, integration, Stokes theorem, Derham's theorem.
Effective: Spring 1992
Prerequisite: MATH 527

MATH 529 **Algebraic Topology** (3) Manifolds, Poincare duality, vector bundles, Thom isomorphism, characteristic classes, classifying spaces for vector bundles, discussion of bordism, as time allows.
Effective: Spring 1992
Prerequisite: MATH 528

MATH 530 **Differential Geometry** (3) Distributions and Frobenius theorem, curvature of curves and surfaces, Riemannian geometry, connections, curvature, Gauss-Bonnet theorem, geodesic and completeness.
Effective: Spring 1992
Prerequisite: MATH 528

MATH 531 **Differential Topology** (3) DeRham's theorem, geometry of smooth mappings, critical values, Sard's theorem, Morse functions, degree of mappings, smooth fiber bundles.
Effective: Spring 1992
Prerequisite: MATH 528

MATH 533 **Lie Theory I** (3) Lie groups, lie algebras, exponential mappings, subgroups, subalgebras, simply connected groups, adjoint representation, semisimple groups, infinitesimal theory, Cartan's criterion.
Effective: Spring 1992
Prerequisite: MATH 528

MATH 534 **Lie Theory II** (3) Representations of compact lie groups and semisimple lie algebras, characters, orthogonality, Peter-Weyl theorem, Cartan-Weyl highest weight theory.
Effective: Spring 1992
Prerequisite: MATH 533

MATH 535 **Algebra** (3) Permutation groups, Sylow theorems, Jordan-Holder theorem, polynomial rings, unique factorization domains, algebraic and transcendental field extensions, Galois theory.
Effective: Fall 1983
Prerequisite: MATH 435 and a course in linear algebra

MATH 536 **Algebra** (3) Permutation groups, Sylow theorems, Jordan-Holder theorem, polynomial rings, unique factorization domains, algebraic and transcendental field extensions, Galois theory.
Effective: Fall 1983
Prerequisite: MATH 535

MATH 537 **Field Theory** (3) Finite and infinite algebraic extensions; cyclotomic fields; transcendental extensions; bases of transcendence, Luroth's theorem, ordered fields, valuations; formally real fields.
Effective: Fall 1983
Prerequisite: MATH 536

MATH 538 **Commutative Algebra** (3) Topics selected from Noetherian rings and modules, primary decompositions, Dedekind domains and ideal theory, other special types of commutative rings or fields.
Effective: Winter 1978
Prerequisite: MATH 536

MATH 539 **Ring Theory** (3) Selected topics including Noetherian and Artinian modules and rings, semisimple rings, Wedderburn theorems, Jacobson radical and density theorem.
Effective: Fall 1983
Prerequisite: MATH 536

MATH 540 **Ring Theory** (3) Selected topics including Noetherian and Artinian modules and rings, semisimple rings, Wedderburn theorems, Jacobson radical and density theorem.
Effective: Fall 1983
Prerequisite: MATH 539

MATH 542 **Group Theory I** (3) Topics selected by instructor from abelian, solvable, and nilpotent groups; finite presentations; free products; group extensions; group representations.
Effective: Fall 1983

Prerequisite: MATH 535

MATH 543 **Group Theory II** (3) Topics selected by instructor from abelian, solvable, and nilpotent groups; finite presentations; free products; group extensions; group representations.
Effective: Fall 1983
Prerequisite: MATH 542

MATH 544 **Applied Algebra** (3) Basic algorithms of algebra, application to number theory, group theory, field theory, linear algebra, and combinatorics.
Effective: Spring 1992
Prerequisite: MATH 435, MATH 436 ability to use a computer

MATH 546 **Semigroup Theory and Applications** (3) Basic algebraic properties of semigroups, finite transformation semigroups, free semigroups. Applications to automata theory, formal languages, and combinatorics.
Effective: Fall 1983
Prerequisite: MATH 435, MATH 535

MATH 547 **Algebraic Geometry I** (3) Affine and projective algebraic varieties; Zariski topology; Hilbert Nullstellensatz; regular functions and maps; birationality; smooth varieties normalization; dimension.
Effective: Spring 1992
Prerequisite: MATH 536

MATH 548 **Algebraic Geometry II** (3) Topics may include algebraic curves, Riemann-Roch theorem, linear systems and divisors, intersectino theory, schemes, sheaf cohomology, algebraic groups.
Effective: Spring 1992
Prerequisite: MATH 547

MATH 549 **Mathematical Programming** (3) Quadratic and convex programming, integer and combinatorial programming, dynamic and stochastic programming.
Effective: Spring 1992
Prerequisite: MATH 484

MATH 550 (CSE 550) **Numerical Linear Algebra** (3) Solution of linear systems, sparse matrix techniques, linear least squares, singular value decomposition, numerical computation of eigenvalues and eigenvectors.
Effective: Summer 1996
Prerequisite: MATH 441 orMATH 456

MATH 551 (CSE 551) **Numerical Solution of Ordinary Differential Equations** (3) Methods for initial value and boundary value problems; convergence and stability analysis, automatic error control, stiff systems, boundary value problems.
Effective: Summer 1996
Prerequisite: MATH 451 orMATH 456

MATH 552 (CSE 552) **Numerical Solution of Partial Differential Equations** (3) Finite difference methods for elliptic, parabolic, and hyperbolic differential equations; solutions techniques for discretized systems; finite element methods for elliptic problems.
Effective: Summer 1996
Prerequisite: MATH 402 orMATH 404;MATH 451 orMATH 456

MATH 553 (CSE 553) **Introduction to Approximation Theory** (3) Interpolation; remainder theory; approximation of functions; error analysis; orthogonal polynomials; approximation of linear functionals; functional analysis applied to numerical analysis.
Effective: Summer 1996
Prerequisite: MATH 401 3 credits of computer science and engineering

MATH 554 **Approximation Theory** (3) Approximation in normed spaces; existence, uniqueness, characterization, computation of best approximations; error bounds; degree of approximation; approximation of linear functionals.
Effective: Spring 1992
Prerequisite: MATH 451 orMATH 456;MATH 501

MATH 555 (CSE 555) **Numerical Optimization Techniques** (3) unconstrained and constrained optimization methods, linear and quadratic programming, software issues, ellipsoid and Karmarkar's algorithm, global optimization, parallelism in optimization.
Effective: Summer 1996
Prerequisite: MATH 456

MATH 556 (CSE 556) **Finite Element Methods** (3) Sobolev spaces, variational formulations of boundary value problems; piecewise polynomial approximation theory, convergence and stability, special methods and applications.
Effective: Summer 1996
Prerequisite: MATH 502, MATH 552

MATH 557 **Mathematical Logic** (3) The predicate calculus; completeness and compactness; Godel's first and second incompleteness theorems; introduction to model theory; introduction to proof theory.
Effective: Spring 1992
Prerequisite: MATH 435 orMATH 457

MATH 558 **Foundations of Mathematics I** (3) Decidability of the real numbers; computability; undecidability of the natural numbers; models of set theory; axiom of choice; continuum hypothesis.
Effective: Spring 1992
Prerequisite: any 400 level math course

MATH 559 **Recursion Theory I** (3) Recursive functions; degrees of unsolvability; hyperarithmetic theory; applications to

Borel combinatorics. Computational complexity. Combinatory logic and the Lambda calculus.
Effective: Spring 1992
Prerequisite: MATH 459, MATH 557 orMATH 558

MATH 560 **Recursion Theory II** (3) Recursive functions; degrees of unsolvability. Hyperarithmetic theory; applications to Borel combinatorics. Computational complexity. Combinatory logic and the Lambda calculus.
Effective: Spring 1992
Prerequisite: MATH 459, MATH 557 orMATH 558

MATH 561 **Set Theory I** (3) Models of set theory. Inner models, forcing, large cardinals, determinacy. Descriptive set theory. Applications to analysis.
Effective: Spring 1992
Prerequisite: MATH 557 orMATH 558

MATH 562 **Set Theory II** (3) Models of set theory. Inner models, forcing, large cardinals, determinacy. Descriptive set theory. Applications to analysis.
Effective: Spring 1992
Prerequisite: MATH 557 orMATH 558

MATH 563 **Model Theory I** (3) Interpolation and definability; prime and saturated models; stability; additional topics; applications to algebra.
Effective: Spring 1992
Prerequisite: MATH 557

MATH 564 **MODEL THEORY II** (3) Interpolation and definability; prime and saturated models; stability; additional topics; applications to algebra.
Effective: Spring 1992
Prerequisite: MATH 557

MATH 565 **Foundations of Mathematics II** (3) Subsystems of second order arithmetic; set existence axioms; reverse mathematics; foundations of analysis and algebra.
Effective: Spring 1992
Prerequisite: MATH 557, MATH 558

MATH 567 **Number Theory I** (3) Congruences, quadratic residues, arithmetic functions, partitions, classical multiplicative ideal theory, valuations and p-adic numbers; primes in arithmetic progression, distribution of primes.
Effective: Spring 1994
Prerequisite: MATH 421

MATH 568 **Number Theory II** (3) Congruences, quadratic residues, arithmetic functions, partitions, classical multiplicative ideal theory, valuations and p-adic numbers; primes in arithmetic progression, distribution of primes.
Effective: Spring 1994
Prerequisite: MATH 421

MATH 569 **Algebraic Number Theory I** (3) Dedekind rings; cyclotomic and Kummer extensions; valuations; ramification, decomposition, inertial groups; Galois extensions; locally compact groups of number theory.
Effective: Spring 1992
Prerequisite: MATH 536, MATH 568

MATH 570 **Algebraic Number Theory II** (3) Topics chosen from class field theroy; integral quadratic forms; algebraic and arithmetic groups; algebraic function of one variable.
Effective: Spring 1992
Prerequisite: MATH 569

MATH 571 **Analytic Number Theory I** (3) Improvements of the prime number theorem, L-functions and class numbers, asymptotic and arithmetic properties of coefficients of modular forms.
Effective: Spring 1994
Prerequisite: MATH 421

MATH 572 **Analytic Number Theory II** (3) Distribution of primes, analytic number theory in algebraic number fields, transcendental numbers, advanced theory of partitions.
Effective: Spring 1992
Prerequisite: MATH 571

MATH 574 **Topics in Logic and Foundations** (3-6 per semester) Topics in mathematical logic and the foundations of mathematics.
Effective: Spring 1992
Prerequisite: MATH 558

MATH 577 (M E 577) **Stochastic Systems for Science and Engineering** (3) The course develops the theory of stochastic processes and linear and nonlinear stochastic differential equations for applications to science and engineering.
Effective: Summer 1998
Prerequisite: MATH 414 orMATH 418;M E 550 orMATH 501

MATH 580 **Introduction to Applied Mathematics I** (3) A graduate course of fundamental techniques including tensor, ordinary and partial differential equations, and linear transforms.
Effective: Fall 2003
Prerequisite: Basic knowledge of linear algebra vector calculus and ODEMATH 405

MATH 581 **Introduction to Applied Mathematics II** (3) A graduate course of fundamental techniques including Ordinary, Partial, and Stochastic Differential Equations, Wavelet Analysis, and Perturbation Theory.

Effective: Summer 2003
Prerequisite: MATH 580 or consent of instructor

MATH 582 **Introduction to C* Algebra Theory** (3) Basic properties of C* algebras, representation theory, group C* algebras and crossed products, tensor products, nuclearity and exactness.
Effective: Summer 2006
Prerequisite: MATH 503

MATH 583 **Introduction to K-Theory** (3) K-theory groups for compact spaces and C*-algebras. Long exact sequences, Bott periodicity, index theory and the Pimsner-Voiculescu theorem.
Effective: Summer 2006
Prerequisite: MATH 503

MATH 584 **Introduction to von Neumann Algebras** (3) Comparison of projections, traces, tensor products, ITPFI factors and crossed products, the Jones index, modular theory, free probability.
Effective: Summer 2006
Prerequisite: MATH 503

MATH 588 (CSE 588) **Complexity in Computer Algebra** (3) Complexity of integer multiplication, polynomial multiplication, fast Fourier transform, division, calculating the greatest common divisor of polynomials.
Effective: Spring 2008
Prerequisite: CMPSC 465

MATH 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

MATH 591 **Mathematics Seminar** (1-6) Selected topics from recent mathematical developments.
Effective: Fall 1983

MATH 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

MATH 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

MATH 597A **Elliptic PDE and Reaction-Diffusion Equations** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 597B **Multilevel and Adaptive Methods** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 597C **Compact Groups and Symplectic Manifolds** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 597D **Continuum Mechanics and Variational Methods** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MATH 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1994

MATH 599 (IL) **Foreign Studies** (1-12 per semester, maximum of 24) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005

MATH 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

MATH 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Winter 1978

MATH 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching of mathematics

undergraduate recitation classes with senior faculty instruction supervision.
Effective: Fall 1983

MATH 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

MATH 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Winter 1978

NOTE: Courses in computer science and statistics are listed separately.

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Mathematics Education (MTHED)

MTHED 411 **Teaching Secondary Mathematics I** (3) Conditions for learning mathematics; problem solving; subject matter types; curriculum; learning goals; nature and history of mathematics at secondary level
Effective: Spring 2007
Prerequisite: acceptance into Secondary Education/Mathematics Option certification program;C I 295 ; a grade of C or better inCMPSC 101, MATH 140, MATH 141, MATH 220, MATH 230, MATH 311W Concurrent: MTHED 427

MTHED 412W **Teaching Secondary Mathematics II** (3) Assessing learning and instruction; methods of evaluation and grading; long- term planning; accommodating needs of diverse learners; connecting theory and practice.
Effective: Summer 2010
Prerequisite: a grade of C or better inMTHED 411 Concurrent: C I 495C C I 412W

MTHED 420 **Teaching Mathematics in the Elementary Schools** (3) Strategies for teaching mathematics at the elementary school level; analysis of the philosophy and content of contemporary programs of instruction.
Effective: Spring 2007
Prerequisite: LL ED 400, LL ED 401, LL ED 402 ; a grade of C or better required inMATH 200;PSYCH 212 Concurrent: SCIED 458 C I 495B ; C I 495A or SS ED 430W

MTHED 424 **Contemporary School Mathematics Programs** (3) In-depth analysis of school mathematics programs and the factors and forces influencing them; contemporary curriculum developments.
Effective: Summer 2010
Prerequisite: MTHED 412W orMTHED 420

MTHED 427 **Teaching Mathematics in Technology-Intensive Environments** (3) Interaction among pedagogy, content, and technology in mathematics teaching and learning in technology-intensive environments; secondary, early college curricula; laboratory experience.
Effective: Spring 2007
Prerequisite: acceptance into Secondary Education/Mathematics Option certification program;C I 295 ; a grade of C or better inCMPSC 101, MATH 140, MATH 141, MATH 220, MATH 230, MATH 311W Concurrent: MTHED 411

MTHED 430 **Students' Mathematical Thinking** (3 per semester, maximum of 6) Develop abilities in planning, conducting, and interpreting mathematics interviews to gain an understanding of students' thinking processes and current knowledge.
Effective: Summer 1994
Prerequisite: C I 495D, C I 495E or experience teachnig mathematics

MTHED 431 **Data Analysis in Secondary School Mathematics** (3) Intense development of foundations of data analysis for secondary mathematics as a process using statistical concepts for predictions and inferences.
Effective: Summer 2006
Prerequisite: CMPSC 101 or equivalent; at least 18 credits of mathematics at or above the calculus level; acceptance into secondary mathematics certification program or permission of program

MTHED 432 **Mathematical Modeling in Secondary School Mathematics** (3) Students work from teaching and curricular perspective to explore and apply school and undergraduate mathematics to model real-world phenomena.
Effective: Summer 2006
Prerequisite: CMPSC 101 or equivalent; at least 18 creidts of mathematics at or above the calculus level; acceptance into secondary mathematics certification program or permission of program

MTHED 433 **Function Concept in Secondary School Mathematics** (3) This course develops the concept of function as an essential topic that underlies and connects school and collegiate mathematics.
Effective: Summer 2006
Prerequisite: CMPSC 101 or equivalent; at least 18 credits of mathematics at or above the calculus level; acceptance into secondary mathematics certification program or permission of program

MTHED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

MTHED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

MTHED 497A **Inquiry Into Big Ideas** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MTHED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

MTHED 498A **AP Statistics** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

MTHED 498B **AP Calculus AB** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

MTHED 501 **Foundations of Mathematics Education I: Learning** (3) This course focuses on understanding and application of theories of mathematical thinking and learning in research and practice.
Effective: Summer 2007
Prerequisite: acceptance in Mathematics Education Emphasis Area/Curriculum and Instruction Ph.D. program

MTHED 502 **Foundations of Mathematics Education II: Teaching** (3) Teaching is the object of study encountered through connections among classical and contemporary theories of teaching and research on teaching.
Effective: Summer 2007
Prerequisite: acceptance in Mathematics Education Emphasis Area/Curriculum and Instruction Ph.D.

MTHED 503 **Foundations of Mathematics Education III: Curriculum** (3) Study of mathematics curriculum blends historical trends and current issues with research literature and techniques to study effects of innovations.
Effective: Summer 2007
Prerequisite: acceptance in Mathematics Education Emphasis Area/Curriculum and Instruction Ph.D.

MTHED 504 **Foundations of Mathematics IV: Teacher Development and Policy** (3) Nature and study of teacher education and professional development programs and projects coupled with policy and impact in mathematics education.
Effective: Summer 2007
Prerequisite: acceptance in Mathematics Education Emphasis Area/Curriculum and Instruction Ph.D.

MTHED 520 **Analysis of Research in Mathematics Education** (3) Survey of the status of knowledge about mathematics learning and instruction, K-12; analysis of research procedures; instruments for evaluating research.
Effective: Summer 2010
Prerequisite: MTHED 412W orMTHED 420 ; 3 credits in statistics; teaching experience

MTHED 523 **Projects in Mathematics Education Research, Curriculum Development, and Evaluation** (1-3 per semester, maximum of 24) Conceptualizing, designing, conducting, and reporting mathematics education research, curriculum development and/or evaluation projects.
Effective: Spring 1997
Prerequisite: enrollment in Curriculum and Instruction graduate program and by permission of the Mathematics Education emphasis area; course in psychological foundations and course in qualitative or quantitative research foundation

MTHED 525 **Research Participation in School Mathematics Curriculum Construction** (3) Development of theoretical bases for the construction of instructional materials in mathematics; research participation in preparing and testing curriculum materials.
Effective: Fall 1983

MTHED 527 **Research on the Use of Technology in Mathematics Education** (3) Reviewing, critiquing, designing, and conducting research on mathematics learning and teaching in technology intensive environments.
Effective: Spring 1997
Prerequisite: MTHED 427

MTHED 530 **Mathematical Thinking at the Secondary and Early College Levels** (3) Exploring and applying theories of advanced mathematical thinking; reviewing, conducting research on mathematical thinking at secondary and early college levels.
Effective: Spring 1997
Prerequisite: enrollment in Curriculum and Instruction doctoral program with Mathematics Education emphasis; mathematics background equivalent to a Bachelors' degree in mathematics

MTHED 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1996

MTHED 595 **Advanced Clinical Internship in Mathematics Learning** (3) Supervised internship in advanced procedures for the implementation of diagnostic/prescriptive approaches as a strategy for improving mathematics learning.
Effective: Spring 1987
Prerequisite: 6 credits in mathematics education

MTHED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

MTHED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

MTHED 597A **Readings in MTHED** (1-6) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

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Mechan Engr Technolg (MET)

MET 401 **Advanced Kinematics** (3) Analysis and design of planar and space mechanisms using advanced techniques, including computers; robotics.
Effective: Spring 2008
Prerequisite: E MCH 212, MET 108, MET 321

MET 403 **Advanced Mechanical Design** (3) Continuation of strength of materials and machine design, with emphasis on advanced methods of design and analysis of machine elements.
Effective: Spring 2007
Prerequisite: MET 365

MET 415 **Finite Element Analysis Applications I** (3) Solutions of advanced engineering design problems using finite elements. Intended for engineering technologists.
Effective: Spring 2007
Prerequisite: MET 320 ; Concurrent:MET 306

MET 417 **Finite Element Analysis** (3) Formulation and computer implementation of finite element models for solving problems in heat transfer, fluid flow, and solid mechanics.
Effective: Spring 2007
Prerequisite: MET 365

MET 418 **Finite Element Analysis for Plastics Design** (3) Solutions of advanced engineering problems using finite element and finite difference techniques; advanced topics in computer-aided manufacturing; problems in optimization and design.
Effective: Spring 2007
Prerequisite: MCH T 213, PL ET 232, PL ET 235 . Prerequisite or concurrent:PL ET 350

MET 425 **Finite Element Analysis Applications II** (3) Solutions of advanced engineering design problems using finite element methods.
Effective: Spring 2007
Prerequisite: MET 415

MET 431 **Heat Transfer** (3) Basic principles of conduction, convection, and radiation with applications.
Effective: Spring 2007
Prerequisite: MET 332

MET 432 **Fluid Power** (3) Principles of fluid flow, hydraulic components, and hydraulic circuits having application to industry.
Effective: Fall 2007
Prerequisite: M E 300 orMET 330;MET 331W

MET 435 **Building Energy Systems** (3) Analysis and design of components and systems for building heating and cooling; emphasis on applying the thermal sciences.
Effective: Spring 2007
Prerequisite: MET 332, MET 336

MET 438 **Thermal Engineering B** (3) Applied thermodynamics of power cycles; refrigeration and air conditioning cycles; combustion; psychometrics; and gas mixtures.
Effective: Spring 2007
Prerequisite: MET 332

MET 440 **Vibrations for Technologists** (3:) Principles of basic vibration theory, vibration measurement, data acquisition and analysis, and the effective presentation of vibration data.
Effective: Spring 2008
Prerequisite: E MCH 212 orMET 206;MATH 231 andMATH 250 orMATH 211;MET 341;MET 415

MET 441 **Vibration Analysis** (4) Analysis of motion arising from lateral and torsional vibrations of systems; free and forced vibrations; damping; isolation; balancing.
Effective: Spring 2008
Prerequisite: E MCH 212, MET 321

MET 448 **Mechanical Engineering Technology Laboratory B** (2) Laboratory exercises in the areas of instrumentation, strength of materials, fluid flow, vibrations, thermodynamics, etc.
Effective: Spring 2007
Prerequisite: MET 336, MET 342, ENGL 202C and senior standing

MET 450 **Manufacturing Engineering** (3) Design, analysis and operational issues related to improved productivity and efficiency in modern manufacturing systems.
Effective: Spring 2007
Prerequisite: MET 358

MET 452 **Rapid Prototyping** (3) Introduction to the production of prototypes directly from computer models.
Effective: Fall 2007
Prerequisite: IET 216, MET 306

MET 454 **Automatic Controls** (3) An introduction to basic automatic control theory, practical applications of automatic

controls to typical industrial machinery, HVAC equipment, etc.
Effective: Spring 2008
Prerequisite: E MCH 212, MET 321

MET 457 **Lean Manufacturing** (3) Principles and methods of Lean Manufacturing currently used in modern industries.
Effective: Summer 2007
Prerequisite: 7th semester standing; andIE T 215 orM E 468 or permission of program

MET 461 **Advanced Machine Design** (3) Stress analysis, material selection, design of machine elements, design of connections, and computer-aided design.
Effective: Spring 2007
Prerequisite: MET 210W, MET 415

MET 462 **Internal Combustion Engine Design** (3) The effect of operation requirements on design and construction of internal combustion engines; study of support systems and emissions control.
Effective: Spring 2007
Prerequisite: MET 332

MET 470 **Materials Engineering** (3) Study of material selection, material properties, material test methods, and special topics.
Effective: Summer 2007
Prerequisite: CHEM 110, CHEM 111, MET 320

MET 480 **Senior Capstone** (1) Career and professional topics; development of year-long senior project with industry.
Effective: Fall 2007
Prerequisite: M E 300 orMET 330;MET 415

MET 481 **Project Design** (1) Design of system or machine, including decision making, engineering analysis, layout, detail drawings, specifications, construction.
Effective: Spring 2007
Prerequisite: MET 365, MET 431 and senior standing

MET 485 **Senior Industrial Project** (3) Individual or group design projects in mechanical design or materials.
Effective: Spring 2007
Prerequisite: MET 425, MET 470, MET 480

MET 486 **Project Design** (3) Design of system or machine, including decision making, engineering analysis, layout, detail drawings, specifications, construction.
Effective: Spring 2007
Prerequisite: MET 365, MET 431, MET 481 and senior standing

MET 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica or internships. Written and oral critique of activity required.
Effective: Spring 2007
Prerequisite: prior approval of proposed assignment by instructor

MET 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2007

MET 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2007

MET 497B **Energy Conservation Systems** (3) Analyze processes and systems for energy conversion, including power, refrigeration and air conditioning cycles, thermoelectric, and fuel cells.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: MET 330

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Mechanical Engineering (M E)

M E 400 **Thermodynamics of Propulsion and Power Systems** (3) Analysis and modeling of propulsion and power systems, including combustion, compressible flow through nozzles, chemical equilibrium, and moist air systems.
Effective: Fall 2007
Prerequisite: M E 300 andM E 320 ; Prerequisite or concurrent:M E 410

M E 401 **Refrigeration and Air Conditioning** (3) Theoretical principles, design, performance, and selection of various refrigeration and air-conditioning systems; building heat and cooling loads; solar heating.
Effective: Fall 2007
Prerequisite: M E 410

M E 402 **Power Plants** (3) A study of fossil-fuel steam generation and utility plants, including cogeneration, gas turbine, and combined cycles.
Effective: Fall 2007
Prerequisite: M E 410

M E 403 **Polymer Electrolyte Fuel Cell Engines** (3) Introduction to Fundamentals of Polymer Electrolyte Fuel Cells (PEFCs). Includes fundamentals of electrochemistry, thermodynamics, fluid mechanics, heat transfer materials, and manufacturing issues of PEFCs. A brief survey of other fuel cell types is also included.
Effective: Fall 2007 Ending: Fall 2010
Prerequisite: M E 300, M E 320, CMPSC 201 Concurrent: M E 410 or equivalent

M E 403 **Polymer Electrolyte Fuel Cell Engines** (3) Introduction to Fundamentals of Polymer Electrolyte Fuel Cells (PEFCs). Includes fundamentals of electrochemistry, thermodynamics, fluid mechanics, heat transfer materials, and manufacturing issues of PEFCs. A brief survey of other fuel cell types is also included.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: M E 300 Prerequisite or concurrent:M E 320 Concurrent: M E 410 or equivalent

M E 404 **Gas Turbines** (3) Thermodynamic cycles relating to gas turbines; analysis and performance of compressors, combustion chambers, single- and multi-stage turbines; recent developments.
Effective: Fall 2007
Prerequisite: M E 320 orM E 302

M E 405 **Indoor Air Quality Engineering** (3) Prediction of the motion of contaminants (both gaseous particulate) in gas streams; analysis of ventilation systems and air pollution control systems; comparison of experimental sampling techniques.
Effective: Fall 2007
Prerequisite: M E 320 or equivalent

M E 406 (NUC E 406) **Introduction to Statistical Thermodynamics** (3) Statistical description of systems composed of large numbers of particles in the context of classical and quantum mechanics; basic concepts of probability theory and thermodynamics as they relate to statistical mechanics.
Effective: Fall 2007
Prerequisite: M E 300 orM E 201 orM E 302 orCH E 303;MATH 230 orMATH 231

M E 408 **Energy Systems** (3) Theory, analysis, design, selection, and application of energy conversion systems.
Effective: Fall 2007
Prerequisite: M E 320, M E 410, M E 347

M E 410 **Heat Transfer** (3) Transient heat conduction; convection in laminar and turbulent flow; heat exchanger devices; boiling and condensation; radiation.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: AERSP 308, AERSP 311, C E 360 orM E 320;CMPSC 201 orCMPSC 202;MATH 220 orNUC E 309;MATH 251

M E 410 **Heat Transfer** (3) Thermal energy transfer mechanisms: conduction (steady, transient), convection (internal, external), radiation; lumped parameter method; heat exchangers; introduction to numerical methods.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: AERSP 308, AERSP 311, C E 360 orM E 320;CMPSC 200 orCMPSC 202;MATH 220 orNUC E 309;MATH 251

M E 411 **Heat-Exchanger Design** (3) Thermal design and application of different heat-exchanger types, including surface selection and design optimization.
Effective: Fall 2007
Prerequisite: M E 410

M E 420 **Compressible Flow I** (3) Introductory compressible flow (gas dynamics), mathematical background, and physical concepts of isentropic flow, shock waves, expansion waves, and applications.
Effective: Fall 2007
Prerequisite: M E 320

M E 421 **Viscous Flow Analysis and Computation** (3) Investigate analytical and computational methods for solving the differential equations describing fluid flow. Incompressible external flows past objects and internal flows in pipes and ducts are some problems considered.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: M E 320, M E 302, AERSP 311 orC E 261;CMPSC 201 orCMPSC 202;MATH 220, MATH 251

M E 421 **Viscous Flow Analysis and Computation** (3) Apply analytical and computational methods to solve the

differential equations describing fluid flow. Incompressible external flows past objects and internal flows in pipes and ducts are some problems considered.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: M E 201, M E 320, AERSP 308, AERSP 311 orC E 361;CMPSC 200 orCMPSC 201 orCMPSC 202;MATH 220;MATH 250 orMATH 251

M E 422 **Principles of Turbomachinery** (3) Application of Newton's laws of motion and basic laws of thermodynamics to analysis of fluid flow in turbomachinery.
Effective: Fall 2007
Prerequisite: M E 320

M E 427 **Incompressible Aerodynamics** (3) Analysis of lift and drag using potential flow theory, effects of viscosity on potential flow calculations, wind tunnel testing.
Effective: Fall 2007
Prerequisite: M E 320

M E 428 **Applied Computational Fluid Dynamics** (3) Introduction to theory and application of computational techniques for solving fluid flow and heat transfer.
Effective: Fall 2007
Prerequisite: M E 320, M E 410, M E 347

M E 430 (EGEE 430) **Introduction to Combustion** (3) Concepts related to laminar and turbulent premixed and nonpremixed combustion with applications to propulsion and stationary systems.
Effective: Fall 2009
Prerequisite: M E 201 orM E 300 orEME 301

M E 431 **Internal Combustion Engines** (3) Thermodynamic aspects of internal combustion engine design and performance; two- and four-stroke cycle, supercharged and non-supercharged, diesel and spark-ignition types.
Effective: Fall 2007
Prerequisite: M E 302

M E 432 **Rocket Propulsion** (3) Design and performance of rocket propulsion components and systems; thermodynamics, solid and liquid fuels, heat transfer, materials, controls, and instrumentation.
Effective: Fall 2007
Prerequisite: M E 320, M E 410

M E 433 **Fundamentals of Air Pollution** (3) Natural and man-made sources of pollution; atmospheric dispersion; biological and health effects; control systems; legislation and regulations.
Effective: Fall 2007
Prerequisite: M E 201 orM E 300

M E 440W **Mechanical Systems Design Project** (3) Design and analysis of mechanical components and systems. Application of fundamental design and analysis methods to open ended engineering problems.
Effective: Fall 2007
Prerequisite: ENGL 202C, I E 312, M E 360, M E 370, M E 340

M E 441W **Thermal Systems Design Project** (3) Design of thermal systems through component design and/or selection, system simulation and optimization. Assessment of system economics and energy efficiency.
Effective: Fall 2007
Prerequisite: ENGL 202C, M E 340, M E 410

M E 442W **Advanced Vehicle Design I** (2) Part one of a two course sequence; applications of design and analysis methods to open-ended advanced transportation vehicles. Two semester course; satisfies Senior Design or ME Technical Elective requirements (when combined with M E 443W).
Effective: Summer 2010
Prerequisite: ENGL 202C, I E 312, M E 340, M E 360, M E 370 Concurrent: M E 410

M E 443W **Advanced Vehicle Design II** (1) Part two of a two course sequence; applications of design and analysis methods to open-ended advanced transportation vehicles. Two semester course; satisfies Senior Design or ME Technical Elective requirements (when combined with M E 442W).
Effective: Summer 2010
Prerequisite: M E 442W

M E 444 **Engineering Optimization** (3) Problem formulation, algorithms and computer solution of various engineering optimization problems.
Effective: Spring 2010
Prerequisite: MATH 220, MATH 230 orMATH 231, CMPSC 201 orCMPSC 202 orCMPSC 200

M E 445 **Microcomputer Interfacing for Mechanical Engineers** (4) Interfacing of electro-mechanical systems to microcomputers for data acquistion, data analysis and digital control.
Effective: Fall 2007
Prerequisite: M E 345 and seventh-semester standing

M E 446 (NUC E 446) **Reliability and Risk Concepts in Design** (3) Introduction to reliability mathematics. Failure data collection and analysis. Components and systems reliability prediction. Effects of maintenance on reliability. Risk Analysis. Case studies in engineering applications.
Effective: Fall 2007 Ending: Fall 2010
Prerequisite: MATH 250 orMATH 251;M E 345 orSTAT 401 orI E 424 orNUC E 309

M E 446 (NUC E 446) **Reliability and Risk Concepts in Design** (3) Introduction to reliability mathematics. Failure data collection and analysis. Components and systems reliability prediction. Effects of maintenance on reliability. Risk Analysis.

Case studies in engineering applications.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MATH 250 orMATH 251;M E 345 orNUC E 309

M E 448 **Engineering Design Concepts** (3) Engineering design and modelling, engineering economic analysis techniques, technical communication skills, project planning and design.
Effective: Spring 2009
Prerequisite: M E 380 seventh-semester standing Concurrent: M E 367 M E 410

M E 449 **Mechanical Design Projects** (3) Group or individual design projects in the areas of mechanical engineering.
Effective: Fall 2007
Prerequisite: M E 448, eighth-semester standing

M E 450 **Modeling of Dynamic Systems** (3) Modeling and analysis of dynamic interactions in engineering systems. Classical and state variable methods; digital simulation; stability and dynamic response.
Effective: Fall 2007
Prerequisite: M E 370, M E 345

M E 452 **Vehicle Road Dynamics** (3) Investigations of three-dimensional dynamics and design into the study of vehicle dynamics including tire forces, suspension, and stability.
Effective: Fall 2007
Prerequisite: M E 370

M E 455 **Automatic Control Systems** (3) Dynamic analysis of systems involving automatic control of position, speed, power, flow, pressure, temperature, and other physical quantities.
Effective: Fall 2007
Prerequisite: M E 320, M E 450

M E 456 (I E 456) **Industrial Robot Applications** (3) Introduction to robotics, with emphasis on robot selection, programming, and economic justification for manufacturing applications.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: MATH 220;MATH 250 orMATH 251;I E 328 orM E 360;CMPSC 201 orCMPSC 202

M E 456 (I E 456) **Industrial Robot Applications** (3) Introduction to robotics, with emphasis on robot selection, programming, and economic justification for manufacturing applications.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MATH 220;MATH 250 orMATH 251;I E 305 orM E 360;CMPSC 200 orCMPSC 201

M E 460 **Advanced Machine Design Problems** (3) Special machine design problems in unusual types of springs; gear problems and involutometry; cam design and application; multiple diameter shaft deflections and ball bearings.
Effective: Fall 2007
Prerequisite: M E 360, M E 370

M E 461 (E MCH 461) **Finite Elements in Engineering** (3) Computer modeling and fundamental analysis of solid, fluid, and heat flow problems using existing computer codes.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: E MCH 213, E MCH 210H orE MCH 210;CMPSC 201 orCMPSC 202

M E 461 (E MCH 461) **Finite Elements in Engineering** (3) Computer modeling and fundamental analysis of solid, fluid, and heat flow problems using existing computer codes.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: E MCH 213, E MCH 210H orE MCH 210;CMPSC 200, CMPSC 201 orCMPSC 202

M E 462 **Lubrication in Machine Design** (3) Lubricants and lubrication with applications to design aspects of machines and mechanisms including bearings, gears, cams, and automotive engines.
Effective: Fall 2007
Prerequisite: MATH 251, M E 360

M E 465 **Introduction to Manufacturing Laboratory** (1) A laboratory-based introduction to manufacturing processes including material removal, forming, casting and joining for metals and non-metals.
Effective: Summer 2008
Concurrent: M E 468

M E 467 **Applied Finite Element Analysis** (3) Review of matrix algebra; discretization; finite element formulation; application of finite element computer codes.
Effective: Fall 2007
Prerequisite: M E 410, M E 347

M E 468 **Engineering for Manufacturing** (3) Manufacturability, the selection of the most effective materials and processes, and quality assurance.
Effective: Spring 2009
Prerequisite: MATSE 259

M E 469 **Metallic Manufacturing Processes** (3) Principles of metal working and introduction to current theories; analysis of deformation, joining, and metal removal processes.
Effective: Summer 2008
Prerequisite: Prerequisite or concurrent:M E 468

M E 470 (E MCH 470) **Analysis and Design in Vibration Engineering** (3) Application of Lagrange's equations to mechanical system modeling, multiple- degree-of-freedom systems, experimental and computer methods; some emphasis on design applications.

Effective: Spring 2008
Prerequisite: E MCH 212 orE MCH 212H;M E 370 orE SC 407H

M E 471 **Noise Control in Machinery** (3) Nature of noise sources in machine elements and systems. Propagation and reduction of noise. Effects of noise on man.
Effective: Fall 2007
Prerequisite: M E 320, M E 370

M E 480 **Machine Dynamics** (3) Force and motion relationships in constrained mechanisms; analysis of cam, gear, and linkage systems for motion and power transmission.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: E MCH 212 ; Prerequisite or Concurrent:CMPSC 201 orCMPSC 202

M E 480 **Mechanism Design and Analysis** (3) Design and analysis of mechanical linkages including kinematic synthesis and dynamic analysis. Linkages for a variety of applications are considered.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: E MCH 212 . Prerequisite or Concurrent:CMPSC 200

M E 481 **Introduction to Computer-Aided Analysis of Machine Dynamics** (3) Techniques and formulations for computer based kinematic and dynamic analyses of machines.
Effective: Fall 2007 Ending: Fall 2010
Prerequisite: M E 480

M E 481 **Introduction to Computer-Aided Analysis of Machine Dynamics** (3) Techniques and formulations for computer based kinematic and dynamic analyses of machines.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: E MCH 212 ; Prerequisite or concurrent:CMPSC 200

M E 491 **Bioengineering Applications of Mechanical Engineering** (3) Application of mechanical engineering knowledge in the context of life sciences.
Effective: Summer 2008
Prerequisite: E E 211, M E 320, M E 357, E MCH 213 or permission of program

M E 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

M E 494H **Senior Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Spring 2007
Prerequisite: Junior or senior status in the University Scholars Program

M E 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Fall 2007
Prerequisite: prior approval of proposed assignment by instructor

M E 496 **Independent Studies** (1-18) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

M E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

M E 497A **Fundamentals of Nuclear Engineering** (3) An intensive course providing introduction to NucE to undergraduate co-op students, non-NucE graduate, and returning students.
Effective: Summer 2010 Ending: Summer 2010

M E 497B **Advanced Vehicle Design I** (2) Part one of a two course sequence; applications of design and analysis methods to open-ended advanced transportation vehicles. Two semester course; satisfies Senior Design or ME Technical requirements (when combined with M E 443W).
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: ENGL 202C, I E 312, M E 340, M E 360, M E 370 ; Prerequisite or concurrent:M E 410

M E 497C (NUC E 497C) **Dynamic Modeling of Energy Systems** (3) To provide engineers with information about energy supplies, their future prospects, and how each can be used most effectively.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

M E 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2008

M E 504 **Advanced Engineering Thermodynamics** (3) Pure and applied thermodynamics including its application to advanced engineering problems; collateral reading and discussion of the classical works on the subject.
Effective: Fall 2007

M E 505 **Design of Air Pollution Control Systems** (3) Advanced principles of design drawn from professional literature, including mechanical collectors, electrostatic precipitators, filters, scrubbers, and industrial ventilation systems.
Effective: Fall 1983
Prerequisite: M E 405

M E 512 **Heat Transfer--Conduction** (3) One- and two-dimensional conduction heat transfer for steady state and transient systems with varying boundary conditions.
Effective: Fall 1983

M E 513 **Heat Transfer--Convection** (3) Laminar and turbulent flow heat transfer in natural and forced convection systems.
Effective: Fall 1983

M E 514 **Heat Transfer--Radiation** (3) Thermal radiation fundamentals; specular and diffuse systems; differential and integral methods; numerical techniques; industrial applications.
Effective: Fall 1983

M E 515 **Two-Phase Heat Transfer** (3) Heat transfer processes involving evaporation, boiling, and condensation.
Effective: Winter 1978

M E 517 **Techniques for Heat Transfer Enhancement** (3) Study of advanced concepts in convective and two-phase heat transfer, with emphasis on techniques of heat transfer enhancement.
Effective: Fall 2007
Prerequisite: M E 320, M E 410

M E 518 **Applied Heat and Mass Transfer** (3) Application of theoretical fundamentals to the design of heat exchange equipment, and the analysis of simultaneous heat and mass transfer processes.
Effective: Fall 2007
Prerequisite: M E 320 orM E 410

M E 520 **Compressible Flow II** (3) Two-dimensional subsonic flow; similarity rules; theory of characteristics; supersonic and hypersonic flows; nonsteady flow; oblique shock waves.
Effective: Fall 2007
Prerequisite: M E 420

M E 521 **Foundations of Fluid Mechanics I** (3) First semester of core sequence in fluid mechanics; Navier-Stokes equations, potential flow, low Re flow, laminar boundary layers.
Effective: Fall 2007
Prerequisite: M E 300, M E 320

M E 522 **Foundations of Fluid Mechanics II** (3) Second semester of core sequence in fluid mechanics; continuation of boundary layers, stability, transition, turbulence, turbulent boundary layers, turbulence models.
Effective: Summer 1990
Prerequisite: M E 421 orM E 521

M E 523 **Numerical Solutions Applied to Heat Transfer and Fluid Mechanics Problems** (3) Application of finite difference methods to the study of potential and viscous flows and conduction and convection heat transfer.
Effective: Fall 2007

M E 524 (AERSP 524) **Turbulence and Applications to CFD: DNS and LES** (3) First of two courses: Scalings, decompositions, turbulence equations; scale representations, Direct and Large-Eddy Simulation; modeling; pseudo-spectral methods; 3 computer projects.
Effective: Spring 2006 Ending: Fall 2010
Prerequisite: a graduate-level course in fluid mechanics

M E 524 (AERSP 524) **Turbulence and Applications to CFD: DNS and LES** (3) First of two courses: Scalings, decompositions, turbulence equations; scale representations, Direct and Large-Eddy Simulation; modeling; pseudo-spectral methods; 3 computer projects.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: M E 521 orAERSP 508

M E 525 (AERSP 525) **Turbulence and Applications to CFD: RANS** (3) Second of two courses: Scalings, decomposition, turbulence equations; Reynolds Averaged Navier Stokes (RANS) modeling; phenomenological models; 3 computer projects.
Effective: Spring 2006 Ending: Fall 2010
Prerequisite: M E 524

M E 525 (AERSP 525) **Turbulence and Applications to CFD: RANS** (3) Second of two courses: Scalings, decomposition, turbulence equations; Reynolds Averaged Navier Stokes (RANS) modeling; phenomenological models; 3 computer projects.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: M E 521 orAERSP 508

M E 526 (AERSP 526) **Computational Methods for Shear Layers** (3) Study of numerical solution methods for steady and unsteady laminar or turbulent boundary-layer equations in two and three dimensions.
Effective: Fall 2007
Prerequisite: AERSP 423 orM E 523

M E 527 (AERSP 527) **Computational Methods in Transonic Flow** (3) Numerical solution of partial differential equations of mixed type, with emphasis on transonic flows and separating boundary layers.
Effective: Fall 2007
Prerequisite: AERSP 423 orM E 523

M E 528 (AERSP 528) **Computational Methods for Recirculating Flows** (3) Numerical solution techniques for laminar/turbulent flow with large recirculation zones. Both primitive variable and stream function-vorticity equations used.
Effective: Fall 2007
Prerequisite: M E 523

M E 530 **Fundamentals of Combustion** (3) Theoretical formulations and methods of solution of engineering problems and physical/chemical processes in various propulsion systems.
Effective: Fall 2007

M E 531 **Species Measurements in Combustion Systems** (1-3) Study of modern instrumentation techniques for determination of species concentrations in combustion systems.
Effective: Fall 2007

M E 532 **Turbulent and Two-Phase Combustion** (3) Fundamentals of chemically reacting turbulent flows in homogeneous systems including turbulent flames, spray combustion, ignition, reacting boundary layers.
Effective: Fall 2007
Prerequisite: F SC 421 orM E 430 orM E 531

M E 533 **Solid Propellant Combustion** (3) Introduction to phenomena of solid propellant combustion, analytical techniques for modeling propellant ignition and combustion behavior, experimental methods.
Effective: Fall 2007
Prerequisite: M E 410

M E 535 (AERSP 535) **Physics of Gases** (3) An introduction to kinetic theory, statistical mechanics, quantum mechanics, atomic and molecular structure, chemical thermodynamics, and chemical kinetics of gases.
Effective: Spring 2010

M E 537 **Laser Diagnostics for Combustion** (3) A study of laser-based techniques for measuring gas temperature and concentration in chemically reacting flows.
Effective: Summer 1990
Prerequisite: M E 535

M E 546 (I E 546) **Designing Product Families** (3) Product families, product platforms, mass customization, product variety, modularity, commonality, robust design, product architectures.
Effective: Fall 2007
Prerequisite: M E 414 orM E 415 orI E 430 orI E 466

M E 547 (EDSGN 547, I E 547) **Designing for Human Variability** (3) Statistics, optimization and robust design methodologies to design products and environments that are robust to variability in users.
Effective: Summer 2009

M E 550 **Foundations of Engineering Systems Analysis** (3) Analytical methods are developed using the vector space approach for solving control and estimation problems; examples from different engineering applications.
Effective: Fall 1996
Prerequisite: MATH 436

M E 554 **Digital Process Control** (3) Analysis and design of control systems with digital controllers, including PID, finite settling time, state feedback, and minimum variance algorithms.
Effective: Fall 2007
Prerequisite: M E 450, M E 455

M E 555 **Automatic Control Systems** (3) Advanced problems and techniques in the design of automatic control systems with emphasis on stability, controller design, and optimum performance.
Effective: Winter 1978
Prerequisite: M E 455

M E 556 (I E 556) **Robotic Concepts** (3) Analysis of robotic systems; end effectors, vision systems, sensors, stability and control, off-line programming, simulation of robotic systems.
Effective: Fall 1983
Prerequisite: I E 456 orM E 456

M E 558 (E E 584) **Robust Control Theory** (3) Fundamentals of Robust Control Theory with emphasis on stability and performance analysis and design.
Effective: Spring 2008
Prerequisite: E E 580 orM E 555

M E 559 (E E 587) **Nonlinear Control and Stability** (3) Design of nonlinear automatic control systems; phase-plane methods; describing functions; optimum switched systems; Liapunov stability; special topics in stability.
Effective: Spring 2008
Prerequisite: E E 380

M E 560 (E MCH 500) **Solid Mechanics** (3) Introduction to continuum mechanics, variational methods, and finite element formulations; application to bars, beams, cylinders, disks, and plates.
Effective: Fall 2007

M E 561 **Structural Optimization Using Variational and Numerical Methods** (3) Shape and size optimization of elastic structures, continuous and discrete solution methods and numerical algorithms, design of compliant mechanisms.
Effective: Summer 2004
Prerequisite: M E 461

M E 563 (E MCH 563) **Nonlinear Finite Elements** (3) Advanced theory of semidiscrete formulations for continua and structures; emphasizes dynamic and nonlinear problems.
Effective: Spring 1996
Prerequisite: A B E 513, E MCH 461 orE MCH 560

M E 564 **Elastic and Dynamic Stability of Structures** (3) An introduction to the concept and analysis methods of structural stability; structures under static/dynamic loading and high speed conditions.
Effective: Spring 2008
Prerequisite: E MCH 213, M E 450 ; students need to have basic understanding of mechanical behavior of materials to follow the equations in this course and basic concepts of "system stability" to expand them to elastic structures

M E 565 **Optimal Design of Mechanical and Structural Systems** (3) Application of numerical optimization techniques to design mechanical and structural systems; design sensitivity analysis.
Effective: Summer 1988

M E 571 (AERSP 571, E MCH 571) **Foundations of Structural Dynamics and Vibration** (3) Modeling approaches and analysis methods of structural dynamics and vibration.
Effective: Fall 2007
Prerequisite: AERSP 304, E MCH 470, M E 450 orM E 570

M E 572 **Experimental Modal Analysis** (3) The development of structural dynamic models from experimental data, analytical and experimental vibration, analysis methods, laboratory techniques.
Effective: Fall 2007
Prerequisite: M E 450

M E 573 (ACS 573) **Designing Quiet Structures** (3) Course integrates structural dynamics, acoustics and optimization into unified method for designing quiet structures virtually for early product development.
Effective: Fall 2007
Prerequisite: M E 470 andACS 502

M E 577 (MATH 577) **Stochastic Systems for Science and Engineering** (3) The course develops the theory of stochastic processes and linear and nonlinear stochastic differential equations for applications to science and engineering.
Effective: Summer 1998
Prerequisite: MATH 414 orMATH 418;M E 550 orMATH 501

M E 578 (E SC 578) **Theory and Applications of Wavelets** (3) Theory and physical interpretation of continuous and discrete wavelet transforms for applications in different engineering disciplines.
Effective: Summer 1999
Prerequisite: M E 550

M E 580 **Advanced Dynamics of Machines** (3) Linear and torsional vibrations in and balancing of rotating and reciprocating machinery; exact analysis of stresses produced by these and other dynamic forces in machine parts.
Effective: Spring 2008
Prerequisite: E MCH 212, M E 370

M E 581 **Simulation of Mechanical Systems** (3) Introduces computational fundamentals, including digital logic; programming language, basic numerical analysis and data processing, as applied to mechanical simulation techniques.
Effective: Fall 2007
Prerequisite: M E 480

M E 582 **Mechanism Synthesis** (3) Geometrical and algebraic methods for synthesizing planar and spatial mechanisms, dynamics of spatial mechanism.
Effective: Fall 2007

M E 590 **Colloquium** (1) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2009

M E 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

M E 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

M E 597A **Vibration of Nanomechanical Systems** (3) To prepare students with strong fundamental understanding of Vibration in Nanomechanical Systems, and to provide them with the current state-of-the-art.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

M E 597K **High-Power Energy Storage** (3) One of two required core courses in the Penn State Graduate Automotive Technology Education (GATE) curriculum leading to a GATE certificate.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

M E 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

M E 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

M E 602 **Suprvised Experience in College Teaching** (1-3 per semester/maximum of 6) For graduate students helping to teach the beginning thermodynamics course, M.E. 22. Must have taken M.E. 504.
Effective: Fall 1983

M E 603 **Foreign Academic Experience** (1 per semester/maximum of 12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Fall 2002

M E 610 **Thesis Research Off Campus** (1-15) No Description.
Effective: Fall 1983

M E 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Mechanical Technology (MCH T)

No courses for department code **MCH T** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Medieval Studies (MEDVL)

MEDVL 411 (IL) (HIST 411) **Medieval Britain** (3) Political, cultural, and economic history of Britain from circa 400 to 1485 with an emphasis on the kingdom of England.
Effective: Spring 2006
Prerequisite: 6 credits in European history or medieval studies

MEDVL 413 (IL) (HIST 413) **Medieval Celtic Studies** (3) Celtic civilization from antiquity to the end of the middle ages.
Effective: Spring 2006
Prerequisite: 3 credits in medieval studies or in language literature or European history of the medieval period

MEDVL 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

MEDVL 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

MEDVL 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 2002
Prerequisite: prior approval of proposed assignments by instructor

MEDVL 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 1995

MEDVL 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1995

MEDVL 499 (IL) **Foreign Studies** (12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

MEDVL 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 2002

MEDVL 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2002

MEDVL 595 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 2002

MEDVL 596 **Individual Studies** (1-9) Creative projects, including nonthesis research that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2002

MEDVL 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2002

MEDVL 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2002

MEDVL 599 (IL) **Foreign Studies** (1-12 per semester; maximum of 24) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

MEDVL 600 **Thesis Research** (1-15) No description.
Effective: Summer 2002

MEDVL 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 2002

MEDVL 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) Students experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Summer 2002

MEDVL 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Summer 2002

MEDVL 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 2002

MEDVL 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 2002

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Meteorology (METEO)

METEO 410 **Advanced Topics in Weather Forecasting** (3) Exploring highly specialized topics and techniques in weather forecasting that span from mesoscale to planetary spatial scales and short-term to long- range time scales.
Effective: Spring 2004
Prerequisite: METEO 101, METEO 241, METEO 361

METEO 411 **Synoptic Meteorology Laboratory** (4) Techniques of analyzing synoptic scale weather situations; introduction to weather forecasting.
Effective: Spring 2004
Prerequisite: METEO 101 orMETEO 200A andMETEO 200B orMETEO 201;MATH 230 orMATH 231 Prerequisite or concurrent:METEO 421 andMETEO 431

METEO 412 **Synoptic Applications of Dynamic Meteorology** (4) Study of development and structure of large-scale weather systems and fronts.
Effective: Summer 1989
Prerequisite: METEO 411;METEO 422

METEO 413 **Map Analysis** (3) Analysis of actual surface weather observations, with emphasis on the Norwegian cyclone model, missing or bad data, and mesoscale phenomena.
Effective: Fall 2002
Prerequisite: METEO 411

METEO 414 **Mesoscale Meteorology** (4) A survey of conceptual models and analysis techniques for mesoscale atmospheric features.
Effective: Summer 1996
Prerequisite: METEO 411

METEO 415 **Forecasting Practicum** (3) Modern techniques in weather analysis and forecasting.
Effective: Spring 2001 Ending: Fall 2010
Prerequisite: or concurrent:METEO 414

METEO 415 **Forecasting Practicum** (3) Modern techniques in weather analysis and forecasting.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: METEO 411

METEO 416 **Advanced Forecasting** (3) Competitive, simulated, operational, real-time forecasting is covered.
Effective: Spring 1998
Prerequisite: METEO 414, METEO 415

METEO 417 **Hydrometeorology** (3) Theory and application of precipitation meteorology, hydrology, and regional forecast planning; control of the hydrometeorological system and its societal effects.
Effective: Spring 1998
Prerequisite: METEO 414

METEO 418W **Topics in Mesoscale Meteorology** (3) Topics in mesoscale meteorology will be investigated in an independent study environment through computer-based modules, papers, and semester project.
Effective: Fall 1995
Prerequisite: METEO 414

METEO 419 **Air Quality Forecasting** (3) Issues relating to the prediction and dispersion of air pollutants as discussed.
Effective: Summer 2010
Prerequisite: CHEM 110 andMETEO 003 orMETEO 101 orMETEO 200A andMETEO 201B orMETEO 201

METEO 421 **Atmospheric Dynamics** (4) Balanced and unbalanced flows, vorticity, circulation and potential vorticity, an introduction to wave dynamics and stability analysis, and a quantitative discussion of the general circulation.
Effective: Fall 2009
Prerequisite: METEO 300;MATH 230 orMATH 231 andMATH 232 Concurrent: PHYS 212 METEO 431 MATH 251

METEO 422 **Advanced Atmospheric Dynamics** (3) Survey of advanced dynamical topics including instabilities, numerical modeling, and others of current interest.
Effective: Fall 2009
Prerequisite: METEO 421

METEO 431 **Atmospheric Thermodynamics** (3) Classical thermodynamics applied to both the dry and the moist atmosphere.
Effective: Spring 2001
Prerequisite: PHYS 212

METEO 434 **Radar Meteorology** (3) Fundamental operating principles of radars, with application to observation of meteorological phenomena.
Effective: Fall 2001
Prerequisite: METEO 437 Concurrent: METEO 414

METEO 436 **Radiation and Climate** (3) Elements of earth-sun geometry, radiative transfer, photochemistry, remote sensing of the atmosphere, physical climatology, climate forcing.
Effective: Fall 2009

Concurrent: METEO 431

METEO 437 **Atmospheric Chemistry and Cloud Physics** (3) Properties of aerosols and clouds, cloud nucleation and precipitation processes, atmospheric electricity, cloud and precipitation chemistry, biogeochemical cycles.
Effective: Fall 2009
Prerequisite: METEO 431

METEO 440W **Principles of Atmospheric Measurements** (3) Theory and practices used in measurement and analysis of meteorological variables.
Effective: Summer 2006 Ending: Summer 2010
Prerequisite: METEO 300, METEO 431, STAT 301 orSTAT 401 orENNEC 472

METEO 440W **Principles of Atmospheric Measurements** (3) Theory and practices used in measurement and analysis of meteorological variables.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: METEO 300, METEO 431, STAT 301 orSTAT 401 orE B F 472

METEO 445 **Laboratory in Atmospheric Physics I** (1) Measurement practices, data analysis and management, radiometry lidars and radars, trace gas measurements.
Effective: Spring 1991
Prerequisite: or concurrent:METEO 436

METEO 446 **Laboratory in Atmospheric Physics II** (1) Experimental practices in cloud and aerosol physics, atmospheric electricity, atmospheric chemistry, radar meteorology.
Effective: Spring 1991
Prerequisite: or concurrent:METEO 437

METEO 448 **Stormwater Hydrology** (3) Relationship between surface runoff, rainfall and water chemistry during rainfall events for the purpose of assessing urbanization, non-point source contamination.
Effective: Spring 2002

METEO 451 **Introduction to Physical Oceanography** (3) Air-sea interaction, wind-driven and thermohaline circulations, upwelling, El Nino, waves, and tides.
Effective: Spring 2007
Prerequisite: METEO 421

METEO 452 **Tropical Meteorology** (3) Atmospheric processes in the tropics; mass, heat, energy, momentum, and water vapor budgets, cumulus convection, hurricanes and other disturbances.
Effective: Fall 1983
Prerequisite: METEO 411, METEO 421

METEO 454 **Introduction to Micrometeorology** (3) Physical processes and their measurement in the lowest layers of the atmosphere; application to hydrology, plant systems, and air pollution.
Effective: Fall 2009
Prerequisite: METEO 421 andMETEO 431 orEME 301

METEO 455 **Atmospheric Dispersion** (3) The basic principles of atmospheric flow, introduction to the modeling of turbulent diffusion, and the use of EPA dispersion models.
Effective: Fall 2009
Prerequisite: EME 301, C E 360, M E 320, METEO 454, METEO 456 orEGEE 470

METEO 456 **Environmental Meteorology** (3) Atmospheric processes and phenomena relevant to the environmental sciences and engineering, including boundary layer meteorology and air pollution dispersion.
Effective: Spring 1997
Prerequisite: C E 360, MATSC 401

METEO 460 **Weather Risk and Financial Markets** (3) This course will introduce the role that weather plays as a source of financial and operational risk for businesses, market and other institutions.
Effective: Fall 2009 Ending: Summer 2010
Prerequisite: METEO 411;ENNEC 472;E B F 301 orEM SC 473

METEO 460 **Weather Risk and Financial Markets** (3) This course will introduce the role that weather plays as a source of financial and operational risk for businesses, market and other institutions.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: METEO 411;E B F 472;E B F 301 orEM SC 473

METEO 465 **Middle Atmosphere Meteorology** (3) A topical survey of physical, chemical, and dynamical processes at work in the stratosphere and mesosphere (middle atmosphere).
Effective: Spring 1988
Prerequisite: METEO 421, METEO 431

METEO 466 **Planetary Atmospheres** (3) A survey of planetary atmospheres and the chemical and physical processes by which they form and evolve.
Effective: Spring 2001
Prerequisite: MATH 141, PHYS 211

METEO 469 **From Meteorology to Mitigation: Understanding Global Warming** (3) Introduction to global warming and climate change: the basic, science, projected impacts, and approaches to mitigation.
Effective: Summer 2010
Prerequisite: MATH 110

METEO 470 **Climate Dynamics** (3) The fundamental principles that govern Earth's climate and their relevance to past and future climate change.
Effective: Spring 2002
Prerequisite: METEO 300, METEO 421, METEO 431 Concurrent: METEO 436

METEO 471W **Observing Meteorological Phenomena** (3) Teaching the observational and interpretative skills needed to read the sky.
Effective: Spring 1999
Prerequisite: METEO 421 . Prerequisite or concurrent:METEO 436

METEO 472W **Topics in Climatology** (3) Selected topics of current interest in physical and dynamic climatology and climatic change.
Effective: Summer 2002
Concurrent: METEO 300

METEO 473 **Application of Computers to Meteorology** (3) Application of statistical and numerical methods to practical problems in meteorology.
Effective: Spring 2008
Prerequisite: CMPSC 101, CMPSC 201 orCMPSC 202

METEO 474 **Computer Methods of Meteorological Analysis and Forecasting** (3) Distribution of scalars and vectors; sampling; regression and correlation in two and three dimensions; time series, statistical forecasting; forecast verification.
Effective: Summer 2010
Prerequisite: STAT 301 orSTAT 401 orE B F 472

METEO 475W (GEOSC 475W) **Global Biogeochemical Cycles** (3) The study of Earth's major global biogeochemical cycles (carbon, oxygen, nitrogen, phosphorus, and sulfur) in the context of the climate system.
Effective: Summer 2007
Prerequisite: MATH 110 andMATH 111 orMATH 140 andMATH 141 andCHEM 110

METEO 476 **Atmospheric Natural Disasters Seminar** (2) Survey of naturally occurring, catastrophic meteorological events, including severe thunderstorms, tornadoes, aviation hazards, floods, and severe winter storms.
Effective: Fall 1998
Prerequisite: METEO 411 Concurrent: METEO 414

METEO 477 (E E 477) **Fundamentals of Remote Sensing Systems** (3) The review of fundamental physical properties leads into discussions of various techniques, including imaging, spectroscopy, radiometry, and active sensing.
Effective: Spring 2008
Prerequisite: E E 330 orMETEO 436

METEO 480M **Undergraduate Research** (3) A research thesis will be prepared. A written and oral presentation required.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: junior or senior standing as a Meteorology Major

METEO 480M **Undergraduate Research** (3) A research thesis will be prepared. A written and oral presentation required.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: junior or senior standing as a Meteorology Major

METEO 480W **Undergraduate Research** (3) A research thesis will be prepared. A written and oral presentation required.
Effective: Summer 1991
Prerequisite: junior or senior standing as a Meteorology Major

METEO 481 **Weather Communications I** (3) Multi-instructor weather communications survey including forecasting, science teaching and writing, television and radio broadcasting, climate studies, forensics, industrial applications.
Effective: Spring 2004
Prerequisite: METEO 201 orMETEO 101

METEO 482 **Weather Communications II** (3) Multi-instructor workshop designed to mimic real-life applications of weather communications in industry, broadcasting, the courtroom, and the classroom.
Effective: Spring 2002
Prerequisite: METEO 481

METEO 483 **Weather Communications III** (3) Individualized course designed for in-depth study of weather communications in industry, broadcasting, the courtroom and/or the classroom.
Effective: Spring 2002
Prerequisite: METEO 411, METEO 482

METEO 484 **Weather Communications Apprenticeship** (3) Mentor-led course that focuses on a specific issue of problem in weather communications related to broadcasting, climate or industry.
Effective: Summer 2003
Prerequisite: METEO 481, METEO 482 andMETEO 483

METEO 485 **National Weather Service Operations** (2-3) Joint instruction with lead personnel from the State College National Weather Service Office on a variety of operational weather topics.
Effective: Summer 2003
Prerequisite: prerequisite or concurrent:METEO 481, METEO 415

METEO 486 **Pennsylvania Climate Studies** (1-2 per semester/maximum of 3) An overview of the Pennsylvania State Climate Office and an introduction to various aspects of its operations.
Effective: Summer 2006 Ending: Fall 2010

Prerequisite: METEO 101

METEO 486 **Pennsylvania Climate Studies** (1-2 per semester/maximum of 3) An overview of the Pennsylvania State Climate Office and an introduction to various aspects of its operations.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: METEO 101 orMETEO 200A andMETEO 200B orMETEO 201

METEO 491 **Joint National Weather Service Map Discussion** (1) Students evaluate and discuss real-time, regional and local weather conditions and forecasts with University instructors and National Weather Service forecasters.
Effective: Spring 1998
Prerequisite: METEO 411, METEO 415 Concurrent: METEO 414

METEO 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2010

METEO 495A **Meteorology Communications Internship** (3 per semester/maximum of 6) Internship focusing on communication of weather forecasts or other meteorological information.
Effective: Summer 2010
Prerequisite: METEO 411

METEO 495B **Meteorology Private Sector Internship** (3 per semester/maximum of 6) Internship focusing on meteorological problems and applications pursued by private sector companies.
Effective: Summer 2010
Prerequisite: METEO 411

METEO 495C **Meteorological Operations Internship** (3 per semester/maximum of 6) Internship focusing on time-sensitive meteorological applications such as weather or climate forecasts that are produced.
Effective: Summer 2010
Prerequisite: METEO 411

METEO 495D **Meteorological International Internship** (3 per semester/maximum of 6) Meteorological internship in an international setting.
Effective: Summer 2010
Prerequisite: 6 credits of 400-level Meteorology coursework

METEO 495E **Meteorological Off-Campus Research Internship** (3 per semester/maximum of 6) Off-campus meteorological internship focusing on a research project.
Effective: Summer 2010
Prerequisite: 9 credits of 400-level Meteorology coursework

METEO 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

METEO 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

METEO 497A **Aerobiology Field Methods** (3) Field measurement and modeling of the dispersion of biological particles and atmospheric conditions within and above plant canopies.
Effective: Summer 2010 Ending: Summer 2010

METEO 497A **Communications Internship** (3) Supervised internship of at least 100 hours at a facility that focuses on disseminating weather forecasts or weather-related information.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 497B **Private Secotr Internship** (3) Supervised internship of at least 100 hours at a private company that focuses on creating or applying meteorological knowledge.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 497C **Operations Internship** (3) Supervised internship of at least 100 hours at a governmental facility that focuses on operational weather forecasting.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 497D **International Internship** (3) Supervised internship of at least 100 hours at an international meteorological facility.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 497E **Off Campus Research Internship** (3) Supervised internship of at least 100 hours in which the student engages in off-campus research. .
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

METEO 498K **Supervised Teaching** (1) Select undergraduates help prepare lessons and get in front of the classroom.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 498K **Supervised Teaching** (1) Select undergraduate help prepare lessons and get in front of the classroom.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

METEO 501 **Atmospheric Phenomena** (3) Overview of the complex interactions within the atmosphere, ranging from molecular to global scale.
Effective: Spring 1998

METEO 512 **Synoptic Applications of Dynamic Meteorology** (3) Graduate version of topics covered in METEO 412.
Effective: Spring 2008
Prerequisite: METEO 411 orMETEO 411H;METEO 422

METEO 516 **Mesoscale Forecasting** (3) Competitive, simulated, operational, real-time forecasting is covered.
Effective: Summer 2005
Prerequisite: METEO 414 orMETEO 415

METEO 520 **Geophysical Fluid Dynamics** (3) Fundamentals of fluid dynamics with an emphasis on basic concepts that are important for atmospheric and oceanic flows.
Effective: Spring 2009
Prerequisite: Vector calculus differential equations

METEO 521 **Dynamic Meteorology** (3) An overview of the major large-scale atmospheric motions of weather and climate.
Effective: Spring 1996
Prerequisite: METEO 520

METEO 523 **Modeling the Climate System** (3) An introduction to the mathematical description and modeling of atmospheric and oceanic motions.
Effective: Summer 2005

METEO 526 **Numerical Weather Prediction** (3) Finite difference and spectral methods, barotropic and baroclinic models, filtered and primitive equation models, synoptic-scale and mesoscale models.
Effective: Fall 1983
Prerequisite: METEO 422 orMETEO 522

METEO 527 **Atmospheric Wave Motion** (3) From classical and physical hydrodynamics to the numerical prediction of wave motion in a baroclinic atmosphere.
Effective: Spring 1988
Prerequisite: METEO 521

METEO 529 **Mesoscale Dynamics** (3) A survey of concepts of mesocale systems including frontogenesis, symmetric instability, mountain waves, wave CISK, and frontal waves.
Effective: Spring 1988
Prerequisite: METEO 521

METEO 532 **Chemistry of the Atmosphere** (3) Review of chemical principles in gaseous and multiphase environments; characteristics of key atmospheric components and chemical systems in the lower and middle atmosphere.
Effective: Summer 2007
Prerequisite: CHEM 110

METEO 533 **Cloud Physics** (3) Overview of cloud systems; theories of phase changes in clouds and micro- physical mechanisms of precipitation formation; cloud electrification.
Effective: Fall 1993
Prerequisite: METEO 431

METEO 535 **Radiative Transfer** (3) Fundamentals of electromagnetic radiation and its interaction with matter; radiation and climate, atmospheric remote sensing, and observable atmospheric optical phenomena.
Effective: Spring 1996

METEO 537 **Radar Meteorology** (3) Weather radar principles; single- and dual-Doppler radar analysis techniques; multiparameter (dual polarization, dual wavelength) radar analysis; intro- duction to NEXRAD.
Effective: Spring 1996
Prerequisite: METEO 421, PHYS 204

METEO 538 **Atmospheric Convection** (3) Properties of shallow and deep atmospheric convection and interactions between convection, the boundary layer, and larger-scale weather systems.
Effective: Summer 1995

METEO 554 **Atmospheric Turbulence** (3) An introduction to the physics, structure, modeling, representation, and

measurement of atmospheric turbulence.
Effective: Spring 1996
Prerequisite: METEO 520

METEO 555 **Atmospheric Diffusion** (3) The theory of molecular and turbulent diffusion; experiments, theory, and practical implications of air pollution problems.
Effective: Spring 1996
Prerequisite: METEO 520

METEO 563 **Bioclimatology** (3) Climatic phenomena in their relation to life.
Effective: Fall 1988

METEO 565 **Physics of the Upper Atmosphere** (3) Graduate version of material that is covered in METEO 465.
Effective: Fall 1983
Prerequisite: METEO 421, METEO 431

METEO 574 **Atmospheric Dynamics Seminar** (1-3 per semester/maximum of 15) A weekly seminar course that focuses on current and past research problems in dynamic meteorology and oceanography.
Effective: Spring 1988

METEO 575 **Climate Dynamics Seminar** (1-3 per semester/maximum of 15) Review of evolving climate dynamics and earth system science, including ongoing departmental research.
Effective: Spring 1988

METEO 580 **Communication of Meteorological Research** (1) Methods for effective written and oral presentation of meteorological research are reviewed.
Effective: Spring 1994

METEO 581 **Topics in Atmospheric Chemistry** (1-3 per semester/maximum of 15) Discussion of recent research papers in, and concepts pertinent to, acidic deposition, photochemical air pollution, and global chemical budgets.
Effective: Spring 1988

METEO 582 **Ice and Snow Physics** (1-3 per semester/maximum of 15) Structure of ice and its electrical, optical, mechanical, and surface properties; snow formation in the atmosphere.
Effective: Fall 1991

METEO 587 **Topics in Atmospheric Physics** (1-3 per semester, maximum of 15) Seminar discussion of physical processes in the atmosphere including cloud life cycles, radiative transfer, remote sensing, and hydrologic cylce.
Effective: Spring 1989

METEO 588 (GEOSC 588) **Oceans and Climate Seminar** (2) A focussed discussion on some aspect of the ocean's role in the climate system. Theme to vary from semester to semester.
Effective: Summer 1998

METEO 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1988

METEO 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

METEO 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

METEO 597A **Atmospheric Moist Thermodynamics** (3) An advanced treatment of moist thermodynamics and buoyancy with atmospheric applications ranging from boundary layer to deep convection.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 597A **Tropical Cyclones and Climate** (1) The relationship between tropical cyclone strength and frequency and potential climate change is discussed through extensive literature review.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

METEO 597B **Development and Ethics as a Researcher in the Atmospheric Sciences** (1) Course implements Penn State requirements for Scholarship and Research Integrity (SARI) training of atmospheric science researchers.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 597B **General Circulation and Climate Dynamics** (3) General circulation theory and the dynamic nature of the earth's climate are discussed.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

METEO 597C **Weather from Global to Micro Scales** (3) A survey of conceptual models and underlying physics for weather phenomena on scales from the global circulation to turbulence.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: METEO 520, METEO 521, METEO 535

METEO 597D **Classical Large Scale Atmospheric Dynamics** (1) Classical papers in large-scale atmospheric dynamics are examined with an emphasis on major papers of the early 20th century.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 597D **Research Proposal Preparation** (1) Techniques for effective proposal writing and submission are discussed.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

METEO 597E (GEOSC 597E) **Climate Dynamics Seminar** (1) Topics in climate dynamics pertaining to the earth sciences are discussed.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 597E **Climate Dynamics** (1) Topics in climate dynamics pertaining to the earth sciences are discussed.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

METEO 597F **The Hurricane Boundary Layer** (1) Journal review and discussion of the hurrican boundary layer and impact of boundary layer fluxes on the hurricane.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 597G **Dynamic Oceanography** (3) Physical properties of sea water; heat balance of the oceans; theory and observations of ocean currents, waves, and tides.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 597I **Climate Dynamics of the Earth** (3) Covers fundamental principles that govern Earth's climate and their relevance to past and future climate change.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

METEO 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

METEO 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

METEO 602 **Supervised Experiences in College Teaching** (1-3 per semester/maximum of 6) No description.
Effective: Fall 1983

METEO 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

METEO 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

METEO 801 **Understanding Weather Forecasting for Educators** (3) Fundamental principles of synoptic and physical meteorology, remote sensing and data analysis in the setting of mid-latitude weather forecasting.
Effective: Summer 2008

METEO 802 **Fundamentals of Tropical Forecasting for Educators** (3) Applying atmospheric principles to the tropics, with an emphasis on the development, structure, prediction, and destructive impact of hurricanes.
Effective: Summer 2008
Prerequisite: METEO 801

METEO 803 **Fundamentals of Mesoscale Weather Forecasting for Educators** (3) Applying atmospheric principles to small-scale weather systems, with an emphasis on the conceptual modeling and short-range prediction of severe thunderstorms.
Effective: Summer 2008
Prerequisite: METEO 801

METEO 804 **Special Topics in Weather Forecasting for Educators** (3) Exploring specialized weather forecasting topics and techniques spanning from mesoscale to planetary spatial scales and short-term to long-range time scales.

Effective: Summer 2008
Prerequisite: METEO 801;METEO 802;METEO 803

METEO 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2007

Last Import from UCM: July 10, 2010 3:00 AM

Microbiology (MICRB)

MICRB 400 **Introductory Environmental Microbiology** (2) Elementary ecological relationships of microorganisms in the biosphere; role of bacteria in water pollution and purification. This course should not be scheduled by students who have taken Micrb. 201 or 202.
Effective: Summer 2007
Prerequisite: CHEM 202

MICRB 401 **Microbial Physiology and Structure** (3) Physiology and structure of bacteria important in microbiological research. Designed for science majors.
Effective: Summer 2007
Prerequisite: CHEM 202 orCHEM 210;MICRB 201, MICRB 202

MICRB 405A **Seminar and Practicum in Medical Technology** (8) Chemistry. Fundamental principles and the quantitative measurement of chemical components in the blood and other body fluids.
Effective: Fall 1987

MICRB 405B **Seminar and Practicum in Medical Technology** (1) Urinalysis. Identification of cellular and noncellular urinary sediments. Qualitative chemical analysis of urine.
Effective: Fall 1988

MICRB 405C **Seminar and Practicum in Medical Technology** (6) Hematology. Principles of red and white blood cell development. Identification of normal and pathological conditions.
Effective: Fall 1988

MICRB 405D **Seminar and Practicum in Medical Technology** (5) Immunohematology. Immunologic and genetic principles governing the transfusion of blood and blood products.
Effective: Fall 1987

MICRB 405E **Seminar and Practicum in Medical Technology** (7) Microbiology. Identification of normal and abnormal microbial flora from various locations on and within the human body.
Effective: Fall 1987

MICRB 405F **Seminar and Practicum in Medical Technology** (3) Serology-Immunology. Immunological principles and their application in the identification of present or past disease states of the human.
Effective: Fall 1987

MICRB 408 **Laboratory Instructional Practice** (1-2) Participation in the instruction of undergraduate laboratory courses, including classroom preparation; discussion of principles and objectives of each exercise.
Effective: Spring 1994
Prerequisite: 8 credits in microbiology and permission of department head

MICRB 410 **Principles of Immunology** (3) Theories of immunity; focuses on the basis for the acquired immune response at the organ, cell, and molecular levels.
Effective: Summer 1998
Prerequisite: B M B 251, MICRB 201 orMICRB 251

MICRB 411 **Survey of Microbiology Literature** (1 per semester) An introduction to readings and oral presentations in microbiology.
Effective: Spring 1994
Prerequisite: 8 credits in microbiology courses

MICRB 412 **Medical Microbiology** (3) Characteristics, methods of identification, and pathogenesis of bacteria that cause human disease; principles of disease dynamics and control.
Effective: Fall 1993
Prerequisite: MICRB 201

MICRB 413 **Microbial Diversity** (2) survey of microorganisms having special adaptive mechanisms for life in common and unique environments; topics include ecology, evolution, and bioremedia- tion.
Effective: Spring 1997
Prerequisite: MICRB 201, MICRB 202

MICRB 415 **General Virology: Bacterial and Animal Viruses** (3) The interaction of different types of viruses with bacterial and animal cells, including mechanisms of infection and viral synthesis.
Effective: Summer 2000
Prerequisite: B M B 251, B M B 252 orBIOL 110, BIOL 230W;MICRB 201

MICRB 416 (BIOTC 416) **Microbial Biotechnology** (2) Fundamentals of applied biotechnology; the use of microorganisms in the synthesis of biologically-important and industrially-useful products.
Effective: Spring 2009
Prerequisite: MICRB 201, MICRB 202;B M B 442 orMICRB 442

MICRB 421W **Laboratory of General and Applied Microbiology** (3) Laboratory exercises demonstrating fundamental techniques and principles of experimentation of general and applied microbiology.
Effective: Spring 2001
Prerequisite: MICRB 201, MICRB 202

MICRB 422 **Medical Microbiology Laboratory** (2) Laboratory exercises demonstrating properties and classification of medically important microorganisms and techniques used in their identification.
Effective: Fall 1993
Prerequisite: MICRB 202 Concurrent: MICRB 412

MICRB 432 (B M B 432, VB SC 432) **Advanced Immunology: Signaling in the Immune System** (3) The study of signaling pathways that regulate the immune response.
Effective: Fall 2007
Prerequisite: B M B 400, MICRB 410

MICRB 435 (VB SC 435, B M B 435) **Viral Pathogensis** (2) A study of the molecular, immunological and pathological aspects of viral diseases as well as laboratory methods of diagnosis.
Effective: Fall 2007
Prerequisite: MICRB 201;B M B 251 andB M B 252 orBIOL 110 andBIOL 230W

MICRB 442 (B M B 442) **Laboratory in Proteins, Nucleic Acids, and Molecular Cloning** (3) Laboratory in enzyme purifications and assay techniques; nucleic acid isolation and characterization, including plasmid preparation.
Effective: Spring 2009
Prerequisite: B M B 251, BIOL 230W orMICRB 201;CHEM 202 orCHEM 210 . Prerequisite or concurrent:B M B 211 orB M B 401

MICRB 447 **Laboratory in Molecular Immunology** (1) Laboratory in molecular techniques to assay antigens, antibodies, and receptor sites.
Effective: Fall 1995
Prerequisite: MICRB 410

MICRB 450 (B M B 450) **Microbial/Molecular Genetics** (2) Genetic phenomena, with emphasis on molecular mechanisms: gene transfer, recombination, gene conversion, gene fusion, suppression, transposons.
Effective: Spring 2001 Ending: Summer 2010
Prerequisite: BIOL 222, MICRB 201

MICRB 450 (B M B 450) **Microbial/Molecular Genetics** (2) Genetic phenomena, with emphasis on molecular mechanisms: gene transfer, recombination, gene conversion, gene fusion, suppression, transposons.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: BIOL 222 orBIOL 322, MICRB 201

MICRB 460 (B M B 460) **Cell Growth and Differentiation** (3) Mechanisms and regulation of protein trafficking, organelle biosynthesis, cell development, signaling and cell cycle control. Emphasizes experimental design and analysis.
Effective: Spring 2006
Prerequisite: B M B 252

MICRB 480 (B M B 480) **Tumor Viruses and Oncogenes** (3) Oncogenes, DNA and RNA tumor viruses, and relevant experimental techniques with emphasis on molecular basis of carcinogenesis and gene regulation.
Effective: Spring 2001
Prerequisite: or concurrent:MICRB 415, MICRB 435 orMICRB 460

MICRB 496 **Independent Studies** (1-18) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

MICRB 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1995

MICRB 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1995

MICRB 498A (B M B 498A) **Antibiotics: Development and Resistance** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MICRB 498A **Antibiotics: Development and Resistance** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MICRB 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

1 Students must take a combination of MICRB 106 GN and 107 GN to receive General Education credit in biology.

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Mineral Engineering (MIN E)

MIN E 415 **Management in the Mineral Industries for Environmental, Legal, and Health and Safety Problems** (3) Mineral industries management and labor structure analyzed, with emphasis on environmental, health and safety, and legal aspects.
Effective: Spring 1999
Prerequisite: sixth-semester standing

MIN E 471 **Aggregates Production** (3) Design and analysis of quarries, sand and gravel pits, and ancillary operations.
Effective: Spring 1999
Prerequisite: sixth-semester standing

MIN E 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

MIN E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1999

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Mineral Processing (MN PR)

MN PR 401 **Mineral Process Engineering** (3) Unit operations for processing particulate materials: comminution, screening, classification, slurry pumping, thickening, filtration, etc.; application to mineral processing plant design.
Effective: Spring 2001
Prerequisite: MN PR 301, MATH 250 orMATH 251

MN PR 410 **Introduction to Quantitative Mineral Processing Engineering Analysis** (3) This course examines the use of quantitative engineering techniques such as simulation, optimization, parameter estimation, etc., to calculate the expectations of mineral processing circuitry.
Effective: Spring 1999
Prerequisite: MN PR 301, MN PR 401

MN PR 413 **Mineral Processing Laboratory** (1) A laboratory study of the chemical and physical principles involved in practical mineral processing operations.
Effective: Spring 1999
Prerequisite: or concurrent:MN PR 301

MN PR 421 **Particle Technology Laboratory** (1-3) Particle sizing techniques used in mineral separations. Sampling, sieving, perturbation, adsorption, microscopic methods. Separations based on size, shape, density, paramagnetism.
Effective: Spring 2001
Prerequisite: MATH 250 orMATH 251;PHYS 212

MN PR 424 **Coal Preparation** (3) Unit operations, flowsheets, and testing methods used in preparation of coal.
Effective: Spring 1999
Prerequisite: MN PR 301

MN PR 425 **Interfacial Phenomena and Flotation** (3) Surface and interfacial phenomena related to flotation agglomeration, flocculation, and dispersion of particles. Application to mineral separation and related processes.
Effective: Fall 2009
Prerequisite: EME 301;MATH 250 orMATH 251;MN PR 301

MN PR 426 (MATSE 426) **Aqueous Processing** (3) A study of the chemical and engineering principles pertinent to metal processing in aqueous systems: hydrometallurgical extraction, plating, materials preparation.
Effective: Fall 2009
Prerequisite: EME 301 orMATSE 401

MN PR 451 **Senior Projects** (1-6) Independent research and/or design projects under the supervision of the mineral processing faculty.
Effective: Spring 1999
Prerequisite: seventh-semester standing

MN PR 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

MN PR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1999

MN PR 501 **Interfacial Phenomena in Mineral Systems** (3) Applications of surface phenomena to mineral engineering systems. Thermodynamics of surfaces, flotation, adsorption of detergents, electrical double layer, flocculation, dispersion.
Effective: Summer 2007
Prerequisite: CHEM 450

MN PR 502 **Froth Flotation and Agglomeration** (3) Intensive study of theory and applications of froth flotation and agglomeration.
Effective: Spring 1999
Prerequisite: MN PR 501

MN PR 503 **Colloid Phenomena** (3) Flotation microkinetics; shear, carrier, and selective flocculation; aerosols, foams, and emulsions; spherical agglomeration and emulsion flotation; colloids in hydrometallurgy.
Effective: Summer 2007
Prerequisite: CHEM 450

MN PR 505 **Physical Separations in Mineral Processing** (3) Intensive study of theory and applications of gravity, magnetic, electrostatic, centrifugal, and other methods of mineral processing.
Effective: Spring 1999
Prerequisite: MN PR 401

MN PR 506 **Mineral Process Plant Design** (3-10) Process design and economy. Development and quantification of flow sheets. Integration of unit operations. Plant layout, equipment selection, and instrumentation.
Effective: Spring 1999
Prerequisite: MN PR 401

MN PR 507 (MATSE 560) **Hydrometallurgical Processing** (3) Fundamental physico-chemical factors underlying the aqueous extraction and recovery of metals and nonmetals from ores, minerals, and scrap metal.
Effective: Spring 2003
Prerequisite: MATSE 426

MN PR 508 **Mineral Particle Systems** (3) Creation, characterization, separation, and agglomeration of particles. Comminution, sizing, fractionation of powders; surface area, pore size determinations. Agglomeration and balling.
Effective: Spring 1999

MN PR 509 **Particle-Fluid Dynamics** (3) Movement of particles in fluids, rheology of non-Newtonian mineral suspensions, design of concentrating devices, fluidized beds, electrodynamic, magnetic separations.
Effective: Spring 1999

MN PR 510 **Size Reduction** (3) Review of the state of the art in precise design of size reduction devices; their incorporation into mineral processing circuits.
Effective: Spring 1999

MN PR 520 **Mathematical Modeling for Mineral Process Engineers** (3) Techniques for setting up mathematical models of physical processes of interest in mineral process engineering; analytical and computational methods of solution.
Effective: Spring 1999
Prerequisite: MATH 250

MN PR 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1999

MN PR 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

MN PR 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1999

MN PR 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1999

MN PR 600 **Thesis Research** (1-15) No description.
Effective: Spring 1999

MN PR 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 1999

MN PR 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in development of instructional materials, organizing and conducting lectures and laboratories and evaluating students in undergraduate level courses (1-499).
Effective: Spring 1999

MN PR 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 1999

MN PR 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 1999

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Mining (MNG)

MNG 400 (IL) **Mining and Our Environment** (3) For nonmining students. Nontechnical treatment of mining methods, practices, and role in today's civilization; socioeconomic and environmental problems.
Effective: Summer 2005

MNG 401 **Introduction to Mining Operations** (1) An introduction to underground and surface mining methods; selection of extraction equipment; relevant auxiliary operations. Not intended for Mining Engineering majors.
Effective: Spring 2008
Prerequisite: E MCH 211

MNG 402 **Mine Plant Engineering** (3) Theory and concepts of electrical power systems and loads in mining and similar industrial applications; drive systems for materials handling.
Effective: Spring 2001
Prerequisite: PHYS 212

MNG 403 **Mine Power System Design** (3) Mine power system arrangements; design and specification of components and equipment.
Effective: Spring 2008
Prerequisite: MNG 402 orE E 211 orE E 387

MNG 404 **Mine Materials Handling Systems** (2) Analysis and design of materials-handling systems in mining, such as belt conveyors, locomotives, and hoisting.
Effective: Spring 1999
Prerequisite: MNG 402

MNG 410 **Underground Coal Extraction** (2) Underground coal-mine design; extraction techniques; description of the various auxiliary operations as they relate to the mining methods.
Effective: Spring 1999
Prerequisite: MNG 404, MNG 422, MNG 431

MNG 411 **Mine Systems Engineering** (2) Applied operations research and systems methods for decision making in mine operations; time and systems studies to improve productivity.
Effective: Spring 1999
Prerequisite: MNG 404

MNG 412 **Mineral Property Evaluation** (3) Ore reserve estimation using statistics and geostatistics, mine cost estimation, engineering economy concepts applied to mineral deposits.
Effective: Spring 1999
Prerequisite: MNG 030

MNG 422 **Mine Ventilation and Air Conditioning** (3) Quality, quantity, and temperature-humidity control of the mine atmosphere; general mine environmental control.
Effective: Fall 2007
Prerequisite: C E 360, MNG 030 . Prerequisite or concurrent:M E 300

MNG 431 **Rock Mechanics** (3) Ground stresses, laboratory rock properties, laboratory and field instrumentation, rock mass characteristics, subsidence, slope stability, design of mine workings.
Effective: Fall 2003
Prerequisite: E MCH 210

MNG 441 **Surface Mining Systems and Design** (3) Design of surface mining for noncoal and coal minerals; emphasis on quarry and strip mining planning parameters: unit operations, systems, haulroads, draglines, spoil stability, reclamation, legal requirements, and health and safety.
Effective: Spring 1999
Prerequisite: MN PR 301, MNG 030

MNG 442 **Surface Mine Sedimentation Control** (2) Design principals and practices for rainfall runoff control, erosion control systems, and sedimentation pond sizing and construction.
Effective: Spring 1999
Prerequisite: C E 360, MNG 441

MNG 443 **Strip Mine Cut Planning** (2) Analysis of cut planning, sequencing, and spoil placement in mine and outside dumps for contour, area, and mountain-top mining.
Effective: Spring 1999
Prerequisite: MNG 441

MNG 444 **Groundwater Aspects in Mining** (2) Physical and chemical hydrology specific to mining and the environment; mine drainage formation, abatement, and remediation.
Effective: Spring 1999

MNG 445 **Environmental Concerns in the Mining Industry** (3) Environmental aspects of mining including water and soil contamination; remediation techniques; revegetation and land use planning and legislation.
Effective: Summer 2007
Prerequisite: CHEM 110

MNG 451W **Mining Engineering Project** (1-5) Independent and integrative design and report of specific mine evaluation, layout, equipment selection, environmental control, permitting, and financial analysis.
Effective: Spring 1999
Prerequisite: seventh-semester standing in mining engineering plus six months of mining work experience

MNG 460 **Mine Maintenance Engineering** (3) Mine maintenance system design; maintenance planning and management; safety and cost analysis of maintenance programs.
Effective: Spring 1999

MNG 470 **Mining and Geologic Structures** (3) Study of geologic structures and their impacts on mining operations.
Effective: Summer 2009
Prerequisite: GEOSC 001, GEOSC 201

MNG 497 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2008

MNG 497A **Ground Support in Mining Applications** (3) The course will cover the issues related to ground support in surface and underground mines.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: MNG 431 andC E 334

MNG 497A **Ground Support in Minin Applications** (3) The course will cover the issues related to ground support in surface and underground mines.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: MNG 431 andC E 334

MNG 515 **Mine Systems Simulation** (3) Principles and practices of probabilistic and deterministic simulation in the analysis of operating systems related to mills and mines.
Effective: Spring 1999
Prerequisite: MNG 411

MNG 541 **Surface Mine Equipment Selection Analysis** (3) Design analysis and selection criteria for principal surface mine equipment, their interaction in operation, and auxiliary equipment requirements.
Effective: Spring 1999
Prerequisite: C E 360, MNG 441

MNG 554 **Rock Mechanics Design** (3) Engineering design process; design of mines, tunnels, slopes, and underground chambers; guided design concept; creativity and innovation; group design project.
Effective: Spring 1999
Prerequisite: MNG 543

MNG 557 (GEOEE 557) **Computational Geomechanics I** (3) Finite element and boundary element analysis of rock mechanics, groundwater flow, and mass transport.
Effective: Summer 2002

MNG 559 (GEOEE 559) **Consolidation of Porous Media** (2) Coupled fluid flow and deformation behavior of geologic media. Theory and applications in geological, environmental, and petroleum engineering.
Effective: Summer 2002
Prerequisite: MNG 557

MNG 590 (P N G 590, EME 590, F SC 590) **Colloquium** (1-3) Continuing seminars which consist of individual lectures by faculty, students or outside speakers on energy and mineral engineering issues.
Effective: Spring 2009

MNG 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

MNG 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1999

MNG 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1999

MNG 599 (IL) **Foreign Study** (1-12 maximum of 24) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005

MNG 600 **Thesis Research** (1-15) No description.

Effective: Spring 1999

MNG 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 1999

MNG 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 1999

MNG 611 **Ph.D. Dissertation Part Time** (0) No description.
Effective: Spring 1999

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Mining Technology (MNG T)

No courses for department code **MNG T** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Music (MUSIC)

Individual instruction in technique, literature, and pedagogy is offered in six categories covering eighteen instruments:

BRASS: Trumpet, French horn, trombone, euphonium, tuba
KEYBOARD: Piano, organ
STRINGS: Violin, viola, violoncello, doublebass
WOODWINDS: Flute, oboe, clarinet, bassoon, saxophone
PERCUSSION
VOICE

For each instrument individual instruction in offered to different types of students at different levels:

Primary instrument: Student in B.A. (Music) and B.S. (Music Ed) Levels I-VII
Performance instrument: Students in B.Mus. Level I-VII
Secondary instrument: Nonmajor students or others using this as secondary instrument.

The courses are designated according to a particular pattern for identification on the student's transcript and in the *Schedu* *Schedule of Classes.* Applied music fees are required for individualized instruction: $175 for a 1-credit course; $250 for a 2-credit course; $250 for a 3-credit course. Examples of listings:

Course Abbrev	Number & Suffix	Instrument	Type of Student	Level	Credit	Fee
BRASS	100J	TRUMPET:	Secondary:		1	$175
	110J	TRUMPET:	Secondary:		2	$250
BRASS	120J	TRUMPET:	Primary:	Level I	2	$250
	170J	TRUMPET:	Primary:	Level II	2	$250
BRASS	200J	TRUMPET:	Primary:	Level III	2	$250
	270J	TRUMPET:	Primary	Level IV	2	$250
BRASS	320J	TRUMPET:	Primary:	Level V	2	$250
	370J	TRUMPET:	Primary:	Level VI	2	$250
BRASS	420J	TRUMPET:	Primary:	Level VII	2	$250
	470J	TRUMPET:	Primary:	Level VIII	2	$250
BRASS	130J	TRUMPET:	Performance:	Level I	3	$250
	180J	TRUMPET:	Performance:	Level II	3	$250
BRASS	230J	TRUMPET:	Performance:	Level III	3	$250
	280J	TRUMPET:	Performance:	Level IV	3	$250
BRASS	330J	TRUMPET:	Performance:	Level V	3	$250
	380J	TRUMPET:	Performance:	Level VI	3	$250
BRASS	430J	TRUMPET:	Performance:	Level VII	3	$250
	480J	TRUMPET:	Performance:	Level VIII	3	$250

MUSIC 400 **Solo Recital** (1) Required recital for Performer's Certificate.
Effective: Spring 1994
Prerequisite: permission of the director of the school of music

MUSIC 412 **Jazz Pedagogy** (2) The development of advanced skills in pedagogy for teaching jazz bands.
Effective: Summer 1994
Prerequisite: admission to the Music Education program or certification

MUSIC 414 **String Pedagogy** (1-2) The development of skills in pedagogy for teaching strings.
Effective: Spring 1992
Prerequisite: completion of 300-level strings course

MUSIC 415 **Woodwind Pedagogy** (1-2) The development of skills in pedagogy for teaching woodwinds.

Effective: Spring 1992
Prerequisite: completion of 300-level woodwind course

MUSIC 416 **Brass Pedagogy** (1-2) The development of skills in pedagogy for teaching brass.
Effective: Spring 1992
Prerequisite: completion of 300-level brass course

MUSIC 417 **Percussion Pedagogy** (1-2) The development of advanced skills in pedagogy for teaching percussion.
Effective: Summer 1992
Prerequisite: MUSIC 152;PERCN 320J orPERCN 330J or permission of instructor

MUSIC 418 **Voice Pedagogy** (2) Analysis of techniques of teaching voice and studies of related music literature and pedagogical writings.
Effective: Spring 2004
Prerequisite: VOICE 270J orVOICE 280J ; or four semesters ofVOICE 100J orVOICE 110J

MUSIC 419 **Piano Pedagogy I** (2) Analysis of beginning teaching methods and teaching strategies for children.
Effective: Spring 1997
Prerequisite: KEYBD 270 orKEYBD 280;MUSIC 331

MUSIC 421 **Jazz Combo Class** (1) Study and performance of small group jazz.
Effective: Summer 1994
Prerequisite: MUSIC 181

MUSIC 422 **Jazz Harmony and Arranging** (3) Analysis and composition of jazz tunes and chord progressions; instrumental and vocal arranging in the jazz idiom.
Effective: Fall 1983
Prerequisite: MUSIC 222, MUSIC 232

MUSIC 424 **Piano Pedagogy II** (2) Analysis of techniques of teaching intermediate-early advanced level piano and studies of music literature and pedagogical writings.
Effective: Spring 1997
Prerequisite: KEYBD 270 orKEYBD 280;MUSIC 331

MUSIC 425 **Advanced Voice Pedagogy** (2) Analysis of techniques of teaching voice, supervised teaching, studies of studio materials and related topics.
Effective: Spring 2004
Prerequisite: MUSIC 418

MUSIC 427 **Masters of Music** (3) An intensive investigation of the works of a major composer in Western music history. (May be repeated for credit.)
Effective: Spring 2007

MUSIC 428 **Graduate Review of Tonal Analysis** (2) Application of analytical techniques to music from Bach to Brahms.
Effective: Spring 1997
Prerequisite: undergraduate core in music theory and literature at an accredited university or elementary analysis; MUSIC 429 and 430 if indicated on entering competency exam

MUSIC 429 **Aural Review for Graduate Students** (1) An intensive review of the aural skills required for a theoretical understanding of 18th- and 19th-century music.
Effective: Summer 1994
Prerequisite: MUSIC 221 or undergraduate core in music theory at an accredited university

MUSIC 430 **Harmony Review for Graduate Students** (2) An intensive review of tonal harmony from a linear approach, including part- writing and counterpoint.
Effective: Spring 1995
Prerequisite: MUSIC 232 or undergraduate core in music theory at an accredited university

MUSIC 431 **ADVANCED TONAL ANALYSIS** (2-3) Advanced techniques of musical analysis.
Effective: Fall 1996
Prerequisite: MUSIC 331

MUSIC 432 **Graduate Review of Twentieth-Century Analysis** (2-3) The theory and analysis of style in music of the twentieth century.
Effective: Fall 1997
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 433 **Advanced Analysis of Twentieth Century Music** (2-3) In-depth studies of selected twentieth-century repertoires and/or analytical models.
Effective: Summer 1996
Prerequisite: MUSIC 262, MUSIC 332

MUSIC 435 **Score Reading** (1) Introduction in score reading at the keyboard.
Effective: Spring 1991
Prerequisite: MUSIC 232 ; piano proficiency passed

MUSIC 438 **Figured Bass** (2) Learning to realize and play figured basses at the keyboard with emphasis on examples from Italy, Germany, France, and England from 1600 to 1800.
Effective: Spring 1991
Prerequisite: MUSIC 232 ; piano proficiency passed

MUSIC 440 **Forms in Music** (3) An investigation of the traditional forms of tonal music in Western culture. (May be repeated for credit.)
Effective: Spring 2007

MUSIC 441W **Capstone Experience in Elementary General and Choral Music** (3) Selection and application of materials, methods, teaching and assessment strategies for elementary general and choral music settings.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: MUSIC 345, MUSIC 395B

MUSIC 441W **Emphasis in Elementary General and Choral Music** (3) Selection and application of materials, methods, teaching and assessment strategies for elementary general and choral music settings.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MUSIC 345, MUSIC 395B

MUSIC 442W **Capstone Experience in Middle School General and Choral Music** (3) Capstone experience to teaching in general and choral middle school settings.
Effective: Fall 2007
Prerequisite: Limited to Music Education Majors.MUSIC 345, MUSIC 395B

MUSIC 443 **Choral Methods and Materials: Emphasis** (3) Selection and analysis of choral literature, study of the adolescent voice; administration of school choral programs. Intended for those with a choral emphasis.
Effective: Fall 2007
Prerequisite: MUSIC 266, MUSIC 295A, MUSIC 340, MUSIC 348 piano proficiency passed

MUSIC 444W **Capstone Experiences in Elementary and Intermediate Band** (3) Examination and application of teaching strategies and materials for students planning to teach band in the elementary and middle schools.
Effective: Fall 2007 Ending: Fall 2010
Prerequisite: MUSIC 345, MUSIC 395A, MUSIC 366 piano proficiency passes

MUSIC 444W **Emphasis in Elementary and Intermediate Band** (3) Examination and application of teaching strategies and materials for students planning to teach band in the elementary and middle schools.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MUSIC 345, MUSIC 395A, MUSIC 366 piano proficiency passes

MUSIC 445W **Capstone Experiences in High School Band** (3) Examination and application of teaching strategies and materials for students planning to teach high school bands.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: MUSIC 345, MUSIC 395B

MUSIC 445W **Emphasis in High School Band** (3) Examination and application of teaching strategies and materials for students planning to teach high school bands.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MUSIC 345, MUSIC 395B

MUSIC 446W **Capstone Experiences in Strings and Orchestra** (3) Development of teaching techniques for instructing elementary and secondary string/orchestra student musicians for music education majors.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: MUSIC 345, MUSIC 395B

MUSIC 446W **Emphasis in Strings and Orchestra** (3) Development of teaching techniques for instructing elementary and secondary string/orchestra student musicians for music education majors.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MUSIC 345, MUSIC 395B

MUSIC 450 **Teaching Marching Band** (2) Traditional and contemporary drill design principles, show development strategies, instructional techniques, and organizational procedures involved in teaching marching band.
Effective: Fall 2007
Prerequisite: MUSIC 345 or three years collegiate marching band experience or permission of program

MUSIC 451 **Computer Programming for Musicians** (3 per semester/maximum of 12) In-depth study of music programming techniques.
Effective: Summer 2008
Prerequisite: INART 258, MUSIC 455 or permission of program

MUSIC 455 **Technology in Music** (1-3:1.5:1.5) Survey of how musical information is stored and processed in computer systems.
Effective: Spring 2008
Prerequisite: CMPSC 100, CMPSC 101, CMPSC 121 orMUSIC 231

MUSIC 458 **Electronic Music Composition** (3) An introduction to the art of composition in the electronic audio medium.
Effective: Spring 2006
Prerequisite: INART 258

MUSIC 459 **Project in Electronic Music** (1-3 per semester, maximum of 12) A studio course in the theory and practice of electronic music. Enrollment is restricted to 10 students.
Effective: Spring 1998
Prerequisite: MUSIC 458

MUSIC 460 **Teaching Musical Cultures** (2) Exploration of the world's musical cultures and the implication of and procedures for teaching multicultural music. Limited to upper division music majors or permission of program.

Effective: Summer 2006
Prerequisite: MUSIC 262 or permission of program

MUSIC 461W **Studies in Music History: Antiquity to 1600** (3) In-depth study of selected aspects of music and culture from antiquity to 1600, with emphasis on writing and research.
Effective: Spring 1997 Ending: Summer 2010
Prerequisite: MUSIC 261, MUSIC 331

MUSIC 461W **Studies in Music History: Antiquity to 1600** (3 per semester/maximum of 6) In-depth study of selected aspects of music and culture from antiquity to 1600, with emphasis on writing and research.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MUSIC 261, MUSIC 331

MUSIC 462W **Studies in Music History: 1550-1750** (3) In-depth study of selected aspects of music and culture from 1550-1750, with emphasis on writing and research.
Effective: Fall 1996 Ending: Summer 2010
Prerequisite: MUSIC 261, MUSIC 331

MUSIC 462W **Studies in Music History: 1550-1750** (3 per semester/maximum of 6) In-depth study of selected aspects of music and culture from 1550-1750, with emphasis on writing and research.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MUSIC 261, MUSIC 331

MUSIC 463W **Studies in Music History: 1700-1900** (3) In-depth study of selected aspects of music and culture from 1700-1900, with emphasis on writing and research.
Effective: Spring 1997 Ending: Summer 2010
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 463W **Studies in Music History: 1700-1900** (3 per semester/maximum of 6) In-depth study of selected aspects of music and culture from 1700-1900, with emphasis on writing and research.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 464W **Studies in Music History: 1850-Present** (3) In-depth study of selected aspects of music and culture from 1850 to the present, with emphasis on writing and research.
Effective: Spring 1997 Ending: Summer 2010
Prerequisite: MUSIC 262, MUSIC 332

MUSIC 464W **Studies in Music History: 1850-Present** (3 per semester/maximum of 6) In-depth study of selected aspects of music and culture from 1850 to the present, with emphasis on writing and research.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: MUSIC 262, MUSIC 332

MUSIC 465 **Advanced Conducting I** (3) Advanced instruction in conducting; conducting techniques specific to instrumental or choral music; emphasis on score study and rehearsal technique.
Effective: Summer 1994
Prerequisite: MUSIC 366

MUSIC 466 **Advanced Conducting II** (2 per semester/maximum of 8) Standard scores of symphonies, tone poems, operas, oratorios, and shorter vocal and instrumental works studied from the viewpoint of the conductor.
Effective: Spring 1995
Prerequisite: MUSIC 465

MUSIC 467 **Opera Workshop** (1-3 per semester/maximum of 6) History, analysis, and production of operas from sixteenth century to present.
Effective: Spring 2001
Prerequisite: audition

MUSIC 468 **Acting for Singers** (2 per semester/maximum of 4) To help students develop authentic and specific characters/portrayals on stage through physical and emotional awareness.
Effective: Fall 2008
Prerequisite: Must be currently enrolled for voice jury track at the level of V220J or higher or register with permission of the program

MUSIC 471 **Structural and Sixteenth-Century Counterpoint** (2) Advanced species counterpoint and its application to the sixteenth-century style.
Effective: Fall 1983
Prerequisite: MUSIC 222, MUSIC 232

MUSIC 472 **Eighteenth-Century Counterpoint** (2) Imitative and nonimitative counterpoint in the style of Bach.
Effective: Fall 1983
Prerequisite: MUSIC 222, MUSIC 232

MUSIC 473 **Composition VII** (3) Composition instruction for fourth-year composition majors.
Effective: Spring 1998
Prerequisite: MUSIC 374

MUSIC 474 **Composition VIII** (3) Composition instruction for fourth-year composition majors.
Effective: Spring 1998
Prerequisite: MUSIC 473

MUSIC 476W **B.A. Senior Project** (3) A semester project appropriate to student's option in B.A. program (e.g., research paper, performance with program notes, or related paper).
Effective: Spring 1992
Prerequisite: seventh-semester standing

MUSIC 478 **Vocal Literature** (3) Introduction to the literature for solo voice in opera, oratorio, cantata, art song, and chamber music from the baroque to the present.
Effective: Spring 1997
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 480 **Opera Literature** (3) Studies in the development of the opera from 1600 to the present, treating both libretto and music.
Effective: Spring 1997
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 481 **Keyboard Literature** (3) Studies in the development of keyboard music and instruments; a survey of all eras using listening, analysis, and performance.
Effective: Spring 1997
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 483 **Seminar in Voice Pedagogy** (2) Survey of literature relevant to the teaching of voice from historical sources through recent pedagogical scholarship.
Effective: Spring 2004
Prerequisite: MUSIC 418

MUSIC 485 **Chamber Music Literature** (3) Survey of chamber music for strings, winds, and brass instruments from the mid-16th century to the present day.
Effective: Spring 1997
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 487 **Orchestral Literature** (3) Survey of orchestral literature.
Effective: Spring 1997
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 489 **Studio and Recital Accompaniment** (1 per semester/maximum of 4) Advanced keyboard accompaniment of student soloists in the studio and in public performance under faculty supervision.
Effective: Fall 1983
Prerequisite: MUSIC 194 or permission of instructor

MUSIC 493 **Sonata Duos** (1 per semester/maximum of 4) Preparation for performance of advanced sonata literature for various individual instruments with keyboard.
Effective: Fall 1983
Prerequisite: MUSIC 193 or equivalent; permission of instructor

MUSIC 494 **Research Topics** (1-3) Supervised research leading to senior thesis or project.
Effective: Fall 1983

MUSIC 494H **Research Topics** (1-3) Supervised research leading to senior thesis or project.
Effective: Fall 2007

MUSIC 495A **Student Teaching: General Music** (5-7) Observation and teaching under supervision.
Effective: Fall 2001
Prerequisite: completion of all courses in the major with a grade of "C" or better Concurrent: MUSIC 442

MUSIC 495B **Student Teaching: Choral Music** (5-7) Observation and teaching under supervision.
Effective: Fall 2001
Prerequisite: completion of all courses in the major with a grade of "C" or better Concurrent: MUSIC 443

MUSIC 495C **Student Teaching: Instrumental Music** (5-7) Observation and teaching under supervision.
Effective: Fall 2001
Prerequisite: completion of all courses in the major with a grade of "C" or better Concurrent: MUSIC 444

MUSIC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

MUSIC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

MUSIC 497A **Survey Music History** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 497A **Essence of Joy** (1) Ensemble to perform sacred and secular repertoire from the african american traditions.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 497B **Oriana Singers** (1) Performs music written for treble voices.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 497B **Survey Music History** (3) For graduate students who need remedial work in music history.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 497C **Women's Chorale** (1) Performs selected treble repertoire from the past five centuries.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 497C **Oriana Singers** (1) Performs music written for treble voices.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 497D **University Choir** (1) Presents both major large-scale choral works and appropriate shorter work. 18th, 19th, and 20th century major works.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 497D **Mallet Ensemble** (1) Study and Performance of Music for keyboard percussion instruments.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 497E **Essence of Joy** (1) Ensemble to perform sacred and secular repertoire from the African American traditions.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 497E **Viola Orchestral Excerpts** (1) An introduction to excerpts from the viola parts of standard orchestral literature required for professional orchestral auditions.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 497F **Glee Club** (3) Male voices singing music from the renaissance through the twentieth-century.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 497F **Business of Music** (1) Survey of topics related to a career in music performance - including auditions, competitions, finances, work abroad, etc. Gues lecturers included.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 497G **Hi-Lo's** (1) Select group performing choral chamber music.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 497I **Viola Orchestral Excerpts** (1) An introduction to excerpts from the viola parts of standard orchestral literature required for professional orchestral auditions.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 497J **Mallet Ensemble** (1) Study and performance of music for keyboard percussion instruments.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

MUSIC 498A **Review of Harmony/Analysis** (2) Devoted to an in-depth study of tonal harmony and analysis, beginning with a review of diatonic progressions and continuing with chromatic harmony.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 498B **Bass Orchestral Excerpts** (1) This course is designed to study in depth a series of double bass excerpts from the standard orchestral and opera repertoire. We will look at how to prepare and mock audition behind a screen at the end of the semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 498C **Early Childhood Practicum** (1) Students will plan and deliver weekly music classes for preschool children at the Bennett Center. Will complete a case study on one child they observe throughout the semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

MUSIC 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2007

MUSIC 500 **Introduction to Music Reference and Research Materials** (2) A study of musicological reference and research materials in English and Western European languages, with exercises in their use.
Effective: Fall 1983

MUSIC 502 **Early Music Ensemble** (1) Ensemble for the performance and study of Renaissance and Baroque music on instruments of the era.
Effective: Summer 2002
Prerequisite: placement audition

MUSIC 503 **Concert Choir** (1 per semester, maximum of 4) Rehearsal and performance of choral repertoire appropriate to mixed-voice ensemble of approximately sixty voices.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 504 **Chamber Singers** (1 per semester, maximum of 4) Rehearsal and performance of choral repertoire appropriate to mixed-voice ensemble of approximately twenty-four voices.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 505 **symphonic Wind Ensemble** (1 per semester, maximum of 4) Rehearsal and performance of wind repertoire and concert band literature.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 506 **Symphonic Band** (1 per semester, maximum of 4) Rehearsal and performance of symphonic band literature. A select group using standard instrumentation.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 507 **Philharmonic Orchestra** (1 per semester, maximum of 4) Orchestra rehearsal and performance.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 508 **Chamber Orchestra** (1 per semester, maximum of 4) Chamber orchestra rehearsal and performance.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 509 **Centre Dimensions** (1 per semester, maximum of 4) The rehearsal and performance of large jaza band literature ("charts") along with individualized formal study of jazs improvisation.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 510 **Brass Choir** (1 per semester, maximum of 4) Rehearsal and performance of literature involving brass instruments.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 511 **Percussion Ensemble** (1 per semester, maximum of 4) Study and performance of percussion chamber music in various instrumental combinations focusing on the classical and contemporary repertoire.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 519 **Graduate Seminar in Intermediate Piano Pedagogy** (2) Graduate seminar in intermediate teaching repertoire and strategies for piano from the Baroque to the 21st century.
Effective: Summer 2008
Prerequisite: MUSIC 424, MUSIC 589

MUSIC 520 **Chamber Music for Strings** (1 per semester, maximum of 4) Preparation for performance of (advanced) chamber music literature involving primarily stringed instruments--quartets and quintets.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 521 **Chamber Music for Woodwinds** (1 per semester, maximum of 4) Preparation for performance of (advanced) chamber music literature involving primarily woodwind instruments--quartets and quintets.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 522 **Chamber Music for Brass** (1 per semester, maximum of 4) Preparation for performance of (advanced) chamber music literature involving primarily brass instruments--quartets and quintets.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 523 **Sonata Duos** (1 per semester, maximum of 4) Preparation for performance of (advanced) sonata literature for various individual instruments with keyboard.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 524 **Graduate Seminar in Advanced Piano Pedagogy** (2) Graduate seminar in advanced repertoire, history of piano pedagogy, and strategies for piano from the Baroque to the 21st century.

Effective: Summer 2008
Prerequisite: MUSIC 424, MUSIC 589

MUSIC 531 **Analytical Techniques** (3) Twentieth-century theories of tonal music other that Schenker; emphasis on motivic, thematic, metric, and rhythmic analysis.
Effective: Spring 1992
Prerequisite: MUSIC 331

MUSIC 532 **Schenkerian Analysis** (3) An intensive introduction to the analytical method developed by the Twentieth-century Austrian theorist and musicologist, Heinrich Schenker.
Effective: Summer 1991
Prerequisite: a grade of B is required inMUSIC 430 or satisfactory performance on the graduate theory placement examination

MUSIC 533 **The Pedagogy of Undergraduate Theory and History** (2) A study of approaches to the teaching and learning of music theory (written and aural skills) and history.
Effective: Summer 1995
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 535 **Composition** (1-4) Composition of vocal, instrumental, and electronic media and preparation of compositions for performance.
Effective: Fall 1998
Prerequisite: MUSIC 474

MUSIC 547 **The Materials of Appreciation** (3) Examination of written and recorded materials and appropriate techniques for developing appreciation of music at elementary, secondary, and college levels.
Effective: Fall 1983

MUSIC 551 **Administration and Supervision of School Music** (3) Examination of procedures for effective supervision of music instruction and administration of school music programs.
Effective: Summer 1984
Prerequisite: 5 years of music teaching in public schools

MUSIC 552 **Internship in Music Supervision** (3-6) Internship in schools under supervision of graduate faculty in music education.
Effective: Fall 1984
Prerequisite: EDLDR 560, MUSIC 551

MUSIC 560 **Choral Conducting** (2-4 per semester, maximum of 16) Study of choral conducting techniques, comprehensive score analysis, and supervised rehearsal and performance practicum.
Effective: Summer 1995
Prerequisite: MUSIC 466 or admission by audition

MUSIC 561 **Orchestral Conducting** (2-4 per semester, maximum of 8) Study of orchestral conducting technique, comprehensive score analysis, and supervised rehearsal and performance practicum.
Effective: Spring 2008
Prerequisite: MUSIC 466 or admission by audition

MUSIC 562 **Band/Wind Ensemble Conducting** (2-4 per semester, maximum of 16) Study of band and wind ensemble conducting, comprehensive score analysis, and supervised rehearsal and performance practicum.
Effective: Summer 1998

MUSIC 565 **Studio and Recital Accompaniment** (1 per semester, maximum of 4) Keyboard accompaniment of student soloists in the studio and in public performance, under faculty supervision.
Effective: Spring 1993
Prerequisite: admission by audition

MUSIC 572 **Seminar in Musicology** (3 per semester/maximum of 9) Research in selected areas of music history.
Effective: Fall 1983

MUSIC 573 **Integrative Seminar in Music Theory and History** (3 per semester/maximum of 9) Special topics (composer, style, genre) taught from both theoretical and historical perspectives.
Effective: Fall 2000
Prerequisite: MUSIC 262, MUSIC 331

MUSIC 574 **Seminar in Music Theory** (3) Study of analytical techniques, aesthetics, writings, in music theory, music cognition, musical sketches, and mathematical models taught from a theory perspective.
Effective: Spring 2001
Prerequisite: MUSIC 428, MUSIC 432

MUSIC 575 **Integrative Conducting Seminar** (1 per semester/maximum of 2) A seminar for choral, orchestral, and band/wind ensemble graduate conducting majors, taught by conducting faculty in all three areas.
Effective: Summer 1998

MUSIC 580 **Studies in Orchestral Literature** (1-3 per semester/maximum of 8) Selected studies in orchestral literature from the seventeenth century to the present.
Effective: Spring 2008

MUSIC 582 **Studies in Band/Wind Ensemble Literature** (2-3 per semester/maximum of 8) Selected studies in band and wind ensemble literature from the Renaissance to the present.
Effective: Summer 1998

MUSIC 583 **Studies in Choral Literature** (2-3 per semester, maximum of 20) Selected studies in choral literature of all types from the Renaissance to the present.
Effective: Spring 1992

MUSIC 585 **Graduate Seminar in Keyboard Music 1710 to 1820** (2) Seminar in music for keyboards (organ, harpischord, pianoforte) from the early works of J.S. Bach (c. 1710) to late Beethoven.
Effective: Summer 2008
Prerequisite: MUSIC 481

MUSIC 586 **Graduate Seminar in Piano Music 1820-1920** (2) Seminar in music for pianoforte from the early works of Schubert, circa 1820, to Rachmaninoff (Romantic and post-Romantic).
Effective: Summer 2008
Prerequisite: MUSIC 481

MUSIC 587 **Graduate Seminar in Piano Music 1890-Present** (2) Seminar in modern music for pianoforte from the early works of Debussy (circa 1890) to the present day.
Effective: Summer 2008
Prerequisite: MUSIC 481

MUSIC 588 **Seminar in Music Literature of the Major Performance Area** (1-3) Selected studies in music literature specific to the student's major performance area. Will include research, analysis, and performance.
Effective: Summer 1991

MUSIC 589 **Seminar in Piano Pedagogy** (2) Selected variable topics in piano pedagogy; includes reserach, performance and discussion of appropriate literature, and class participation.
Effective: Summer 1992
Prerequisite: MUSIC 419, MUSIC 424

MUSIC 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1995

MUSIC 591 **Graduate Degree Performance** (1) A juried recital performance for students majoring in performance, composition, or conducting.
Effective: Spring 1985
Prerequisite: consent of department

MUSIC 594 **Master's Paper Research** (1-6) Investigation of a specific problem in music or music education.
Effective: Fall 1983

MUSIC 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1994
Prerequisite: MUSIC 419, MUSIC 424, MUSIC 589

MUSIC 595A **Internship in Piano Pedagogy** (1) Piano perforance and pedagogy majors observe experienced teachers and gain supervised teaching experience. Gradually assume responsibility for the lessons of one or two students.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: MUSIC 419, MUSIC 424, MUSIC 589

MUSIC 595B **Internship in College Teaching** (2) Identify goals for undergraduate courses in general music; develop and structure learning experience in music for students in higher education.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: MUSIC 419, MUSIC 424, MUSIC 589

MUSIC 595B **Internship in College Teaching** (2) Identify goals for undergraduate courses in general music; develop and structure learning experience in music for students in higher education.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: MUSIC 419, MUSIC 424, MUSIC 589

MUSIC 595B **Internship in College Teaching** (1) Identify goals for undergraduate courses in general music; develop and structure learning experience in music for students in higher education.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: MUSIC 419, MUSIC 424, MUSIC 589

MUSIC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

MUSIC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

MUSIC 597A **Jaxx4Teachers** (1-2) Five day jazz instructional and pedagogical workshop to study with jazz masters and educators. Jazz principles, history, methods, materials, and improvisational techniques for practical applications in the classrooms.
Effective: Summer 2010 Ending: Summer 2010

MUSIC 597A **Women's Chorale** (1) Performs selected treble repertoire from the past five centuries.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 597B **Glee Club** (1) Male voices singing music from the renaissance through the twentieth-century.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 597C **Hi-Lo's** (1) Small ensemble of members of glee club singing music from the renaissance through the twentieth century.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 597D **University Choir** (1) Presents both major large scale choral works and appropriate shorter works. 19th, and 20th century major works.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 597E **Student Teaching Supervision** (1) Involves a minimum of 4 observations of music education student teacher(s) during the semester, in addition to meetings and discussions with cooperating teachers.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 597G **Learning Theory** (3) Course will be an analysis of approaches to music learning in the past 150 years. Gordon's music learning theory and related research will be the primary focus. Students will then compare and contrast Gordon's work with that of previous major pedagogues in the field as well as learning theorists in other areas of education.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

MUSIC 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

MUSIC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

MUSIC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience for teaching assistants in music.
Effective: Fall 1983

MUSIC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

MUSIC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

MUSIC 801 **Doctoral Solo Recital (DMA)** (2 per semester/maximum of 4) Culminating solo recital(s) of artist-level repertoire; may be repeated with different repertoire.
Effective: Summer 2008
Prerequisite: Completion of at least one semester of KEYBD 580J (lessons doctoral/artist level)

MUSIC 802 **DMA Lecture-Recital Monograph** (1) Preparation of a monograph to be text of the DMA lecture-recital; must be approved prior to performance.
Effective: Summer 2008
Prerequisite: Candidacy for the DMA; previous completion of one MUSIC 801 recital

MUSIC 803 **Performance of the DMA Lecture-Recital** (2) Performance of the D.M.A. lecture-recital (the lecture monograph to be pre-approved as MUSIC 802).
Effective: Summer 2008
Prerequisite: Candidacy for the Doctor of Musical Arts degree;MUSIC 802

MUSIC 804 **Chamber Music Recital (DMA)** (1 per semester/maximum of 2) Recital devoted to chamber music (including song groups or cycles for voice and piano). May be repeated.
Effective: Summer 2008
Prerequisite: Candidacy for the Doctor of Musical Arts degree

MUSIC 805 **DMA Final Recital** (3) Final, culminating solo recital of artist-level repertoire; independently prepared.
Effective: Summer 2008
Prerequisite: Completion of all other course work; Comprehensive Examination for the degree Doctor of Musical Arts

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Music - Brass (BRASS)

BRASS 420J **Trumpet: Primary VII** (2) Individual instruction in trumpet one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: BRASS 370J and permission of faculty jury

BRASS 421J **French Horn: Primary VII** (2) Individual instruction in French horn one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: BRASS 321J and permission of faculty jury

BRASS 422J **Trombone: Primary VII** (2) Individual instruction in trombone one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: BRASS 372J and permission of faculty jury

BRASS 423J **Euphonium: Primary VII** (2) Individual instruction in euphonium/baritone one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: BRASS 373J and permission of faculty jury

BRASS 424J **Tuba: Primary VII** (2) Individual instruction in tuba one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: BRASS 374J and permission of faculty jury

BRASS 430J **Trumpet: Performance VII** (3) Individual instruction in trumpet one hour per week. For B.Mus. trumpet performance majors.
Effective: Fall 1983
Prerequisite: BRASS 380J and permission of faculty jury

BRASS 431J **French Horn: Performance VII** (3) Individual instruction in French horn one hour per week. For B.Mus. French horn performance majors.
Effective: Fall 1983
Prerequisite: BRASS 381J and permission of faculty jury

BRASS 432J **Trombone: Performance VII** (3) Individual instruction in trombone one hour per week. For B.Mus. trombone majors.
Effective: Fall 1983
Prerequisite: BRASS 382J and permission of faculty jury

BRASS 433J **Euphonium: Performance VII** (3) Individual instruction in euphonium/baritone one hour per week. For B.Mus. euphonium/baritone majors.
Effective: Fall 1983
Prerequisite: BRASS 383J and permission of faculty jury

BRASS 434J **Tuba: Performance VII** (3) Individual instruction in tuba one hour per week. For B.Mus. tuba majors.
Effective: Fall 1983
Prerequisite: BRASS 384J and permission of faculty jury

BRASS 470J **Trumpet: Primary VIII** (2) Individual instruction in trumpet one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: BRASS 420J and permission of faculty jury

BRASS 471J **French Horn: Primary VIII** (2) Individual instruction in French horn one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: BRASS 421J and permission of faculty jury

BRASS 472J **Trombone: Primary VIII** (2) Individual instruction in trombone one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: BRASS 422J and permission of faculty jury

BRASS 473J **Euphonium: Primary VIII** (2) Individual instruction in euphonium/baritone one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: BRASS 423J and permission of faculty jury

BRASS 474J **Tuba: Primary VIII** (2) Individual instruction in tuba one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: BRASS 424J and permission of faculty jury

BRASS 480J **Trumpet: Performance VIII** (3) Individual instruction in trumpet one hour per week. For B.Mus. trumpet

performance majors.
Effective: Fall 1983
Prerequisite: BRASS 430J and permission of faculty jury

BRASS 481J **French Horn: Performance VIII** (3) Individual instruction in French horn one hour per week. For B.Mus. French horn performance majors.
Effective: Fall 1983
Prerequisite: BRASS 431J and permission of faculty jury

BRASS 482J **Trombone: Performance VIII** (3) Individual instruction in trombone one hour per week. For B.Mus. trombone majors.
Effective: Fall 1983
Prerequisite: BRASS 432J and permission of faculty jury

BRASS 483J **Euphonium: Performance VIII** (3) Individual instruction in euphonium/baritone one hour per week. For B.Mus. euphonium/baritone majors.
Effective: Fall 1983
Prerequisite: BRASS 433J and permission of faculty jury

BRASS 484J **Tuba: Performance VIII** (3) Individual instruction in tuba one hour per week. For B.Mus. tuba majors.
Effective: Fall 1983
Prerequisite: BRASS 434J and permission of faculty jury

BRASS 500J **Trumpet: Secondary** (1) Individual instruction in trumpet one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 501J **French Horn: Secondary** (1) Individual instruction in French horn one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 502J **Trombone: Secondary** (1) Individual instruction in trombone one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 503J **Euphonium: Secondary** (1) Individual instruction in euphonium/baritone one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 504J **Tuba: Secondary** (1) Individual instruction in tuba one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 510J **Trumpet: Secondary** (2) Individual instruction in trumpet one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 511J **French Horn: Secondary** (2) Individual instruction in French horn one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 512J **Trombone: Secondary** (2) Individual instruction in trombone one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 513J **Euphonium: Secondary** (2) Individual instruction in euphonium/baritone one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 514J **Tuba: Secondary** (2) Individual instruction in tuba one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

BRASS 530J **Trumpet: Performance** (4 per semester/maximum of 16) Individual instruction in trumpet one hour per week. For graduate trumpet performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

BRASS 531J **French Horn: Performance** (4 per semester/maximum of 16) Individual instruction in French Horn one hour per week. For graduate French horn performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

BRASS 532J **Trombone: Performance** (4 per semester/maximum of 16) Individual instruction in trombone one hour per week. For graduate trombone majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

BRASS 533J **Euphonium: Performance** (4 per semester, maximum of 16) Individual instruction in euphonium one hour per week. For graduate euphonium majors.
Effective: Spring 1992
Prerequisite: acceptance into program by faculty jury

BRASS 534J **Tuba: Performance** (4 per semester/maximum of 16) Individual instruction in tuba two sessions per week. For graduate tuba performance majors.
Effective: Fall 1986
Prerequisite: acceptance into major by faculty jury

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Music - Keyboard (KEYBD)

KEYBD 420J **Piano: Primary VII** (2) Individual instruction in piano one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: KEYBD 370J and permission of faculty jury

KEYBD 421J **Organ: Primary VII** (2) Individual instruction in pipe organ one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: KEYBD 371J and permission of faculty jury

KEYBD 430J **Piano: Performance VII** (3) Individual instruction in piano one hour per week. For B.Mus. piano performance majors.
Effective: Fall 1983
Prerequisite: KEYBD 380J and permission of faculty jury

KEYBD 431J **Organ: Performance VII** (3) Individual instruction in pipe organ one hour per week. For B.Mus. organ performance majors.
Effective: Fall 1983
Prerequisite: KEYBD 381J and permission of faculty jury

KEYBD 470J **Piano: Primary VIII** (2) Individual instruction in piano one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: KEYBD 420J and permission of faculty jury

KEYBD 471J **Organ: Primary VIII** (2) Individual instruction in pipe organ one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: KEYBD 421J and permission of faculty jury

KEYBD 480J **Piano: Performance VIII** (3) Individual instruction in piano one hour per week. For B.Mus. piano performance majors.
Effective: Fall 1983
Prerequisite: KEYBD 430J and permission of faculty jury

KEYBD 481J **Organ: Performance VIII** (3) Individual instruction in pipe organ one hour per week. For B.Mus. organ performance majors.
Effective: Fall 1983
Prerequisite: KEYBD 431J and permission of faculty jury

KEYBD 500J **Piano: Secondary** (1) Individual instruction in piano one-half hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

KEYBD 501J **Organ: Secondary** (1) Individual instruction in pipe organ one-half hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

KEYBD 502J **Harpsichord: Secondary** (1) Individual instruction in harpsichord one-half hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

KEYBD 510J **Piano: Secondary** (1) Individual instruction in piano one hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

KEYBD 511J **Organ: Secondary** (2) Individual instruction in pipe organ one hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

KEYBD 512J **Harpsichord: Secondary** (2) Individual instruction in harpsichord one hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

KEYBD 530J **Piano: Performance** (4 per semester/maximum of 16) Individual instruction in piano one hour per week. For graduate piano performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

KEYBD 531J **Organ: Performance** (4 per semester/maximum of 16) Individual instruction in pipe organ one hour per week. For graduate organ performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

KEYBD 532J **Harpsichord: Performance** (4 per semester/maximum of 16) Individual instruction in harpsichord one hour per week. For graduate harpsichord performance major.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

KEYBD 580J **Piano Performance Doctoral/Artist Level** (4) One-hour weekly piano lessons with jury examination at end of each semester; repeatable course; four semesters required.
Effective: Summer 2008

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Music - Percussion (PERCN)

PERCN 420J **Percussion: Primary VII** (2) Individual instruction in percussion one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: PERCN 370J and permission of faculty jury

PERCN 430J **Percussion: Performance VII** (3) Individual instruction in percussion one hour per week. For B.Mus. percussion majors.
Effective: Fall 1983
Prerequisite: PERCN 380J and permission of faculty jury

PERCN 470J **Percussion: Primary VIII** (2) Individual instruction in percussion one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: PERCN 420J and permission of faculty jury

PERCN 480J **Percussion: Performance VIII** (3) Individual instruction in percussion one hour per week. For B.Mus. percussion majors.
Effective: Fall 1983
Prerequisite: PERCN 430J and permission of faculty jury

PERCN 500J **Percussion: Secondary** (1) Individual instruction in percussion one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

PERCN 510J **Percussion: Secondary** (2) Individual instruction in percussion one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

PERCN 530J **Percussion: Performance** (4 per semester/maximum of 16) Individual instruction in percussion one hour per week. For graduate percussion performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

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Music - String (STRNG)

STRNG 420J **Violin: Primary VII** (2) Individual instruction in violin one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: STRNG 370J and permission of faculty jury

STRNG 421J **Viola: Primary VII** (2) Individual instruction in viola one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: STRNG 371J and permission of faculty jury

STRNG 422J **Violoncello: Primary VII** (2) Individual instruction in violoncello one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: STRNG 372J and permission of faculty jury

STRNG 423J **Double Bass: Primary VII** (2) Individual instruction in double bass one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: STRNG 373J and permission of faculty jury

STRNG 430J **Violin: Performance VII** (3) Individual instruction in violin one hour per week. For B.Mus. violin performance majors.
Effective: Fall 1983
Prerequisite: STRNG 380J and permission of faculty jury

STRNG 431J **Viola: Performance VII** (3) Individual instruction in viola one hour per week. For B.Mus. viola performance majors.
Effective: Fall 1983
Prerequisite: STRNG 381J and permission of faculty jury

STRNG 432J **Violoncello: Performance VII** (3) Individual instruction in violoncello one hour per week. For B.Mus. violoncello performance majors.
Effective: Fall 1983
Prerequisite: STRNG 382J and permission of faculty jury

STRNG 433J **Double Bass: Performance VII** (3) Individual instruction in double bass one hour per week. For B.Mus. double bass performance majors.
Effective: Fall 1983
Prerequisite: STRNG 383J and permission of faculty jury

STRNG 470J **Violin: Primary VIII** (2) Individual instruction in violin one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: STRNG 420J and permission of faculty jury

STRNG 471J **Viola: Primary VIII** (2) Individual instruction in viola one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: STRNG 421J and permission of faculty jury

STRNG 472J **Violoncello: Primary VIII** (2) Individual instruction in violoncello one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: STRNG 422J and permission of faculty jury

STRNG 473J **Double Bass: Primary VIII** (2) Individual instruction in double bass one hour per week. For School of Music B.A. and B.S. majors; other qualified students.
Effective: Fall 1983
Prerequisite: STRNG 423J and permission of faculty jury

STRNG 480J **Violin: Performance VIII** (3) Individual instruction in violin one hour per week. For B.Mus. violin performance majors.
Effective: Fall 1983
Prerequisite: STRNG 430J and permission of faculty jury

STRNG 481J **Viola: Performance VIII** (3) Individual instruction in viola one hour per week. For B.Mus. viola performance majors.
Effective: Fall 1983
Prerequisite: STRNG 431J and permission of faculty jury

STRNG 482J **Violoncello: Performance VIII** (3) Individual instruction in violoncello one hour per week. For B.Mus. violoncello performance majors.
Effective: Fall 1983
Prerequisite: STRNG 432J and permission of faculty jury

STRNG 483J **Double Bass: Performance VIII** (3) Individual instruction in double bass one hour per week. For B.Mus. double bass performance majors.
Effective: Fall 1983
Prerequisite: STRNG 433J and permission of faculty jury

STRNG 500J **Violin: Secondary** (1) Individual instruction in violin one-half hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

STRNG 501J **Viola: Secondary** (1) Individual instruction in viola one-half hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

STRNG 502J **Violoncello: Secondary** (1) Individual instruction in violoncello one-half hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

STRNG 503J **Double Bass: Secondary** (1) Individual instruction in double bass one-half hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

STRNG 510J **Violin: Secondary** (2) Individual instruction in violin one hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

STRNG 511J **Viola: Secondary** (2) Individual instruction in viola one hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

STRNG 512J **Violoncello: Secondary** (2) Individual instruction in violoncello one hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

STRNG 513J **Double Bass: Secondary** (2) Individual instruction in double bass one hour per week. For students who qualify.
Effective: Fall 1983
Prerequisite: permission of instructor

STRNG 530J **Violin: Performance** (4 per semester/maximum of 16) Individual instruction in violin one hour per week. For graduate violin performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

STRNG 531J **Viola: Performance** (4 per semester/maximum of 16) Individual instruction in viola one hour per week. For graduate viola performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

STRNG 532J **Violoncello: Performance** (4 per semester/maximum of 16) Individual instruction in violoncello one hour per week. For graduate violoncello performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

STRNG 533J **Double Bass: Performance** (4 per semester/maximum of 16) Individual instruction in double bass one hour per week. For graduate double bass performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

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Music - Voice (VOICE)

VOICE 412J **Musical Theatre Voice V** (2) Individual instruction in voice. Intended for Theatre BFA in Music Theatre students.
Effective: Fall 2006
Prerequisite: admission into Theatre BFA in Musical Theatre

VOICE 420J **Voice: Primary VII** (2) Individual instruction in voice one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: VOICE 370J and permission of faculty jury

VOICE 430J **Voice: Performance VII** (3) Individual instruction in voice one hour per week. For B.Mus. voice performance majors.
Effective: Fall 1983
Prerequisite: VOICE 380J and permission of faculty jury

VOICE 462J **Musical Theatre Voice VI** (2) Individual instruction in voice. Intended for Theatre BFA in Music Theatre students.
Effective: Fall 2006
Prerequisite: Admission into Theatre BFA in Musical Theatre

VOICE 470J **Voice: Primary VIII** (2) Individual instruction in voice one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: VOICE 420J and permission of faculty jury

VOICE 480J **Voice: Performance VIII** (3) Individual instruction in voice one hour per week. For B.Mus. voice performance majors.
Effective: Fall 1983
Prerequisite: VOICE 430J and permission of faculty jury

VOICE 500J **Voice: Secondary** (1) Individual instruction in voice one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

VOICE 510J **Voice: Secondary** (2) Individual instruction in voice one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

VOICE 530J **Voice: Performance** (4 per semester/maximum of 16) Individual instruction in voice one and one-half hours per week. For graduate voice performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

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Music - Woodwinds (WWNDS)

WWNDS 420J **Flute: Primary VII** (2) Individual instruction in flute one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 370J and permission of faculty jury

WWNDS 421J **Oboe: Primary VII** (2) Individual instruction in oboe one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 371J and permission of faculty jury

WWNDS 422J **Clarinet: Primary VII** (2) Individual instruction in clarinet one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 372J and permission of faculty jury

WWNDS 423J **Bassoon: Primary VII** (2) Individual instruction in bassoon one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 373J and permission of faculty jury

WWNDS 424J **Saxophone: Primary VII** (2) Individual instruction in saxophone one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 374J and permission of faculty jury

WWNDS 430J **Flute: Performance VII** (3) Individual instruction in flute one hour per week. For B.Mus. flute performance majors.
Effective: Fall 1983
Prerequisite: WWNDS 380J and permission of faculty jury

WWNDS 431J **Oboe: Performance VII** (3) Individual instruction in oboe one hour per week. For B.Mus. oboe majors.
Effective: Fall 1983
Prerequisite: WWNDS 381J and permission of faculty jury

WWNDS 432J **Clarinet: Performance VII** (3) Individual instruction in clarinet one hour per week. For B.Mus. clarinet majors.
Effective: Fall 1983
Prerequisite: WWNDS 382J and permission of faculty jury

WWNDS 433J **Bassoon: Performance VII** (3) Individual instruction in bassoon one hour per week. For B.Mus. bassoon performance majors.
Effective: Fall 1983
Prerequisite: WWNDS 383J and permission of faculty jury

WWNDS 434J **Saxophone: Performance VII** (3) Individual instruction in saxophone one hour per week. For B.Mus. saxophone performance majors.
Effective: Fall 1983
Prerequisite: WWNDS 384J and permission of faculty jury

WWNDS 470J **Flute: Primary VIII** (2) Individual instruction in flute one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 420J and permission of faculty jury

WWNDS 471J **Oboe: Primary VIII** (2) Individual instruction in oboe one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 421J and permission of faculty jury

WWNDS 472J **Clarinet: Primary VIII** (2) Individual instruction in clarinet one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 422J and permission of faculty jury

WWNDS 473J **Bassoon: Primary VIII** (2) Individual instruction in bassoon one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 423J and permission of faculty jury

WWNDS 474J **Saxophone: Primary VIII** (2) Individual instruction in saxophone one hour per week. For School of Music B.A. and B.S. majors.
Effective: Fall 1983
Prerequisite: WWNDS 424J and permission of faculty jury

WWNDS 480J **Flute: Performance VIII** (3) Individual instruction in flute one hour per week. For B.Mus. flute performance majors.

Effective: Fall 1983
Prerequisite: WWNDS 430J and permission of faculty jury

WWNDS 481J **Oboe: Performance VIII** (3) Individual instruction in oboe one hour per week. For B.Mus. oboe majors.
Effective: Fall 1983
Prerequisite: WWNDS 431J and permission of faculty jury

WWNDS 482J **Clarinet: Performance VIII** (3) Individual instruction in clarinet one hour per week. For B.Mus. clarinet majors.
Effective: Fall 1983
Prerequisite: WWNDS 432J and permission of faculty jury

WWNDS 483J **Bassoon: Performance VIII** (3) Individual instruction in bassoon one hour per week. For B.Mus. bassoon performance majors.
Effective: Fall 1983
Prerequisite: WWNDS 433J and permission of faculty jury

WWNDS 484J **Saxophone: Performance VIII** (3) Individual instruction in saxophone one hour per week. For B.Mus. saxophone performance majors.
Effective: Fall 1983
Prerequisite: WWNDS 434J and permission of faculty jury

WWNDS 500J **Flute: Secondary** (1) Individual instruction in flute one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 501J **Oboe: Secondary** (1) Individual instruction in oboe one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 502J **Clarinet: Secondary** (1) Individual instruction in clarinet one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 503J **Bassoon: Secondary** (1) Individual instruction in bassoon one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 504J **Saxophone: Secondary** (1) Individual instruction in saxophone one-half hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 510J **Flute: Secondary** (2) Individual instruction in flute one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 511J **Oboe: Secondary** (2) Individual instruction in oboe one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 512J **Clarinet: Secondary** (2) Individual instruction in clarinet one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 513J **Bassoon: Secondary** (2) Individual instruction in bassoon one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 514J **Saxophone: Secondary** (2) Individual instruction in saxophone one hour per week.
Effective: Fall 1983
Prerequisite: permission of instructor

WWNDS 530J **Flute: Performance** (4 per semester/maximum of 16) Individual instruction in flute one and one-half hour per week. For graduate flute performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

WWNDS 531J **Oboe: Performance** (4 per semester/maximum of 16) Individual instruction in oboe one hour per week. For graduate oboe performance majors.
Effective: Fall 1986
Prerequisite: permission of faculty jury

WWNDS 532J **Clarinet: Performance** (4 per semester/maximum of 16) Individual instruction in clarinet one hour per week. For graduate clarinet performance majors.
Effective: Fall 1986
Prerequisite: permission of faculty jury

WWNDS 533J **Bassoon: Performance** (4 per semester/maximum of 16) Individual instruction in bassoon one hour per week. For graduate bassoon performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

WWNDS 534J **Saxophone: Performance** (4 per semester/maximum of 16) Individual instruction in saxophone one hour per week. For graduate saxophone performance majors.
Effective: Fall 1986
Prerequisite: acceptance into program by faculty jury

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Music Education (MU ED)

MU ED 440 **Music Learning and Development** (2) Psychological principles related to music learning processes and applications of those to teaching music.
Effective: Spring 2010
Prerequisite: permission of program

MU ED 540 **Reflective Practice and Inquiry I** (2) This course will develop students' reflection in and on teaching through gaining understanding of systematic inquiry and reflection paradigms.
Effective: Spring 2010

MU ED 541 **Developing Music Curricula** (2) Introduction to the process for developing music curricula for grades K-12 that reflects current theories/research data as well as state/national guidelines.
Effective: Fall 2009

MU ED 545 **Psychological Foundations of Musical Behavior** (3) Study of psychoacoustical effects of musical stimuli; emphasis on responses affecting learning musical ability, musical taste, and aesthetic reactions.
Effective: Fall 2009

MU ED 546 **Assessment of Music Learning** (2) Exploration of the unique processes, techniques, and challenges involved in the assessment of music learning.
Effective: Fall 2009

MU ED 547 **Mentoring Novice Teachers** (1 per semester/maximum of 2) Strategies for mentoring novice music teachers in peer teaching experiences and in K-12 school field experiences.
Effective: Summer 2010

MU ED 550 **Reflective Practice and Inquiry II** (2) This course will use systematic inquiry and reflection to assist students' in understanding the relevance of research methods in music education.
Effective: Spring 2010
Prerequisite: MU ED 540

MU ED 555 **Doctoral Seminar in Music Education** (1 per semester, maximum of 6) Forum for the discussion of problems in theory and design encountered in individual and group research projects.
Effective: Fall 2009
Prerequisite: admission to doctoral candidacy

MU ED 557 **Readings in the History of American Music Education** (2) Intensive reading course on the history of American music education and the social, theological, and educational influences on the profession.
Effective: Fall 2009

MU ED 559 **Contemporary Issues in Music Education** (1-2) Consideration of the current political and pedagogical issues that influence curriculum development, teaching, and administration of K-12 music programs.
Effective: Fall 2009

MU ED 597A **A World of Possibilies: Creativity in the Music Classroom** (2) Join Dr. Christopher Azzara of the Eastman School of Music and Penn State Music faculty for creativity workshop. Will perform, explore, and dialogue for a deeper understanding of creative processes.
Effective: Summer 2010 Ending: Summer 2010

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Nanofabrication Manufacturing Technology (NMT)

No courses for department code **NMT** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Navy (NAVSC)

NAVSC 401 **Naval Operations and Seamanship** (3) Introduction to naval operations; the theory and principles of the rules of the road; use of the maneuvering board.
Effective: Fall 2006
Prerequisite: NAVSC 205

NAVSC 402 **Leadership and Management II** (2) The Navy's Resource Management Program (personnel management), counseling techniques, military justice, prevention of substance abuse, and naval correspondence and publications.
Effective: Fall 1983
Prerequisite: NAVSC 401

NAVSC 411 **Amphibious Warfare** (2) A historical survey and evaluation of twentieth-century amphibious warfare operations.
Effective: Fall 1992
Prerequisite: 6 credits of Navy ROTC courses

NOTE: Candidates for requlars commission in the Navy will gain practicum work during two afloat summer cruises.

Candidates for Regular commission in the Marine Corps will gain practicum work during one afloat summer cruise and one Maine Corps cruise at a Marine Corps base.
Additionally, the summer between the sophomore and junior years includes career orientation and training on vocational specialties in the Navy and Marine Corps.
Candidates for Reserve commissions in the navy and the Marine Corps will gain practicum work during one afloat summer cruise or one cruise at a Marine Corps base, respectively.

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Nuclear Engineering (NUC E)

NUC E 401 **Introduction to Nuclear Engineering** (3) Fundamental concepts of nuclear engineering, including fission, reactor theory, shielding, and radioisotopes; intended for other than nuclear engineering students.
Effective: Fall 2001
Prerequisite: MATH 250 orMATH 251

NUC E 403 **Advanced Reactor Design** (3) Physical principles and computational methods for reactor analysis and design. Multigroup diffusion theory; determination of fast and thermal group constants; cell calculations for heterogeneous core lattices.
Effective: Fall 1983
Prerequisite: NUC E 302

NUC E 405 (CHEM 406) **Nuclear and Radiochemistry** (3) Theory of radioactive decay processes, nuclear properties and structure, nuclear reactions, interactions of radiation with matter, biological effects of radiation.
Effective: Spring 2007
Prerequisite: CHEM 452 orPHYS 237 orNUC E 301

NUC E 406 (M E 406) **Introduction to Statistical Thermodynamics** (3) Statistical description of systems composed of large numbers of particles in the context of classical and quantum mechanics; basic concepts of probability theory and thermodynamics as they relate to statistical mechanics.
Effective: Fall 2007
Prerequisite: M E 300 orM E 201 orM E 202 orCH E 303;MATH 230 orMATH 231

NUC E 408 **Radiation Shielding** (3) Radiation sources in reactor systems; attenuation of gamma rays and neutrons; point kernel methods; deep penetration theories; Monte Carlo methods.
Effective: Spring 1985
Prerequisite: NUC E 301

NUC E 409 (MATSE 409) **Nuclear Materials** (3) Nuclear reactor materials: relationship between changes in material properties and microstructural evolution of nuclear cladding and fuel under irradiation.
Effective: Spring 2003
Prerequisite: PHYS 214

NUC E 420 **Radiological Safety** (3) Ionizing radiation, biological effects, radiation measurement, dose computational techniques, local and federal regulations, exposure control.
Effective: Spring 1997
Prerequisite: NUC E 301 orNUC E 405

NUC E 428 **Radioactive Waste Control** (3) Nature, sources, and control of radioactive wastes; theory and practice of disposal processes.
Effective: Spring 1997
Prerequisite: NUC E 301 orNUC E 405

NUC E 430 **Design Principles of Reactor Systems** (3) Nuclear power cycles; heat removal problems; kinetic behavior of nuclear systems; material and structural design problems.
Effective: Fall 2007
Prerequisite: M E 410;NUC E 301 orNUC E 401

NUC E 431W **Nuclear Reactor Core Design Synthesis** (4) Technical and economic optimization of nuclear systems.
Effective: Spring 1994
Prerequisite: ENGL 202C;NUC E 403, NUC E 430

NUC E 444 **Nuclear Reactor Operations Laboratory** (1) Correlation of reactor physics and reactor theory with practical reactor situations that will be controlled by the student.
Effective: Fall 1983
Prerequisite: or concurrent:NUC E 302

NUC E 445 **Nuclear Digital Instrumentation** (3) Interfacing nuclear instruments to microprocessors and computers.
Effective: Spring 2008
Prerequisite: E E 212

NUC E 446 (M E 446) **Reliability and Risk Concepts in Design** (3) Introduction to reliability mathematics. Failure data collection and analysis. Components and systems reliability prediction. Effects of maintenance on reliability. Risk Analysis. Case studies in engineering applications.
Effective: Fall 2007 Ending: Fall 2010
Prerequisite: MATH 250 orMATH 251;STAT 401 orI E 424 orNUC E 309

NUC E 446 (M E 446) **Reliability and Risk Concepts in Design** (3) Introduction to reliability mathematics. Failure data collection and analysis. Components and systems reliability prediction. Effects of maintenance on reliability. Risk Analysis. Case studies in engineering applications.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: MATH 250 orMATH 251;M E 345 orNUC E 309

NUC E 450 **Radiation Detection and Measurement** (3) Theory and laboratory applications of radiation detectors, including proton, neutron, charged particle detectors, NIM devices, and pulse-height analysis.
Effective: Spring 2001

Prerequisite: NUC E 301 orNUC E 405;NUC E 309

NUC E 451 **Experiments in Reactor Physics** (3) Acquisition and processing of nuclear and atomic data; application to nucleonic phenomena of importance in nuclear engineering.
Effective: Spring 2008
Prerequisite: E E 212, NUC E 450

NUC E 470 **Power Plant Simulation** (3) Basic knowledge necessary for intelligent simulation and interpretation of simulations of transients in nuclear power plants.
Effective: Fall 2007
Prerequisite: M E 320, MATH 251, NUC E 302

NUC E 490 (AERSP 490, E E 471) **Introduction to Plasmas** (3) Plasma oscillations; collisional phenomena; transport properties; orbit theory; typical electric discharge phenomena.
Effective: Spring 2008
Prerequisite: E E 361 orPHYS 467

NUC E 494H **Senior Thesis** (1-9) Students must have approval of a thesis adviser before scheduling this course.
Effective: Spring 2007
Prerequisite: Junior or senior status in the University Scholars Program

NUC E 496 **Independent studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

NUC E 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

NUC E 497A **Fundamentals of Nuclear Engineering** (3) An intensive course providing introduction to NucE to undergraduate co-op students, non-NucE graduate, and returning students.
Effective: Summer 2010 Ending: Summer 2010

NUC E 497A **Fundamentals of Nuclear Engineering** (3) An intensive course providing introduction to Nuclear Engineering to undergraduate co-op students, non-NucE graduate, and returning students.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

NUC E 497A **Fundamentals of Nuclear Engineering** (3) An intensive course providing introduction to NucE to undergraduate co-op students, non-NucE graduate, and returning students.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

NUC E 497C (M E 497C) **Dynamic Modeling of Energy Systems** (3) To provide engineers with information about energy supplies, their future prospects, and how each can be used most effectively.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

NUC E 497D **Radiation Detection Measurement Lab** (1) Theory and laboratory applications of radiation detectors, including proton, neutron, charged particle detectors, NIM devices, and pulse-height analysis.
Effective: Summer 2010 Ending: Summer 2010

NUC E 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2008

NUC E 501 **Reactor Engineering** (3) Thermal hydraulic fundamentals applied to power reactors, thermal analysis of fuel elements and two-phase heat transfer in heated channels.
Effective: Spring 1992
Prerequisite: NUC E 430

NUC E 505 **Reactor Instrumentation and Control** (3) Reactor control principles; classical control methods; operational control problems; control simulation using modern mainframe and microcomputer software packages; reactor instrumentation.
Effective: Spring 1992
Prerequisite: NUC E 302 orNUC E 401

NUC E 506 **Nuclear Chemistry** (3) Energetics, kinematics, and models of nuclear reactions; nuclear processes as chemical probes, mossbauer effect and perturbed angular correlation spectroscopy.
Effective: Summer 1991

NUC E 512 **Nuclear Fuel Management** (3) Nuclear fuel inventory determination and economic value through the fuel cycle. Emphasis on calculational techniques in reactor, optimization, and design.
Effective: Fall 1983
Prerequisite: NUC E 302

NUC E 521 **Neutron Transport Theory** (3) Derivation of Boltzmann equation for neutron transport; techniques of approximate and exact solution for the monoenergetic and spectrum regenerating cases.
Effective: Fall 1986
Prerequisite: NUC E 403 orPHYS 406

NUC E 523 (MATSE 523) **Environmental Degradation of Materials in Nuclear Power Plants** (3) Degradation of materials performance when exposed to the combination of high temperature, neutron irradiation, and aggressive electrochemistry found in nuclear reactors.
Effective: Spring 2007
Prerequisite: MATSE 420 orNUC E 409

NUC E 525 **Monte Carlo Methods** (3) Fundamentals of the probability theory and statistics, analog and non-analog Monte Carlo methods and their applications, random processes, and numbers.
Effective: Summer 1993
Prerequisite: MATH 141, PHYS 237, STAT 401

NUC E 530 **Parallel/Vector Algorithms for Scientific Applications** (3) Development/analysis of parallel/vector algorithms (finite-differencing of PDEs and Monte Carlo methods) for engineering/scientific applications for shared and distributed memory architectures.
Effective: Spring 2008
Prerequisite: AERSP 424 orCMPSC 450

NUC E 540 (E E 571, AERSP 540) **Theory of Plasma Waves** (3) Solutions of the Boltzmann equation; waves in bounded and unbounded plasmas; radiation and scattering from plasmas.
Effective: Spring 2008
Prerequisite: E E 471

NUC E 541 (E E 572) **Plasma Theory** (3) Advanced topics in kinetic theory, fluctuation theory, microinstability, and turbulence.
Effective: Spring 2008
Prerequisite: E E 471 orNUC E 490

NUC E 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1991

NUC E 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

NUC E 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

NUC E 597B **Reactor Core Thermal-Hydraulics** (3) This course includes an in-depth analysis of the thermal hydraulic design in Light Water Reactors (LWR). Topics include: LWR design criteria, fuel rod design, subchannel analysis, uncertainties anlaysis, and system design.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: NUC E 430

NUC E 597C **Professional Topics** (3) This is a special topics course where the student picks an adviser from the faculty and an adviser from work and writes a professional paper on a topic chosen by the student.
Effective: Summer 2010 Ending: Summer 2010

NUC E 597C **Professional Topics** (3) This is a special topics course where the student chooses an adviser from the faculty to work with and write a professional paper on a topic chosen by the student.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

NUC E 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

NUC E 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

NUC E 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Graduate assistants receive credit for teaching lower level courses while under the direct supervision of a graduate faculty member.
Effective: Fall 1983
Prerequisite: graduate student standing in nuclear engineering

NUC E 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

NUC E 611 **Ph.D. Dissertation Part-Time** (0) No description.

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Effective: Fall 1983

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Nursing (NURS)

NURS 400 **Professional Role Development** (3) Implications of nursing leadership for the professional nurse. Study of leadership roles and various styles of nursing management.
Effective: Fall 2008 Ending: Fall 2010
Prerequisite: NURS 205, NURS 301, NURS 302, NURS 310, NURS 320

NURS 401 (IL) **Concepts of Health** (3) Exploration of current and ancient concepts of health and their respective modes of intervention.
Effective: Fall 2008
Prerequisite: PSYCH 100 orSOC 001

NURS 402 (US;IL) **Holistic Health** (3) Examination of emerging conceptualizations of health and therapy based on a holistic view of human beings.
Effective: Fall 2008
Prerequisite: NURS 401

NURS 403 **School Health and Emergency Care of Children and Adolescents** (3) Techniques for higher-level care for school health and emergency situations and application-based education.
Effective: Spring 2010
Prerequisite: BIOL 129, BIOL 141, HD FS 129

NURS 404 **Cardiac Dysrhythmias: Interpretation, Treatment, and Nursing Management** (1) An introductory course with a focus on dysrhythmia recognition and interpretation of abnormal 12-lead electrocardiograms (EKG, ECG).
Effective: Fall 2008
Prerequisite: BIOL 141, BIOL 129 or equivalent or approval of program

NURS 405 **Nursing Care of the Adult Client with Complex Health Problems** (4) In-depth study of care of patients with acute and complex health problems, utilizing nursing theory and practice.
Effective: Fall 2008 Ending: Fall 2010
Prerequisite: NURS 205, NURS 301, NURS 302, NURS 310, NURS 320

NURS 405A **Nursing Care of the Adult Client with Complex Health Problems: Part A** (4) In-depth study of care of patients with acute and complex health problems, utilizing evidence based practice.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: NURS 350

NURS 405B **Nursing Care of the Adult Client with Complex Health Problems: Part B** (4) In-depth study of care of patients with acute and complex health problems, utilizing evidence based practice.
Effective: Summer 2010
Prerequisite: NURS 350

NURS 406 **Nursing Care of Children and Adolescents** (4) Common health problems and nursing intervention for children and adolescents.
Effective: Fall 2008 Ending: Fall 2010
Prerequisite: NURS 205, NURS 301, NURS 302, NURS 310, NURS 320

NURS 407 **Drugs of Abuse and Mental Health Issues** (3) Examines the health care needs across the lifespan of clients who have an alcohol or other drug disorder.
Effective: Fall 2008
Prerequisite: BB H 143 orPSYCH 100 or approval of program

NURS 408 **Clinical Application of Pharmacological Concepts** (1) Study of the application of pharmacological concepts to the clinical setting.
Effective: Fall 2008
Prerequisite: NURS 205, NURS 301, NURS 302, NURS 310, NURS 320

NURS 409 **Introduction to Forensic Nursing** (3) Provides an introduction to the forensic health sciences, forensic nursing, and the nursing role in the scientific investigation of violence.
Effective: Fall 2008
Prerequisite: NURS 215, NURS 225, NURS 230

NURS 415 (US;IL) **Community and Family Health Nursing--Concepts and Applications** (4) Health promotion concepts to meet the health care needs of multicultural families and groups in community health nursing practice.
Effective: Fall 2008 Ending: Fall 2010
Prerequisite: NURS 205, NURS 301, NURS 302, NURS 310, NURS 320

NURS 415 (US;IL) **Community and Family Health Nursing** (4) Therapeutic nursing care and health promotion concepts to families, groups and populations in the community.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: NURS 350

NURS 417 (US;IL) **Family and Community Health Concepts** (4) Study of the concepts of family and community based nursing care emphasizing multicultural influences on health practices.
Effective: Fall 2008
Prerequisite: NURS 390 and current and valid RN license; Prerequisite or concurrent:NURS 457

NURS 418 **Application of Family and Community Health Concepts** (3) Application of family and community health concepts in a specialized practice setting.
Effective: Fall 2008 Ending: Fall 2010
Prerequisite: NURS 200W, NURS 351, NURS 390, NURS 417, NURS 457 current and valid RN license; Prerequisite or concurrent:NURS 465

NURS 420 **Mental Health Nursing** (4) Emphasizes the clinical application of mental health theory in nursing care of patients with acute and chronic mental health problems.
Effective: Fall 2008 Ending: Fall 2010
Prerequisite: NURS 205, NURS 301, NURS 302, NURS 310, NURS 320

NURS 420 **Mental Health Nursing** (4) Emphasizes clinical application of mental health theory in nursing care of patients with acute and chronic mental health problems.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: NURS 350

NURS 425 **School Health Nursing** (3) Study and experience with the roles and responsibilities of the school health nurse.
Effective: Fall 2008
Prerequisite: NURS 415

NURS 430 **Organization and Administration for the Nurse Manager** (3) Introduction to organizational theory and principles of practice in the administration of nursing services and patient care.
Effective: Fall 2008
Prerequisite: NURS 301, NURS 302, NURS 310, NURS 320 ; or current and valid RN license for RN to BS majors

NURS 431 **Data Management for Nurse Managers** (3) Analysis of information systems to manage nursing service organizations; includes financial management, the budgeting processes, and productivity measurement.
Effective: Fall 2008
Prerequisite: NURS 301, NURS 302, NURS 310, NURS 320 ; or current and valid RN license for RN to BS majors

NURS 432 **Nursing Management of Human Resources** (3) Human resource management and related factors in nursing service organizations.
Effective: Fall 2008
Prerequisite: NURS 301, NURS 302, NURS 310, NURS 320 ; or current and valid RN license for RN to BS majors

NURS 433 **Seminar for Nurse Managers** (3) Course focuses on the application of management principles in the role of the nurse manager.
Effective: Fall 2008
Prerequisite: NURS 301, NURS 302, NURS 310, NURS 320 ; or current and valid RN license for RN to BS majors

NURS 440 **Trauma/Critical Care Nursing** (3) Focuses on the impact of and the nursing care of persons experiencing acute trauma and/or critical illness.
Effective: Fall 2008
Prerequisite: NURS 301, NURS 302, NURS 310, NURS 320 or approval of nursing program

NURS 450A **Professional Role Development III: Leadership and Management** (2) Study of leadership roles and various styles of nursing management and their implications for the professional nurse.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: NURS 350

NURS 450B **Professional Role Development III: Clinical Capstone** (3) Senior level clinical capstone course that emphasizes the integration and application of theory and evidence based practice.
Effective: Summer 2010
Prerequisite: NURS 450A

NURS 452 (US) (BB H 452, WMNST 452) **Women's Health Issues** (3) Exploration of major health issues concerning women today, with an emphasis on social, cultural, and medical influences.
Effective: Fall 2008
Prerequisite: BIOL 141 orPSYCH 100

NURS 457 **Introduction to Computing and Nursing Informatics** (3) An introduction to computers and nursing informatics focusing on applications to the nursing profession.
Effective: Fall 2008 Ending: Fall 2010
Prerequisite: NURS 225, NURS 301, NURS 302, NURS 310 andNURS 320 ; or eligibility for NURN major

NURS 458 **Ethical Challenges in Healthcare Informatics** (3) A case based collaboratory designed for the exploration and analysis of the ethical dilemmas facing healthcare informatics practitioners.
Effective: Fall 2008
Prerequisite: NURS 457

NURS 459 **Legal and Professional Issues in School Nursing** (3) Legal and professional issues of school nurses and delivery impact of health care in school environment.
Effective: Spring 2010
Prerequisite: PSYCH 100 orSOC 001 orHD FS 129

NURS 463 **Compassionate Counseling for Children/Adolescents Dealing with Dying, Death, Other Life Crises** (3) Compassionate Counseling for Children and Adolescents Dealing with Dying, Death, and Other Life Crises.
Effective: Spring 2010
Prerequisite: PSYCH 100 orSOC 001 orHD FS 129

NURS 464 (US;IL) **Dying and Death** (3) Explores attitudes toward death and dying; concept of grief; responsibilities to the

dying person and the family.
Effective: Fall 2008
Prerequisite: PSYCH 100 orSOC 001

NURS 465 **Health Concepts for Adults with Complex Health Care Needs** (3) In-depth study and application of the theoretical principles and roles of adult clients and families with complex healthcare needs.
Effective: Fall 2008
Prerequisite: NURS 390 and current and valid RN license; Prerequisite or concurrent:NURS 457

NURS 466 **Application of Adult Health Concepts** (4) Application of the theoretical principles and roles of adult health nursing to clients and families in clinical settings.
Effective: Fall 2008
Prerequisite: NURS 465

NURS 475 **Integrated Concepts in Nursing Practice** (3) Project-based capstone course for application of nursing concepts to health promotion/disease prevention in populations.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: NURS 417 ; and current and valid RN license

NURS 492 **Emergency Care and Safety** (3) A comprehensive first aid course designed to provide knowledge of prehospital emergency care at the First Responder level.
Effective: Fall 2008
Prerequisite: BIOL 141, BIOL 129 or equivalent or approval of program

NURS 494H **Honors Thesis** (1-6) Independent honors research project related to student's interests directed by faculty supervisor and culminating in production of thesis.
Effective: Summer 2010
Prerequisite: approval of honors thesis adviser

NURS 495 **Nursing study in Specialized Setting** (1-12) Designed to provide student with in-depth study and practice in clinical specialty area of choice.
Effective: Fall 2008
Prerequisite: seventh-semester standing

NURS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2008

NURS 496A **Asthma Awareness in a Rural Setting** (1-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

NURS 496B **Focused Study of Nursing--Common Health Problems and Patient Care** (1-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

NURS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2008

NURS 497A **Medication Update & Health Teaching Interventions for School Nurses** (1) Pharmacologic concepts relevant to treatment of acute/chronic conditions encountered in school nursing. Each unit includes specific health teaching interventions.
Effective: Summer 2010 Ending: Summer 2010

NURS 497A **Relational Aggression in the Health Care Workforce** (1-6) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

NURS 497B **The Process of Patient Education in Nursing** (3) Explore relevance of patient education in health care settings.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: NURS 230 and/or approval of instructor

NURS 497B **Relational Aggression in the Healthcare Setting** (3) Explores issues of relational aggression in healthcare workforce with specific focus on nursing profession. Examine research/impact of this problem.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: PSYCH 100 ; NURN NURS or 2NURS majors only

NURS 497C **Psychotropic Drugs and Children/Adolescents** (1) Study of psychotropic drugs that are used to treat children and adolescents; classifications, idications, actions, adverse reactions and school implications.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: RN license or permission of program

NURS 497D **Perioperative Nursing** (4) Comprehensive introduction to fundamental principles and practices of the

Operating Room Nurse when managing the care of the surgical patient.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: RN License

NURS 497E **Client Education Strategies for Nurses and Other Health Care Providers** (3) Explores current and emerging roles of client education in the knowledge era.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: NURS 230, PSYCH 100 orSOC 001 orHD FS 129 or permission of faculty for RN students

NURS 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2008

NURS 499 (IL) **Foreign Study--Nursing** (1-9) Study of nursing issues in a foreign country.
Effective: Fall 2008

NURS 500 **The Basis of Disease Prevention and Health Promotion for Older Adults** (3) This course will prepare health professionals to apply selected health strategies to the promotion/prevention needs of older adults.
Effective: Fall 2008

NURS 501 **Issues in Nursing and Health Care** (3) Analysis and evaluation of the health care system with emphasis on health policy and economic issues affecting nursing practice.
Effective: Fall 2008

NURS 502 **Physical Assessment Across the Life Span** (3) Advanced assessment and diagnosis of physical, psychosocial, and developmental health throughout the life span in advanced practice.
Effective: Fall 2008

NURS 503 **Pathophysiology** (3) Integration of advanced physiology, genetics, and pathophysiology as related to specific disease entities and alterations in functioning.
Effective: Fall 2008

NURS 504 **Pharmacologic Therapy** (3) Use of pharmacologic therapies in advanced practice nursing.
Effective: Fall 2008

NURS 508 **Perspectives in Population-Based Health** (3) Theories and strategies for promoting health in community aggregates with emphasis on vulnerable and underserved populations of diverse backgrounds.
Effective: Fall 2008

NURS 510 **Theoretical Foundations of Nursing** (3) Current conceptual and theoretical models in nursing including relationship to practice and research in development of nursing science.
Effective: Fall 2008

NURS 512 **Nursing Research** (3) A nursing research course with emphasis on research design, data collection methods, and evaluation of research studies.
Effective: Fall 2008
Prerequisite: NURS 510

NURS 518 **Clinical Nurse Specialist I: Concepts and Theory** (4) Development of a conceptual foundation for advanced nursing practice as a Clinical Nurse Specialist.
Effective: Fall 2008
Prerequisite: NURS 510 or taken concurrently

NURS 519 **Clinical Nurse Specialist II: Analysis and Application** (4) Analysis and application of nursing interventions for individuals, families, and aggregate groups in varied health care delivery settings.
Effective: Fall 2008
Prerequisite: NURS 510, NURS 518

NURS 521 **Nursing Practicum: Clinical Nurse Specialist** (4-8) Integration and synthesis of specialty knowledge and theories into advanced practice nursing.
Effective: Fall 2008
Prerequisite: NURS 501, NURS 512, NURS 518, NURS 519 completion of graduate minor or intensive concentration

NURS 522 **Comprehensive Assessment of the Older Adult** (3) Advanced nursing assessment of biological, physical, clinical, functional, cognitive, psychological, and social changes associated with aging.
Effective: Summer 2009
Prerequisite: basic background in principles of pharmacology

NURS 523 **Interventions for Common Health Problems in Older Adults** (3) Discussion of common acute and chronic health problems experienced by older adults and development of evidence-based interventions for management.
Effective: Summer 2009
Prerequisite: NURS 518;NURS 519;NURS 522

NURS 550 **Transcultural Health Nursing** (3) Analysis of multicultural and ethnic influences on health, health beliefs and behavior, and nursing practice.
Effective: Fall 2008

NURS 570 **Nursing Partnership with Healthy Individuals and Families** (3) Nurse Practitioner role with individuals and families to promote health, prevent illness, and manage common, acute, or episodic health problems.
Effective: Fall 2008
Prerequisite: NURS 502, NURS 503, NURS 504 Concurrent: NURS 572

NURS 571 **Nursing Partnership with Individuals and Families with Complex/Chronic Health Problems** (4) Nurse Practitioner role with individuals and families to promote health, prevent illness, and manage complex/chronic health problems.
Effective: Fall 2008
Prerequisite: NURS 570, NURS 572; Concurrent: NURS 573

NURS 572 **Nurse Practitioner Practicum I** (3) Advanced nursing practicum in assessment and management of healthy individuals and families experiencing common, acute, or episodic health problems.
Effective: Fall 2008
Prerequisite: NURS 502, NURS 503, NURS 504; Concurrent: NURS 570

NURS 573 **Nurse Practitioner Practicum II** (4) Advanced nursing practicum with individuals and families experiencing complex/chronic health problems.
Effective: Fall 2008
Prerequisite: NURS 570, NURS 572 Concurrent: NURS 571

NURS 574 **Family Nurse Practitioner Rural Integrative Practicum** (2-8 per semester/maximum of 8) Advanced nursing practicum with individuals and families integrating community and specialty content.
Effective: Fall 2008
Prerequisite: NURS 570, NURS 571, NURS 572, NURS 573, NURS 575, NURS 576

NURS 574A **Adult Nurse Practitioner Integrative Practicum** (3-6 per semester/maximum of 6) Advanced nursing practicum in the health care of adolescents and adults within the family context, integrating community/speciality content.
Effective: Fall 2008
Prerequisite: NURS 570, NURS 571, NURS 572, NURS 573

NURS 575 **Nursing Partnership with Children and their Families** (2) Nurse Practitioner role with children and their families to promote health, prevent illness, and manage acute or chronic health problems.
Effective: Fall 2008
Prerequisite: NURS 502, NURS 503, NURS 504; Concurrent: NURS 576

NURS 576 **Nurse Practitioner Practicum in Child Health** (2) Advanced nursing practicum with healthy children and children experiencing acute or chronic health problems.
Effective: Fall 2008
Prerequisite: NURS 502, NURS 503, NURS 504; Concurrent: NURS 575

NURS 580 **Epistemology of Nursing Science** (3) Examines the development and organization of nursing knowledge; nursing theories are critically analyzed in relationship to the substantive structure of nursing science.
Effective: Fall 2008
Prerequisite: NURS 510 or an equivalent nursing theory course; Master's degree in Nursing

NURS 581 **Developing Theoretical Constructs Relevant to Nursing** (3) This course provides experience in concept analysis as one mechanism facilitating the development of nursing knowledge.
Effective: Fall 2008
Prerequisite: NURS 580

NURS 582 **Scientific Basis for Nursing Practice** (3) Critical appraisal of the scientific basis of selected areas of nursing practice.
Effective: Fall 2008
Prerequisite: NURS 581

NURS 583 **Advanced Seminar in Nursing Science** (3) Intense interactive seminar for synthesizing prior content into the design of dissertation research.
Effective: Fall 2008
Prerequisite: NURS 582, NURS 585, NURS 586

NURS 585 **Qualitative Methods in Health Research** (3) Provides an overview of advanced qualitative research methodologies useful in the conduct of social and behavioral health research.
Effective: Fall 2008
Prerequisite: Master of Science degree

NURS 586 **Quantitative Methods in Nursing Research** (3) An overview of advanced methodological considerations specific to quantitative research in nursing.
Effective: Fall 2008

NURS 587 **Ethics in Nursing Research** (1) Provides the theoretical and practical knowlege needed to design and conduct ethically responsible social and behavioral health research.
Effective: Fall 2008

Prerequisite: Master of Science degree

NURS 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2008

NURS 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2008

NURS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2008

NURS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2008

NURS 597A **Promoting Healthy Lifestyles for the School-Age Population** (3) Promoting health lifestyles for the school-age population.
Effective: Summer 2010 Ending: Summer 2010

NURS 597K **Research with Faculty** (1-3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2010 Ending: Summer 2010

NURS 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2008

NURS 600 **Thesis Research** (1-15) No description.
Effective: Fall 2008

NURS 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 2008

NURS 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Provides an opportunity for supervised and graded teaching experience in undergraduate nursing courses.
Effective: Fall 2008

NURS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 2008

NURS 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 2008

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Nutrition (NUTR)

NUTR 400 **Introduction to Nutrition Counseling** (1) No description.
Effective: Fall 1998
Prerequisite: NUTR 358 . Prerequisite or concurrent:NUTR 446

NUTR 401 **Nutrition Clinic Practicum** (1-3) To provide qualified nutrition students with the opportunity to practically apply nutrition counseling skills in a supervised environment.
Effective: Spring 2002
Prerequisite: NUTR 400

NUTR 421 (US;IL) **Food Culture and Health Trends** (3) Social-political, historic, and geographic roots of food patterns, featuring specific cuisine areas and nutritional disease patterns; includes foods laboratory.
Effective: Summer 2005
Prerequisite: NUTR 119 orNUTR 120;NUTR 151 orNUTR 251

NUTR 430 (IL) (S T S 430) **Global Food Strategies: Problems and Prospects for Reducing World Hunger** (3) Technological, social, and political solutions to providing basic food needs; food resources, population, and the environment; current issues.
Effective: Summer 2005

NUTR 445 **Nutrient Metabolism I** (3) Nutrients, their sources, metabolism, interrelationships and requirements with focus on carbohydrates, lipids, and proteins.
Effective: Spring 2001
Prerequisite: B M B 211, BIOL 141, NUTR 251

NUTR 446 **Nutrient Metabolism II** (3) Continuation of NUTR 445; nutrients, their sources, metabolism, inter- relationships and requirements with focus on vitamins and minerals.
Effective: Summer 1994
Prerequisite: NUTR 445

NUTR 451 **Nutrition throughout the Life Cycle** (3) Application of basic principles of nutrition to nutritional and physiological needs throughout the life cycle from prenatal to aging.
Effective: Spring 2001
Prerequisite: NUTR 358, NUTR 445 . Prerequisite or concurrent:NUTR 446

NUTR 452 **Nutritional Aspects of Disease** (3) Disturbances in metabolism related to human disease processes; principles of nutrition in therapy.
Effective: Spring 1995
Prerequisite: NUTR 446

NUTR 453 **Diet in Disease** (3) Nutrient and energy controlled diet programs. Implications for nutrition counseling and education.
Effective: Spring 1995
Prerequisite: or concurrent:NUTR 452

NUTR 454 **Laboratory Methods in Nutrition** (3) Research and clinical methods for study of nutritional phenomena, interpretation of data in relation to various nutritional and physiological states.
Effective: Spring 1995
Prerequisite: or concurrent:NUTR 446

NUTR 456 **Community Nutrition** (2) Programs and policies of nutrition-related activities of community agencies; factors pertinent to nutrition education.
Effective: Spring 1992
Prerequisite: NUTR 251

NUTR 490W **Nutrition Seminar** (3) Use of selected materials from the scientific literature to prepare a term paper and an oral report.
Effective: Spring 1995
Prerequisite: or concurrent:NUTR 452

NUTR 494H **Senior Honors Thesis** (1-6) Independent study related to a student's interests directed by a faculty supervisor and culminating in the production of a thesis.
Effective: Summer 2006
Prerequisite: approval of honors thesis advisor

NUTR 495 **Advanced Field Experience in Nutrition** (1-6) Supervised off-campus, non-group instruction including individual field experiences, practicums or internships. Written and oral critique of activity is required.
Effective: Spring 2001
Prerequisite: NUTR 456

NUTR 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1992

NUTR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1992

NUTR 497F **Understanding and Managing Childhood Obesity** (1) This course will investigate why children are becoming obese and what can be done about it. **WILLIAMSPORT CAMPUS**
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: NUTR 251 or Introductory Health Science or Education

NUTR 497G (S T S 497G) **Community Food Security** (3) Through active learning, students explore how communities can reshape food systems, increasing access to wholesome food while increasing economic opportunities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

NUTR 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

NUTR 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

NUTR 597C **Maternal and Child Nutrition** (3) Physiological and epidemiological examination of the nutritional needs, practices and patterns in pregnancy, lactation, and early childhood.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: NUTR 451

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Occupational Therapy (O T)

O T 401 **Conceptual Foundations of Occupational Therapy and Occupational Adaptations** (2) Analysis of philosophies and frames of reference for occupational therapy practice, emphasizing occupational functioning, the adaptation process, and occupational environments. Occupational Therapy majors only.
Effective: Spring 2000

O T 402 **Neuroscience Foundations of Occupational Functioning** (4) The course will examine neuroanatomical, neurochemical, and neurophysiological functions affecting sensorimotor, cognitive, and effective domains of human performance. Occupational Therapy majors only.
Effective: Spring 2000
Prerequisite: BIOL 129, BIOL 141, BIOL 142

O T 403 **Motor Components of Occupational Adaptation and Performance** (3) Analysis of adaptive, homeostatic, and dysadaptive motor patterns across the life span; theory and application of related occupational therapy assessment.
Effective: Spring 2000
Prerequisite: O T 402

O T 404 **Sensory and Perceptual Components of Occupational Adaptation and Performance** (3) Adaptive, dysadaptive, and homeostatic sensory and perceptual skills across the life span; theory and application of related occupational therapy evaluation.
Effective: Spring 2000
Prerequisite: O T 402

O T 405 **Cognitive and Psychosocial Components of Occuppational Adaptation and Performance** (4) Adaptive, dysadaptive, and homeostatic cognitive and psychosocial skills across the life span; theory and application of related occupational therapy evaluation.
Effective: Spring 2000
Prerequisite: O T 402

O T 406 **Occupational Challenges of Infants and Young Children** (3) Conditions interfering with occupational functioning of infants and young children; theory, evaluation, program design, and treatment for facilitating occupational adaptation.
Effective: Spring 2000
Prerequisite: O T 403, O T 404, O T 405

O T 407 **Occupational Challenges of Older Children and Adolescents** (3) Conditions interfering with occupational functioning of older children and adolescents; theory, evaluation, program design, and treatment for facilitating occupational adaptation.
Effective: Spring 2000
Prerequisite: O T 403, O T 404, O T 405

O T 408 **Occupational Challenges of Adults** (4) Conditions interfering with occupational functioning of adults; theory, evaluation, program design, and treatment for facilitating occupational adaptation.
Effective: Spring 2000
Prerequisite: O T 403, O T 404, O T 405

O T 409 **Occupational Challenges of Older Adults** (4) Conditions interfering with occupational functioning of older adults; theory, evaluation, program design, and treatment for facilitating occupational adaptation.
Effective: Spring 2000
Prerequisite: O T 403, O T 404, O T 405

O T 410 **Environmental and Technological Influences on Occupational Adaptation and Performance** (3) Impact of occupational environments on functioning and technological adaptation for mastery over the environment.
Effective: Spring 2000
Prerequisite: O T 403, O T 404, O T 405

O T 411 **Occupational Therapy Management and Professional Ethics** (3) Ethical, managerial, fiscal, and legal responsibilities of program administration, supervision, practice, delivery, and professional development.
Effective: Spring 2000
Prerequisite: O T 401

O T 412W **Introduction to Research** (3) Introduction to quantitative and qualitative research process relative to occupational therapy.
Effective: Spring 2000
Prerequisite: O T 407, O T 408, O T 409;STAT 200 orSTAT 250

O T 495A **Level I Fieldwork Experience** (1 per semester, maximum of 3) Practicum in 3 of 5 areas: occupational therapy evaluation procedures; environmental and technological adaptation; program design; management issues; selected topics.
Effective: Spring 2000
Prerequisite: concurrent with occupational therapy didactic course work

O T 495B **Fieldwork Level II Part 1** (6) Three month practical educational experience facilitating clinical reasoning and application of professional knowledge, behaviors, values, and skills.
Effective: Spring 2000
Prerequisite: completion of O T 495A and all didactic course work

O T 495C **Fieldwork Level II Part 2** (6) Three month practical educational experience facilitating clinical reasoning and application of professional knowledge, behaviors, values, and skills.
Effective: Spring 2000
Prerequisite: successful completing of O T 495B

O T 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2000

O T 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2000

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Operations and Information Systems Management (OISM)

OISM 401W **Statistics and Quality Control** (3) Statistical methods for measurement and improvement of quality; topics include statistical inference, process control, and design.
Effective: Spring 2007
Prerequisite: MATH 110 orMATH 140;SCM 200

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Penn State First-Year Seminar (PSU)

No courses for department code **PSU** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Petroleum and Natural Gas Engineering (P N G)

P N G 405 **Rock and Fluid Properties** (3) Reservoir rock properties, rock and fluid properties (interaction between rock and fluids), flow behavior in reservoir, and fluid properties.
Effective: Spring 2002
Prerequisite: PHYS 211

P N G 406 **Rock and Fluid Laboratory** (1) Systematic study of oil reservoir rocks and fluids; their interrelation applied to petroleum engineering.
Effective: Spring 2001
Prerequisite: PHYS 211 Concurrent: P N G 405

P N G 410 **Applied Reservoir Engineering** (3) Analysis and prediction of reservoir performance by use of material balance and steady and nonsteady state flow equations.
Effective: Spring 2001
Prerequisite: P N G 405, P N G 406, PHYS 211

P N G 411 **Introduction to Petroleum and Natural Gas Extraction** (1) Introduction to the design and implementation of the systems used in the extraction of oil and gas. Not intended for petroleum and natural gas engineering majors.
Effective: Spring 2001
Prerequisite: PHYS 211

P N G 420 **Applied Reservoir Analysis and Secondary Recovery** (4) Application of material balance equations/transient flow solutions to water influx problems; displacement theory as it applies to design/behavior of flooding.
Effective: Spring 2008
Prerequisite: P N G 410;CMPSC 201 orCMPSC 202

P N G 425 **Principles of Well Testing and Evaluation** (3) Mathematical basis for pressure analysis. Theory and practice of pressure testing techniques.
Effective: Spring 1999
Prerequisite: MATH 251, P N G 420

P N G 430 **Reservoir Modeling** (3) The numerical simulation of petroleum reservoir processes by the use of models; scaling criteria and network flow.
Effective: Spring 2008
Prerequisite: MATH 251, P N G 410;CMPSC 201 orCMPSC 202

P N G 440W **Formation Evaluation** (3) Study of those methods used to evaluate the engineering properties of oil and gas bearing reservoir formations.
Effective: Spring 1999
Prerequisite: P N G 405, P N G 406

P N G 450 **Drilling Design and Production Engineering** (3) Design and analysis of oil-field drilling operations and equipment.
Effective: Spring 2001
Prerequisite: C E 360, E MCH 210

P N G 451 **Oil Well Drilling Laboratory** (1) Practice in well-control procedures. Measurement of drilling fluid properties.
Effective: Spring 2001
Prerequisite: C E 360, E MCH 210 Concurrent: P N G 450

P N G 475 **Petroleum Engineering Design** (3) Design and selection of mechanical components used in the production of fluids from subsurface reservoirs.
Effective: Spring 2001
Prerequisite: E MCH 210

P N G 480 **Production Process Engineering** (3) Analysis and evaluation of surface production processes, fluid separation, storage, measurement, treating, custody transfer, transmission, disposal, corrosion, and other operations.
Effective: Fall 2007
Prerequisite: C E 360;M E 201 orM E 300

P N G 482 **Production Engineering Laboratory** (1) Measurement and analyses of the physical and chemical properties of hydrocarbon fluid systems in a production environment.
Effective: Fall 2007
Prerequisite: C E 360;M E 201 orM E 300 Concurrent: P N G 480

P N G 486 **Tertiary Oil Recovery Methods** (3) Presentation of theory of tertiary methods of oil recovery, current field applications, future engineering potential.
Effective: Spring 1999

P N G 489 **Engineering Evaluation of Oil and Gas Properties** (3) Application of present worth and rate-of-return analysis; reserve calculations; decline curve analysis; uncertainty and risk analysis to engineering project design and evaluation.
Effective: Spring 2002 Ending: Summer 2010
Prerequisite: ECON 002 Concurrent: P N G 405

P N G 489 **Engineering Evaluation of Oil and Gas Properties** (3) Application of present worth and rate-of-return analysis; reserve calculations; decline curve analysis; uncertainty and risk analysis to engineering project design and evaluation.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: ECON 002

P N G 490 **Introduction to Petroleum Engineering Design** (1) Introduction to the concepts of engineering design as applied to petroleum and natural gas projects.
Effective: Fall 2001
Prerequisite: ECON 002, P N G 405, P N G 489

P N G 491 **Reservoir Engineering Design** (1) Application of the concepts of reservoir and drilling engineering to petroleum engineering design projects.
Effective: Fall 2001
Prerequisite: ECON 002, P N G 410, P N G 450, P N G 490

P N G 492 **Petroleum Engineering Capstone Design** (1) Integration of petroleum and natural gas engineering concepts to project design.
Effective: Fall 2001
Prerequisite: P N G 491

P N G 494 **Thesis** (1-6) A problem in petroleum engineering involving review of the literature and experimental data obtained in the field or laboratory.
Effective: Spring 1999

P N G 494H **Thesis** (1-6) A problem in petroleum engineering involving review of the literature and experimental data obtained in the field or laboratory.
Effective: Fall 2007

P N G 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 2007

P N G 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1999

P N G 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1999

P N G 501 **Steady State Flow in Porous Media** (3) The formulation and analytical solution of the problems of steady state fluid flow in porous media.
Effective: Spring 1999

P N G 502 **Unsteady Flow in Porous Media** (3) The formulation and analytical solution of the transient fluid flow in porous media.
Effective: Spring 1999
Prerequisite: P N G 501

P N G 503 **Reservoir Engineering Problems** (3) Identification, formulation, and solution of advanced problems in reservoir engineering, e.g., cross-flow problems, dual porosity problems, etc.
Effective: Spring 1999
Prerequisite: P N G 502

P N G 511 **Numerical Solution of the Partial Differential Equations of Flow in Porous Media** (3) Differencing schemes for the partial differential equations of single-phase flow; application to flow of gas and mixing in porous media.
Effective: Spring 1999

P N G 512 **Numerical Reservoir Simulation** (3) Mathematical analysis of complex reservoir behavior and combination drives; numerical methods for the solution of behavior equations; recent developments.
Effective: Spring 1999

P N G 513 **Advanced Numerical Reservoir Simulation** (3) Compositional simulation; history-matching theory; simulation of basic processes involving heat and mass transfer in porous media.
Effective: Spring 1999
Prerequisite: P N G 512

P N G 514 **Optimization of Petroleum Recovery Processes** (3) Optimum search methods, linear programming, nonlinear programming, dynamic programming, application to water-flooding, depletion drive, steam injection, gas cycling, miscible displacement.
Effective: Spring 1999
Prerequisite: P N G 410

P N G 515 **Advanced Oil Recovery Techniques** (3) Advanced oil recovery techniques including water flooding, in situ combustion, steam injection, hot-water injection, and miscible-phase displacement.
Effective: Spring 1999

P N G 518 **Design of Miscible Recovery Projects** (3) Theory and design of miscible methods of oil recovery, current field applications, including hydrocarbon, CO2, micellar/polymer, alkaline, and inert gas.
Effective: Spring 1999

P N G 519 **Design of Thermal Recovery Projects** (3) Suitability of reservoirs for thermal oil recovery; case histories; design of in situ combustion and steamfloods; thermal stimulation; shale oil recovery.
Effective: Spring 1999
Prerequisite: P N G 515

P N G 520 **Phase Relations in Reservoir Engineering** (3) Phase relations as applied to condensate and retrograde condensate reservoirs and to other problems in petroleum production.
Effective: Spring 1999

P N G 530 **Natural Gas Engineering** (1-3) Flow in producing or storage reservoirs; gas well testing; transmission systems; storage cycle; current developments.
Effective: Spring 1999
Prerequisite: P N G 481

P N G 531 **Natural Gas Storage Engineering** (3) Engineering design of natural gas storage; identification of reservoirs, optimization of facilities.
Effective: Summer 2002
Prerequisite: P N G 530

P N G 532 **Natural Gas Transmission and Distribution Engineering** (3) Engineering design of natural gas transmission and distribution pipeline systems; optimization of load distribution.
Effective: Summer 2002
Prerequisite: P N G 520, P N G 530

P N G 533 **Gas-to-Liquid Processing Technology** (3) The major gas-to-liquid processes, including NGL, LPG, and LNG.
Effective: Summer 2002
Prerequisite: P N G 520

P N G 550 **Advanced Engineering Evaluation in Oil and Gas Management** (3) Selected topics of current research and development interest in formation evaluation, geophysical well logging, and production economics.
Effective: Spring 2003
Prerequisite: P N G 440, P N G 489

P N G 555 **Drilling Optimization** (3) Procedures for optimizing fluid properties, hydraulics, bit weight and selection. Balanced drilling conditions are stressed.
Effective: Spring 1999

P N G 575 **Gas Lift Design and Optimization** (3) Design of continuous and intermittent gas lift systems; multiphase flow and inflow well performance.
Effective: Spring 1999

P N G 576 **Production Operations** (3) Exploration of recent practical and theoretical developments in well logging, fracture stimulation and sand control.
Effective: Spring 1999

P N G 580 **Advanced Natural Gas Production Engineering** (3) An advanced study of the total system associated with production and transportation of natural gases.
Effective: Summer 2002
Prerequisite: P N G 480

P N G 590 (EME 590, F SC 590, MNG 590) **Colloquium** (1-3) Continuing seminars which consist of individual lectures by faculty, students or outside speakers on energy and mineral engineering issues.
Effective: Spring 2009

P N G 595 **Internship** (1-15) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 2004
Prerequisite: approval of internship by instructor prior to registration

P N G 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

P N G 597 **Special Topics** (1-9) Creative projects, including nonthesis research, which are supervised on an individual

basis and which fall outside the scope of formal courses.
Effective: Spring 1999

P N G 597A **Reactive Transport Processes in Subsurface** (3) Will cover principles of reactive transport modeling in subsurface and introduce important reactive systems in various applications, different types of reactions, and reaction rate laws.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

P N G 597A **Well Stimulation** (3) Well stimulation and identification of oil and gas wells with low productivity and or recovery, design and evaluation of well stimulation.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

P N G 597B **Well Stimulation** (3) Causes and identification of oil and gas wells with low productivity and or recovery; design and evaluation of well stimulation.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

P N G 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1999

P N G 600 **Thesis Research** (1-15) No description.
Effective: Spring 1999

P N G 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 1999

P N G 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 1999

P N G 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 1999

NOTE: Courses in the use of X-ray diffraction, electron microscopy, and spectroscopy in petroleum and natural gas studies are listed under MATERIALS SCIENCE and GEOLOGICAL SCIENCES.

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Philosophy (PHIL)

PHIL 401 (AM ST 421) **American Philosophy** (3) Survey of key figures and movements in American thought including the Transcendentalists, the Pragmatists, and contemporary developments.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy or 6 credits of philosophy at the 200-level or 5th semester standing

PHIL 402 **European Philosophy** (3 per semester, maximum of 6) Survey of key figures and movements of Europe, including phenomenology, existentialism, structuralism and post-structuralism, and critical theory.
Effective: Fall 2007
Prerequisite: PHIL 102 6 credits of philosophy at the 200 level or 5th semester standing

PHIL 403 **Environmental Ethics** (3) Examines ethical theories, justice, rights, community, and human values revolving around such issues as preservation, conservation, pollution, sustainability, and population.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy includingPHIL 103 or 6 credits of philosophy at the 200 level or 5th semester standing

PHIL 405 **Philosophy of Law** (3) Examines philosophical views of the nature of law, legal ethics, law and society through questions regarding definition, interpretation, and institutions.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy includingPHIL 105 or 6 credits of philosophy at the 200 level or 5th semester standing

PHIL 406 **Business Ethics** (3) Examines the moral justification of business practices and economic systems through critical analyses of case studies and applied ethical theories.
Effective: Summer 1998
Prerequisite: fifth-semester standing

PHIL 407 (S T S 407) **Technology and Human Values** (3) Interrelationships of twentieth-century technological change and human values. Emphasis on the social and ethical aspects of technological progress.
Effective: Spring 1999
Prerequisite: 9 credits of philosophy includingPHIL 107 or 6 credits of philosophy at the 200 level

PHIL 408 **Social and Political Philosophy** (3) Historical and philosophical foundations of political organization, authority, justice, and contemporary issues of rights, community, and culture.
Effective: Fall 2007
Prerequisite: 9 credits in philosophy including PHIL 108 and one 200-level philosophy course; two 200-level philosophy courses or 5th semester standing

PHIL 408W **Social and Political Philosophy** (3) Historical and philosophical foundations of political organization, authority, and justice, and contemporary issues of rights, community, and culture.
Effective: Fall 1998
Prerequisite: 9 credits in philosophy including PHIL 108 or 6 credits at the 200 level

PHIL 409 **Aesthetics** (3) Studies concepts of beauty, truth, value, representation, production and reproduction, and reality through philosophical theory and works of art.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy includingPHIL 109 or 6 credits of philosophy at the 200 level or 3 credits of art or 5th semester standing

PHIL 410 **Philosophy of Science** (3) Historical and contemporary foundational and methodological issues such as causality, relativity and epistemological relativism, teleology, and the nature of reality.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 110 or 6 credits of philosophy at the 200 level

PHIL 412 **Philosophical Logic** (3) The character of thought in terms of truth properties, modality, reference, relations between propositions, and theories of argument and inference.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 012 or 6 credits of philosophy at the 200 level

PHIL 413 **Philosophy of Literature** (3) Discusses truth, belief, illusion, imagination and creativity through philosophical literature, as well as problems of philosophical writing.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 113 or 6 credits of philosophy at the 200 level

PHIL 415 **Philosophy of Education** (3) Philosophical foundations of education, the nature of learning and the educated individual, and education's political, social, and economic relations.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 115 or 6 credits of philosophy at the 200 level

PHIL 416 **Philosophy of Social Science** (3) Examines the philosophical nature and foundations of methodology, structures and objects, value-neutrality and objectivity in the social sciences.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 116 or 6 credits of philosophy at the 200 level

PHIL 417 **Philosophy of Mathematics** (3) Examines the historical foundations of mathematics, modern developments of

logicism, formalism, and intuitionism, and the contemporary realism/ anti-realism debate.
Effective: Spring 1999
Prerequisite: 9 credits of philosophy includingPHIL 117 or 6 credits of philosophy at the 200 level

PHIL 418 **Ethics** (3) Examines ethical theories, justice, rights, community, and human values revolving around such issues as preservation, conservation, pollution, sustainability, and population.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy includingPHIL 103 or 6 credits of philosophy at the 200 level or 5th semester standing

PHIL 418W **Ethics** (3) Examines ethical theories, justice, rights, community, and human values revolving around such issues as preservation, conservation, pollution, sustainability, and population.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 103 or 6 credits of philosophy at the 200 level

PHIL 420 **Philosophy of Economics** (3) Studies the historical philosophical foundations of economic theory, questions of normativity, feasibility, choice, contracts, and politics in economic theory.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 120 or 6 credits of philosophy at the 200 level

PHIL 422 **Philosophy of History** (3) Philosophical investigation of history as content and knowledge, objectivity and relativism in historical analysis, historical laws, interpretation, explanation and narrativity.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 122 or 6 credits of philosophy at the 200 level

PHIL 423 **Philosophy, Media, and Society** (3) Examines philosophical and ethical questions of communication, culture, information, ideology, and political and social organization through the forms of media.
Effective: Summer 1998
Prerequisite: fifth-semester standing

PHIL 424 **Philosophy of Religion** (3) Examines the relation between faith and reason, the nature of religious experience, the problem of evil, the existence of God.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy includingPHIL 124 or 6 credits of philosophy at the 200 level or 5th semester standing

PHIL 425 **Epistemology** (3) The nature of cognition and perception, the conditions of experience, and the justification and truth of belief.
Effective: Summer 1999
Prerequisite: 9 credits of philosophy includingPHIL 125 or 6 credits of philosophy at the 200 level

PHIL 425W **Epistemology** (3) The nature of cognition and perception, the conditions of experience, and the justification and truth of belief.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 125 or 6 credits of philosophy at the 200 level; in addition toENGL 015 orENGL 030

PHIL 426 **Metaphysics** (3 per semester, maximum of 6) Examines the nature of reality, the existence of freedom, and the nature of matter, mind, and values.
Effective: Spring 1999
Prerequisite: 9 credits of philosophy includingPHIL 126 or 6 credits of philosophy at the 200 level

PHIL 426W **Metaphysics** (3) Examines the nature of reality, the existence of freedom, and the nature of matter, mind, and values.
Effective: Summer 1998
Prerequisite: 9 credits in philosophy includingPHIL 126 or 6 credits of philosophy at the 200 level

PHIL 427 **Philosophy of Mind** (3) Investigates problems of mind from the standpoint of traditional metaphysical views, modern scientific psychology, neuroscience, and artificial intelligence.
Effective: Spring 1999
Prerequisite: 9 credits of philosophy includingPHIL 127 or 6 credits of philosophy at the 200 level

PHIL 429 **Philosophy of Language** (3) The nature of language through philosophical discussion of meaning, semantics, pragmatics, the relation between language and mind, and ordinary language.
Effective: Spring 1999
Prerequisite: 9 credits of philosophy includingPHIL 129 or 6 credits of philosophy at the 200 level

PHIL 431 **Philosophy and Agriculture** (3) Studies philosophical and ethical questions regarding agriculture, politics, and policy, including food safety, environment, international development, community, and sustainability.
Effective: Summer 1998
Prerequisite: fifth-semester standing

PHIL 432 (S T S 432) **Medical and Health Care Ethics** (3) Examines ethical, political, and social issues in the research, implementation, and practice of medicine, medical technologies, and healthcare.
Effective: Fall 1998
Prerequisite: fifth-semester standing

PHIL 433 (S T S 433) **Ethics in Science and Engineering** (3) Ethical issues arising in the practice of science and engineering and their philosophical analysis.
Effective: Fall 1995

PHIL 434H (HIST 424H, J ST 424H, RL ST 424H) **Monotheism and the Birth of the West** (3) The birth of monotheism and its relation to social organization, the idea of individuality, and science.
Effective: Spring 2002
Prerequisite: CAMS 004, CAMS 110, CAMS 120 orHIST 102

PHIL 435 (S T S 435) **The Interrelation of Science, Philosophy, and Religion** (3) The historical and transformative interactions between science and Western philosophical and religious views of nature, humanity, and God.
Effective: Spring 1996

PHIL 437 (IL) **World Philosophies and Cultures** (3) Philosophical traditions, problems, and authors in African, Asian, Middle- Eastern, Native American, or other non-Western cultures and intellectual traditions.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy including 6 credits of philosophy at the 200 level or 5th semester standing

PHIL 437H (IL) **World Philosophies and Cultures** (3) Philosophical traditions, problems, and authors in African, Asian, Middle- Eastern, Native American, or other non-Western cultures and intellectual traditions.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: 9 credits of philosophy including 6 credits of philosophy at the 200 level or 5th semester standing

PHIL 438 (WMNST 438) **Feminist Philosophy** (3) Examines the central currents of feminist philosophy, selected problems and concepts regarding difference, gender and sex, identity, and political culture.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy including 6 credits of philosophy at the 200-level or 5th semester standing

PHIL 439 (IL) **Asian Philosophies and Issues** (3) Exploration of the traditions, problems, and authors of one or more of the philosophical systems of Buddhism, Hinduism, Taoism, and Confucianism.
Effective: Fall 2007
Prerequisite: PHIL 007 9 credits in philosophy including PHIL 007 or 5th semester standing

PHIL 453 **Topics in Ancient Philosophy** (3 per semester, maximum of 6) Examines the philosophy of central figures in ancient philosophy from the pre-Socratics to the post-Aristotelians and Neoplatonists.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 200 or 6 credits of philosophy at the 200 level

PHIL 454 **Topics in Medieval Philosophy** (3 per semester, maximum of 6) Topics include major medieval philosophical theories of God, soul, nature, universes, political society, ethics, and logic.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 201 and one other 200 level philosophy course

PHIL 455 **Topics in Modern Philosophy** (3 per semester, maximum of 6) Descartes to Kant, including mind and reality, space and time, God and nature, morality and autonomy.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 202 or 6 credits of philosophy at the 200 level

PHIL 456 **Topics in Nineteenth Century Philosophy** (3 per semester, maximum of 6) Hegel to Nietzsche, including nature and spirit, history and human nature, ideology and morality.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 203 or 6 credits of philosophy at the 200 level

PHIL 457 **Topics in Twentieth Century Philosophy** (3 per semester, maximum of 6) Topics in the philosophy of figures such as Husseri, James, Russell, Wittgenstein, Heidegger, Merleau-Ponty, and Dewey.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy includingPHIL 204 or 6 credits of philosophy at the 200 level or 5th semester standing

PHIL 458 **Topics in Contemporary Philosophy** (3 per semester, maximum of 6) Topics in the philosophy of contemporary figures such as Foucault, Habermas, Rorty, Derrida, Rawls, Davidson, and MacIntyre.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 208 or 6 credits of philosophy at the 200 level

PHIL 460 (US;IL) (AAA S 460) **African American Philosophy** (3) Major works by African American Philosophers, on topics of race, freedom, citizenship, nationhood, law and society.
Effective: Fall 2009
Prerequisite: AAA S 100 orPHIL 009 and 5th semester standing

PHIL 461 **Plato** (3 per semester, maximum of 6) Examines the metaphysics, epistemology, politics, aesthetics, and moral theory of this central figure in the history of philosophy.
Effective: Spring 1999
Prerequisite: 9 credits of philosophy includingPHIL 200 or 6 credits of philosophy at the 200 level

PHIL 462 **Aristotle** (3 per semester, maximum of 6) Epistemology, metaphysics, natural science, moral and political theory of this central figure in the history of philosophy.
Effective: Spring 1999
Prerequisite: 9 credits of philosophy includingPHIL 200 or 6 credits of philosophy at the 200 level

PHIL 464 **Augustine** (3 per semester, maximum of 6) Examines Augustine's philosophy and religious thought regarding God, friendship, evil, free will, community, creation, memory and time, meaning and truth.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 201 or 6 credits of philosophy at the 200 level

PHIL 465 **Aquinas** (3 per semester, maximum of 6) Examines Aquinas' philosophy, political and moral theory regarding knowledge and existence of God, faith, truth, nature, logic, and the soul.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 201 or 6 credits of philosophy at the 200 level

PHIL 468 (J ST 468) **Modern Jewish Philosophy** (3) Explores the major figures in modern Jewish philosophy and their influences on contemporary philosophy.
Effective: Summer 2004
Prerequisite: one course in Philosophy and/or Jewish Studies

PHIL 470 **Rationalism** (3 per semester, maximum of 6) Examines the epistemological emphasis on reason over experience in rationalist philosophers such as Descartes, Leibniz, and Spinoza.
Effective: Fall 1998
Prerequisite: 9 credits in philosophy includingPHIL 202 and 3 other credits of philosophy at the 200 level

PHIL 471 **Empiricism** (3 per semester, maximum of 6) Examines the epistemological emphasis on experience over reason in empiricist philosophers such as Locke, Hume, Berkeley, and contemporary philosophers.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 202 or 6 credits of philosophy at the 200 level

PHIL 472 **Enlightenment** (3 per semester, maximum of 6) Examines Enlightenment views on reason, history, individuals, belief, and science through study of Locke, Voltaire, Diderot, Kant, and their critics.
Effective: Fall 1998
Prerequisite: 9 credits in philosophy includingPHIL 202 or 6 credits of philosophy at the 200 level

PHIL 473 **German Idealism** (3 per semester, maximum of 6) Critically examines the philosophy of central German idealists, including Kant, Fichte, Schelling, and Hegel, and its impact on later philosophy.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy including eitherPHIL 202 orPHIL 203 or 6 credits of philosophy at the 200 level

PHIL 474 **Kant** (3 per semester, maximum of 6) Critical examination of the metaphysics, epistemology, aesthetics, legal and moral philosophy, and influence of Immanuel Kant.
Effective: Fall 1998
Prerequisite: 9 credits in philosophy includingPHIL 202 or 6 credits of philosophy at the 200 level

PHIL 475 **Fichte and Schelling** (3 per semester, maximum of 6) The transformation of post-Kantian idealism before Hegel through Fichte's and Schelling's works on nature, history, reason, morality, and spirit.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 202 or 6 credits of philosophy at the 200 level

PHIL 476 **Hegel** (3 per semester, maximum of 6) Critical examination of the metaphysics, moral theory, epistemology, and philosophy of history of this central figure of 19th-century philosophy.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 203 or 6 credits of philosophy at the 200 level

PHIL 477 **Kierkegaard** (3 per semester, maximum of 6) Studies this 19th-century thinker's ideas on ethical and aesthetic values, despair and selfhood, institutions and individuals, reality, and faith.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy including eitherPHIL 203 or 6 credits of philosophy at the 200 level

PHIL 478 (J ST 478, RL ST 478) **Ethics After the Holocaust** (3) Explores the philosophical effects of the Holocaust for thinking about the primary question: Is ethics possible?
Effective: Spring 2005
Prerequisite: one course in Jewish Studies or Philosophy

PHIL 479 **Critical Theory** (3 per semester, maximum of 6) Examines the ontology, political and social thought of the Frankfurt School from Horkheimer and Adorno to Marcuse and Habermas.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy including eitherPHIL 203 or 6 credits of philosophy at the 200 level

PHIL 480 **Marx** (3 per semester, maximum of 6) Examines the evolution of Marx's economic, social, and political thought, and metaphysics, and their transformations by later Marxist thinkers.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 203 or 6 credits of philosophy at the 200 level

PHIL 481 **Nietzsche** (3 per semester, maximum of 6) Friedrich Nietzsche's basic ideas, including master and slave morality, the will to power, eternal recurrence, genealogical inquiry, and naturalism.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 203 or 6 credits of philosophy at the 200 level

PHIL 482 **Peirce** (3 per semester, maximum of 6) Examination of Peirce's system of the sciences, with an emphasis on his categories, pragmatism and pragmaticism, semiotic, and cosmology.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 401 or 6 credits of philosophy at the 200 level

PHIL 483 **James** (3 per semester, maximum of 6) James' psychology, pluralistic metaphysics, theories of truth and meaning, radical empiricism, and idea of religious experience.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 401 or 6 credits of philosophy at the 200 level

PHIL 484 **Husserl** (3 per semester, maximum of 6) Examines Husserl's phenomenology from the early to later works including his studies of essences, intentionality, intersubjectivity, and the life-world.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 202, PHIL 203 or 6 credits of philosophy at the 200 level

PHIL 485 **Heidegger** (3 per semester, maximum of 6) Studies Heidegger's metaphysical thought from his early to later works regarding being, history, subjectivity, aesthetics, language, and his influence.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 402 or 6 credits of philosophy at the 200 level

PHIL 486 **Wittgenstein** (3 per semester, maximum of 6) Examines Wittgenstein's early and late work, including logical atomism, meaning, language games, forms of life, and the private-language argument.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 204 or 6 credits of philosophy at the 200 level

PHIL 487 **Analytic Philosophy** (3 per semester, maximum of 6) Analytic philosophy's founding by Frege, Russell, Moore, Wittgenstein; and its contemporary development by Quine, Kripke, Dummett, and Davidson.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy includingPHIL 202 orPHIL 204 along with 3 credits of philosophy at the 200 level

PHIL 488 **Post-Structuralism** (3 per semester, maximum of 6) Studies concepts of power, desire, subjectivity, and difference through the work of thinkers including Lacan, Foucault, Derrida, Deleuze, and Lyotard.
Effective: Fall 1998
Prerequisite: 9 credits of philosophy including eitherPHIL 203 orPHIL 204 and 6 credits of philosophy at the 200 level

PHIL 490 **Dewey** (3 per semester, maximum of 6) Critically examines the metaphysics, epistemology, ethics, logic, aesthetics, education theory, and social and political philosophy of this major American pragmatist.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 401 or 6 credits of philosophy at the 200-level

PHIL 491 **Merleau-Ponty** (3 per semester, maximum of 6) Merleau-Ponty's phenomenological anti-dualism through his studies on the body and the flesh, aesthetics, political philosophy, and late ontology.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 402 or 6 credits of philosophy at the 200-level

PHIL 492 **Foucault** (3 per semester, maximum of 6) Foucault's critique of history, methodological archaeology and genealogy, studies of madness and sexuality, and theory of knowledge, power, and subjectivity.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 402 or 6 credits of philosophy at the 200-level

PHIL 493 **Phenomenology and Hermeneutics** (3 per semester, maximum of 6) Studies major figures and issues in phenomenology and hermeneutics, focussing on the work of Husserl, Gadamer, Heidegger, Merleau-Ponty, and Levinas.
Effective: Summer 1998
Prerequisite: 9 credits of philosophy includingPHIL 202 andPHIL 204

PHIL 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

PHIL 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

PHIL 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

PHIL 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

PHIL 497A **Critical Philosophy of Race** (3) This course is specifically to be offered in conjunction with the conference, "Critical Philosophy of Race: Intersections with Culture, Ethnicity, and Nationality Beyond the Black/White Binary", November 11-13, 2010, University Park, PA, to bring together established and emerging scholars to explore new dimensions in the critical philosopy of race.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PHIL 498 **Special topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2001

PHIL 499 (IL) **Foreign Study--Philosophy** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

PHIL 501 **American Philosophy Seminar** (3 per semester/maximum of 6) Critically examines central figures in American philosophy including Emerson, Thoreau, Pierce, James, Royce, Dewey, Santayana, Mead, Quine, Davidson, and Rorty.
Effective: Spring 2000

PHIL 502 **European Philosophy Seminar** (3 per semester/maximum of 6) Critically examines central European philosophers including Husserl, Heidegger, Sartre, Merleau-Ponty, Gadamer, Levinas, Foucault, and Derrida; course content varies with instructor.
Effective: Summer 2000

PHIL 503 **Ethics Seminar** (3 per semester/maximum of 6) Critical investigation of philosophical problems in ethics, and viability of historical and contemporary ethical positions; course content varies with instructor.
Effective: Summer 2000

PHIL 508 **Social and Political Philosophy Seminar** (3 per semester, maximum of 6) Critical examination of social and political philosophies, their historical context and relation to philosophic method; course content varies with instructor.
Effective: Summer 2000

PHIL 510 **Philosophy of Science Seminar** (3 per semester, maximum of 6) Critical examination of specific problems in philosophy of science including, theory, method, and practice; course content varies with instructor.
Effective: Summer 2000

PHIL 512 **Seminar in Logic** (3) This course covers topics in first-order symbolic logic with identity and advanced special topics in metatheory.
Effective: Summer 2009

PHIL 513 (B A 513, PSY 513) **Philosophy of Social Science** (3) Study of major methodological, normative, and theoretical issues in the social sciences, emphasizing the development of positivism and critical alternatives.
Effective: Fall 2004

PHIL 516 **Aesthetic Seminar** (3 per semester, maximum of 6) Critical examination of problems in philosophy of art including beauty, taste, value, politics, culture, interpretation; course content varies with instructor.
Effective: Summer 2000

PHIL 517 **Philosophy of Mathematics Seminar** (3 per semester/maximum of 6) Examines central philosophies of mathematics including logicalism, formalism, intuitionism, and non-foundationalist positions; content varies with instructor.
Effective: Spring 2000

PHIL 525 **Epistemology Seminar** (3 per semester/maximum of 6) Studies problems, figures, and movements in epistemology from the ancient philosophers to contemporary thinkers; course content varies with instructor.
Effective: Spring 2000

PHIL 526 **Metaphysics Seminar** (3 per semester, maximum of 6) Problems, figures, and movements in metaphysics and anti-metaphysics from ancient philosophers to contemporary thinkers; course content varies with instructor.
Effective: Summer 2000

PHIL 527 **Philosophy of Mind Seminar** (3 per semester/maximum of 6) Examines central topics in philosophy of mind: causation, personhood, consciousness, intentionality, artificial intelligence, neuroscientific explanations; course content varies with instructor.
Effective: Spring 2000

PHIL 529 (LING 529) **Philosophy of Language Seminar** (3 per semester/maximum of 6) Examines topics in the philosophy of language including the nature of meaning, and semantic theories, pragmatics, interpretation, and poetic language.
Effective: Spring 2002

PHIL 538 (WMNST 538) **Feminist Philosophy Seminar** (3) Critically examines feminist approaches to ethics, epistemology, philosophy of science, metaphysics, social/political philosophy, and the history of philosophy.
Effective: Summer 2005

PHIL 553 **Ancient Philosophy Seminar** (3 per semester/maximum of 6) Analyzes specific concerns and texts of ancient philosophy including those of Plato and Aristotle; course content varies with instructor.
Effective: Summer 2000

PHIL 554 **Medieval Philosophy Seminar** (3 per semester/maximum of 6) Critical examination of medieval texts and philosophers, including Augustine, Anselm, Aquinas, Duns Scotus, and Ockham; course content varies with instructor.
Effective: Summer 2000

PHIL 555 **Modern Philosophy Seminar** (3 per semester/maximum of 6) Examines rationalism, empiricism, and other philosophical movements from Bacon and Descartes to Kant and Mill; course content varies with instructor.
Effective: Summer 2000

PHIL 556 **19th-Century Philosophy Seminar** (3 per semester, maximum of 6) Examination of philosophy from Hegel to Nietzsche on history, dialectic, ideology, existence, science, and art; course content varies with instructor.
Effective: Summer 2000

PHIL 557 **20th Century Philosophy Seminar** (3 per semester/maximum of 6) Central problems in works of twentieth-century philosophers including Russell, Dewey, Wittgenstein, Heidegger, Foucault, Levinas; course content varies with instructor.
Effective: Spring 2000

PHIL 558 **Contemporary Philosophy Seminar** (3 per semester, maximum of 6) Critically investigates diverse recent figures and problems of continental, pragmatic, and analytic philosophy; course content varies with instructor.
Effective: Summer 2000

PHIL 580 **Phenomenology** (3 per semester/maximum of 6) A critical study of one or more thinkers, ideas, or movements in modern phenomenology.
Effective: Fall 1983

PHIL 581 **Hermeneutics** (3 per semester/maximum of 6) Hermeneutic philosophy and aspects of its methodological significance for human studies, philology, history, sociology and psychology, and philosophy of science.
Effective: Fall 1983

PHIL 589 **Philosophical Translation Seminar** (2) Studies philosophical works in their original (non-English) languages; course content varies with instructor.
Effective: Spring 2001
Prerequisite: appropriate language proficiency demonstrated by satisfactory completion of departmental translation exam in given language

PHIL 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

PHIL 594 **Research Technique** (1) A course utilizing research sources and techniques relevant to philosophical studies. Taken in the first semester of graduate study.
Effective: Spring 1987

PHIL 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

PHIL 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

PHIL 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

PHIL 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

PHIL 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Students will teach introductory logic course--i.e., Phil 1--and other introductory level courses as required by staffing.
Effective: Fall 1983

PHIL 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2000

PHIL 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

PHIL 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

PHIL 803 (HLS 803) **Homeland Security: Social and Ethical Issues** (3) This course will examine the social, political, legal, and ethical issues that arise in the context of homeland security.
Effective: Summer 2010

1 Students may take only one course for General Education credit from PHIL 001 GH or 004 GH.

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Photography (PHOTO)

PHOTO 400 **Digital Photography in the Studio** (4) Concepts and technology of the digital photography studio; large format digital cameras, electronic studio lighting and digital printing.
Effective: Fall 2006
Prerequisite: PHOTO 200

PHOTO 401 **New Materials and Methods in Applied Digital Imaging** (4 per semester) Advanced course where student teams use digital photography, video, and scanning to present story ideas using World Wide Web and gallery exhibition.
Effective: Fall 2006
Prerequisite: PHOTO 200

PHOTO 402 **Photographic Narratives** (4 per semester/maximum of 8) The development of a photographic project that leads to the creation of a handmade book.
Effective: Fall 2006
Prerequisite: PHOTO 200

PHOTO 403 **Photo Assemblage** (4) Collage making through collecting and assembling found materials, including photography; origins of photographic manipulation and contemporary uses.
Effective: Fall 2006

PHOTO 405 **Creative Projects in Photography** (4 per semester/maximum of 8) Special individual problems related to photographic vision.
Effective: Fall 2006
Prerequisite: PHOTO 201, PHOTO 300

PHOTO 410 **Photographing Motion and Athletic Events** (2) A practicum course in photographing sports and athletic events.
Effective: Summer 2007
Prerequisite: PHOTO 200

PHOTO 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 2006

PHOTO 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2006

PHOTO 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2006

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Physical Science (PH SC)

PH SC 410 **Quantum Mechanics of Atoms, Molecules, and Solids** (3) The physical concepts underlying the properties of materials are covered. Quantum mechanics is applied to problems in atomic, molecular, and solid- state physics.
Effective: Summer 2003
Prerequisite: PHYS 237

PH SC 440 **Applied Solid State and Optical Processes** (3) This course covers the solid state physics and material science prerequisite to understand today microelectronic and optoelectronic devices.
Effective: Summer 2003
Prerequisite: PHYS 237, PH SC 410 orPHYS 410

PH SC 450 **Micro-and Nanodevices** (3) This course provides a overview of the microelectronic, optoelectronic and micro mechanical devices and operating principles behind today's micro and nanoscale technology.
Effective: Summer 2003
Prerequisite: PH SC 440 permission of the program

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Physical Therapy (P T)

No courses for department code **P T** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Physics (PHYS)

PHYS 400 **Intermediate Electricity and Magnetism I** (3) Electrostatics, steady-state magnetic field; electrical and magnetic properties of matter; Maxwell's equations, boundary-value problems, and wave propagation.
Effective: Spring 2007
Prerequisite: MATH 250 orMATH 251;MATH 230 orMATH 231;PHYS 212, PHYS 213 andPHYS 214 Concurrent: MATH 230 OR MATH 231 ; PHYS 204

PHYS 401 **Intermediate Electricity and Magnetism II** (3) Electromagnetic wave propagation in media, wave guides, dipole radiation, electrodynamics of charged particles, special theory of relativity, special topics.
Effective: Spring 1994
Prerequisite: PHYS 400

PHYS 402 **Electronics for Scientists** (4) Circuit and network theory; active devices; amplifiers; introduction to digital electronics; noise theory.
Effective: Spring 2007
Prerequisite: MATH 250 orMATH 251;PHYS 212, PHYS 213 andPHYS 214

PHYS 406 **Subatomic Physics** (3) Introductory treatment of elementary particles, fundamental strong and electroweak interactions, nuclear structure, accelerators, particle detection, nuclear astrophysics.
Effective: Spring 1995
Prerequisite: PHYS 410

PHYS 410 **Introduction to Quantum Mechanics I** (3-4) Basic postulates; Schrodinger wave equation; stationary states; variational method; scattering in one dimension; orbital angular momentum; hydrogen atom; numerical methods.
Effective: Spring 2007
Prerequisite: MATH 250 orMATH 251;MATH 230 orMATH 231;PHYS 237

PHYS 411 **Introduction to Quantum Mechanics II** (3) General theory of angular momentum; approximation methods; scattering theory; radiation theory; applications to atomic, molecular, condensed matter, nuclear and particle physics.
Effective: Spring 1994
Prerequisite: PHYS 410

PHYS 412 **Solid State Physics I** (3) Crystal symmetry, x-ray structure analysis, lattice vibrations, thermal properties, free electron transport theory, elementary one-electron quantum theory of solids.
Effective: Fall 1986
Prerequisite: MATH 230 orMATH 231 Concurrent: PHYS 410

PHYS 413 **Solid State Physics II** (3) Quantum theory of electronic and optical properties of solids, semiconductors, dielectrics, magnetic properties, crystal imperfections, low- temperature effects, and superconductivity.
Effective: Fall 1986
Prerequisite: PHYS 412

PHYS 414 **Solid State Physics** (3) Crystal structure; reciprocal lattice; X-ray diffraction; lattice vibrations; thermal properties; free electron gas model; energy bands; semiconductors; magnetism.
Effective: Spring 2007
Prerequisite: MATH 230, PHYS 237

PHYS 419 (MATH 419) **Theoretical Mechanics** (3) Principles of Newtonian, Lagrangian, and Hamiltonian mechanics of particles with applications to vibrations, rotations, orbital motion, and collisions.
Effective: Spring 2007
Prerequisite: MATH 230 orMATH 231;MATH 250 orMATH 251;PHYS 212, PHYS 213 andPHYS 214

PHYS 420 **Thermal Physics** (3) Basic postulates of statistical mechanics and thermodynamics, microscopic quantum states and macroscopic parameters; partition functions; Maxwell- Boltzmann and quantum statistics.
Effective: Spring 2007
Prerequisite: MATH 230 orMATH 231;MATH 250 orMATH 251;PHYS 237

PHYS 421W **Research Methods in Physics** (3) Methodology focusing on the theory of measurement and experiment design.
Effective: Spring 2007
Prerequisite: PHYS 237

PHYS 443 **Intermediate Acoustics** (3) Vibration and simple vibrating systems, sound wave propagation, acoustic instruments, recent developments.
Effective: Fall 1999
Prerequisite: MATH 251, PHYS 212, PHYS 213 andPHYS 214 ; orPHYS 203 orPHYS 204

PHYS 444 **Topics in Contemporary Physics** (2) Modern research topics and career opportunities in physics; employment, graduate education, and tailoring the physics curriculum to meet career goals.
Effective: Spring 2007
Prerequisite: PHYS 237 and 3 credits of physics at the 400 level

PHYS 445 **Nanoscience Seminar** (1) Advanced nanoscience seminar required of Behrend College students for completion of the nanoscience minor.
Effective: Summer 2007
Prerequisite: CHEM 112, E SC 211, E SC 212, E SC 213, E SC 214, E SC 215, E SC 216, MATH 140, PHYS 211 orPHYS 250

PHYS 446 **The Year in Physics: A Seminar on the Latest Research** (1) Discussion recent research in physics.
Effective: Spring 2007
Prerequisite: PHYS 211

PHYS 457 **Experimental Physics** (1-3) Selected experiments in various fields of physics.
Effective: Spring 2007
Prerequisite: PHYS 212 rPHYS 213, PHYS 214 andPHYS 237

PHYS 457W **Experimental Physics** (3) Selected experiments in various fields in physics.
Effective: Spring 2007
Prerequisite: PHYS 212, PHYS 213, PHYS 214 andPHYS 237

PHYS 458 **Intermediate Optics** (4) Geometrical and physical optics: theory of lens systems, aberrations, apertures, interference, diffraction, polarization.
Effective: Spring 2007
Prerequisite: PHYS 212, PHYS 213, PHYS 214;MATH 250 orMATH 251;MATH 230 orMATH 231

PHYS 461 (MATH 461) **Theoretical Mechanics** (3) Continuation of Math.(Phys.) 419. Theoretical treatment of dynamics of a rigid body, theory of elasticity, aggregates of particles, wave motion, mechanics of fluids.
Effective: Fall 1986
Prerequisite: MATH 419

PHYS 462 **Applications of Physics in Medicine** (3) Applications of physics in human physiology and in instrumentation for medical diagnosis and treatment.
Effective: Summer 2002
Prerequisite: PHYS 211, PHYS 212, PHYS 213 andPHYS 214 ; orPHYS 250, PHYS 251

PHYS 479 (MATH 479) **Special and General Relativity** (3) Mathematical description, physical concepts, and experimental tests of special and general relativity.
Effective: Spring 2007
Prerequisite: PHYS 237, PHYS 400, PHYS 419;MATH 250 orMATH 251;MATH 230 orMATH 231

PHYS 494 **Physics Research Project** (1-12) Investigation of an original research problem, including a literature search. Preparation of a formal thesis is optional.
Effective: Spring 2007

PHYS 494H **Physics Research Project** (1-12) Investigation of an original research problem, including a literature search. Preparation of a formal thesis is optional.
Effective: Fall 2007

PHYS 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2007
Prerequisite: prior approval of proposed assignment by instructor

PHYS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

PHYS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

PHYS 497A **Applications of Modern Physics in Medicine** (3) This course is an overview of the applications of nuclear physics in medicine. Methods of diagnostics using X-rays, radioisotopes and nuclear magnetic resonance are reviewed. Various radiation therapy applications are reviewed and compared. (This course is appropriate for students interested in nuclear and medical physics as well as for premed student).
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PHYS 497B **Systems Biology and Networks** (3) Introduce elements of network theory used to describe and model complex networks; focus on biological networks and systems biology.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PHYS 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

PHYS 510 **General Relativity I** (3) Foundations of general relativity, elements of differential geometry, Einstein's equation, Newtonian limit, gravity waves, Friedmann cosmologies and Schwarzschild solution.
Effective: Spring 1996
Prerequisite: PHYS 557

PHYS 511 **Topics in General Relativity** (3) Selected topics from: Cauchy problem, Hamiltonian formulation, positive energy theorems, asymptotics, gravitational radiation, singularity theorems, black-holes, cosmology, observational tests.

Effective: Spring 1996
Prerequisite: PHYS 510

PHYS 512 **Quantum Theory of Solids I** (3) Electrons in periodic potentials; single electron approximations; lattice dynamics; electrical, optical, and magnetic properties of solids; transport theory.
Effective: Spring 1996
Prerequisite: PHYS 412 Concurrent: PHYS 517

PHYS 513 **Quantum Theory of Solids II** (3) Electron-phonon interaction, BCS theory; Landau Fermi-liquid theory; disorder and localized states; spin-wave theroy; many-body theory.
Effective: Spring 1996
Prerequisite: PHYS 512

PHYS 514 **Physics of Surfaces, Interfaces, and Thin Films** (3) This course focuses on interfacial and surface phenomena; structural, electronic, vibrational and thermodynamic properties; physisorption and chemisorption; phase transitions and ultrathin film nucleation; and growth phenomena.
Effective: Summer 1995
Prerequisite: PHYS 412

PHYS 517 **Statistical Mechanics** (3) Thermodynamics, classical and quantum statistics; Bose and Fermi gases; Boltzmann transport equation; phase transitions, critical phenomena; Ising model.
Effective: Spring 1996
Prerequisite: PHYS 561

PHYS 518 **Critical Phenomena and Field Theory** (3) Critical phenomena using field theoretical and renormalization group techni- ques; solvable statistical models and conformal field study; fluctuations and random processes.
Effective: Spring 1996
Prerequisite: PHYS 517, PHYS 563

PHYS 524 **Physics of Semiconductors and Devices** (3) Electronic structure, optical and transport properties of crystalline and amorphous semiconductors, quantum wells, superlattices; quantum devices; quantum Hall effect.
Effective: Spring 1996
Prerequisite: PHYS 412

PHYS 525 **Methods of Theoretical Physics I** (3) Complex variables, Hilbert spaces, linear operators, calculus of variations, Fourier analysis, Green's functions, distributions, differential equations, and special functions.
Effective: Spring 1996

PHYS 526 **Methods of Theoretical Physics II** (3) Finite and Lie groups, representations and application to condensed matter and particle physics; selected topics from differential geometry.
Effective: Spring 1996
Prerequisite: PHYS 525

PHYS 527 (ASTRO 527) **Computational Physics and Astrophysics** (3) Introduction to numerical methods for modeling physical phenomena in condensed matter, atomic and high energy physics, gravitation, cosmology and astrophy.
Effective: Fall 2008

PHYS 530 **Theoretical Mechanics** (3) Newtonian mechanics, noninertial coordinate system, Lagrangian mechanics, small oscillations, Hamiltonian formulation, canonical transformations, Hamilton-Jacobi theroy, dynamical systems.
Effective: Spring 1996
Prerequisite: PHYS 419

PHYS 532 **Theoretical Continuum Mechanics** (3) Wave phenomena, hydrodynamics, heat conduction, elastic continua.
Effective: Fall 1983
Prerequisite: PHYS 530

PHYS 533 **Theoretical Acoustics** (3) Wave propagation in complex systems and materials: viscoelastic fluids, superfluids, elastic solids, periodic and random media, nonlinear media.
Effective: Spring 1996

PHYS 537 **Vacuum Physics** (3) An introduction to physical phenomena occurring at low pressures and their applications to the production and measurement of high vacuum.
Effective: Summer 1987

PHYS 541 **Elementary Particle Phenomenology** (3) Baryons and mesons; leptons and quarks; electromagnetic and weak inter- actions and their unification; quantum chromodynamics; experimental techni- ques.
Effective: Spring 1996
Prerequisite: PHYS 562

PHYS 542 **Standard Model of Elementary Particles Physics** (3) Weinberg-Salam model of electroweak interactions, spontaneous symmetry breaking, quantum chromodynamics; selected topics from grand unified theories and superstring theory.
Effective: Summer 1995
Prerequisite: PHYS 564

PHYS 545 (ASTRO 545) **Cosmology** (3) Modern cosmology of the early universe, including inflation, the cosmic microwave background, nucleosynthesis, dark matter and energy.

Effective: Spring 2009

PHYS 555 (MATSE 555) **Polymer Physics I** (3) Introduction to the fundamental concepts needed to understand the physics applicable to polymer melts, solutions and gels.
Effective: Spring 2006

PHYS 557 **Electrodynamics I** (3) Electro- and magnetostatics, boundary value problems, Maxwell's equations, field energy-momentum, wave propagation in free space and wave guides.
Effective: Summer 2000
Prerequisite: PHYS 400

PHYS 558 **Electrodynamics II** (3) Covariant formulation of electrodynamics, radiation theory, scattering theory, electrodynamics of relativistic charges, special topics on contemporary applications of electrodynamics.
Effective: Summer 2000
Prerequisite: PHYS 557

PHYS 559 **Graduate Laboratory** (2) Study and applications of techniques and instrumentation used in modern physics laboratories.
Effective: Spring 1996

PHYS 561 **Quantum Mechanics I** (3) Postulates of quantum mechanics, Hilbert space methods, one dimensional potentials, spin systems, Harmonic oscillator, angular momentum, Hydrogen atom.
Effective: Spring 1996
Prerequisite: PHYS 410

PHYS 562 **Quantum Mechanics II** (3) Addition of angular momenta, perturbation theory, variational principle, scattering theory, density matrices, identical particles, interpretations of quantum mechanics, Dirac theory.
Effective: Spring 1996
Prerequisite: PHYS 561

PHYS 563 **Quantum Field Theory I** (3) Canonical and functional integral quantization of relativistic and non- relativistic field theories; Feynman diagrams; spontaneous symmetry breaking; renormalization group.
Effective: Spring 1996
Prerequisite: PHYS 562

PHYS 564 **Quantum Field Theory II** (3) Abelian and non-Abelian gauge theories; renormalization group and operator product expansions; BRST quantization; scattering theory, other related topics.
Effective: Spring 1996
Prerequisite: PHYS 563

PHYS 565 **Interface of General Relativity and Quantum Physics** (3) Limitations of perturbative methods, conceptual problems; selected topics from black hole thermodynamics, canonical quantum gravity, loop space methods and string-theory.
Effective: Summer 1995
Prerequisite: PHYS 510, PHYS 563

PHYS 571 **Atomic, Molecular and Optical Physics** (3) Atomic and molecular states: mixed perturbations; radiative processes; internal state coherence effects; coherent relaxation, Doppler-free spectro- scopies; atom trapping and coding.

Effective: Spring 1996
Prerequisite: PHYS 561

PHYS 572 **Laser Physics and Quantum Electronics** (3) Theory of lasers; Guassian optics; nonlinear optics: frequency conversions, nonlinear Raman-type effects, superradiance, photon ecohes, phase conjugation; quantum optics.
Effective: Spring 1996
Prerequisite: PHYS 562

PHYS 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1997

PHYS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

PHYS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

PHYS 597A **Topics in Advanced Cosmology** (1) Inflation, CMB, Topological defects and quantum cosmology.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: PHYS 510

PHYS 597A **Particle Astrophysics** (3) This course will use neutrinos as a common thread for discussing a wide range of particle physics and astrophyics phenomena.

Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PHYS 597A **Introduction to Computational Neuroscience** (3) The course will focus on the computational approaches to studying the behavior of neurons and neural circuits.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PHYS 597B **Systems Biology and Networks** (3) Introduce elements of network theory used to describe and model complex networks; focus on biological networks and systems biology.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PHYS 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

PHYS 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

PHYS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

PHYS 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

PHYS 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2007

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Plant Pathology (PPATH)

PPATH 405 **Microbe-Plant Interactions: Plant Disease and Biological Control** (3) Survey of microbe-plant interactions causing plant disease, mechanisms of pathogenesis, disease control, and microbial and molecular biological control strategies.
Effective: Spring 1999
Prerequisite: BIOL 110

PPATH 412 **Turfgrass Disease Management** (3) Introduction to biology of turfgrass pathogens and management of cool- and warn-season turfgrass disease.
Effective: Spring 2008
Prerequisite: TURF 230, TURF 235, CHEM 101 orCHEM 110, BIOL 127

PPATH 416 **Plant Virology: Molecules to Populations** (3) A exploration of the molecular biology and population dynamics of the virus-plant interaction.
Effective: Fall 2005
Prerequisite: BIOL 110, BIOL 120

PPATH 417 **Phytobacteriology** (3) Lecture and lab coverage of how bacteria cause plant diseases.
Effective: Fall 2009
Prerequisite: BIOL 110;BIOL 222 orBIOL 322;B M B 211 orMICRB 201 orMICRB 251 orB M B 251

PPATH 419 **Plant Nematology** (2) The biology of plant pathogenic nematodes, the diseases they cause, and their control.
Effective: Fall 2009
Prerequisite: BIOL 110, BIOL 120

PPATH 425 (BIOL 425) **Biology of Fungi** (4) A survey of the biological diversity of fungi, stressing evolution, ecology, disease, morphology, life histories, and importance to humans.
Effective: Spring 2002
Prerequisite: fifth-semester or graduate standing in a biological sciences major with six credits completed in the major

PPATH 427 **Mycotoxins: Effects of Fungal Toxins on Human and Animal Health** (3) Description and history of mycotoxicoses. Mycotoxin formation, occurrence, control, economic and social impacts, and regulatory issues.
Effective: Summer 2007
Prerequisite: BIOL 110 orBIOL 011 andBIOL 012;CHEM 112, CHEM 113 ; course can also be taken with approval of the department

PPATH 430 (E R M 430) **Air Pollution Impacts to Terrestrial Ecosystems** (3) An overview of direct and indirect effects of air pollution on terrestrial plants and ecosystems.
Effective: Summer 2004
Prerequisite: BIOL 220W, FOR 308

PPATH 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

PPATH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

PPATH 502 **Plant Disease Diagnosis** (3) Field and laboratory techniques used in diagnosing plant diseases caused by various types of pathogens with emphasis on fungi.
Effective: Summer 2005
Prerequisite: PPATH 401

PPATH 505 **Fundamentals of Phytopathology** (2) An in-depth tutorial of the fundamental theories and concepts of plant pathology.
Effective: Spring 2004
Prerequisite: PPATH 405 or equivalent

PPATH 533 **Molecular Genetics of Plant-Pathogen Interactions** (3) In depth discussion/review of the primary literature on the mechanisms of plant-pathogen interactions at the molecular and cellular levels.
Effective: Summer 2003
Prerequisite: PPATH 405 or equivalent andB M B 400 or equivalent

PPATH 540 **Plant Disease Control** (3) Principles of plant disease control, including theoretical considerations involved in control by chemical and nonchemical means.
Effective: Winter 1978

PPATH 542 **Epidemiology of Plant Diseases** (3) Disease development in populations of plants, with emphasis on the impact of environment and control practices on rate of development.
Effective: Spring 1984
Prerequisite: PPATH 401;MATH 111 orMATH 141 or 3 credits in statistics

PPATH 543 **Pathogen Variation and Host Resistance** (3) Mechanisms and implications of genetic variation in plant pathogens related to breeding for disease resistance in plants by genetic means.
Effective: Fall 1983
Prerequisite: PPATH 401 orAGRO 411 orHORT 407

PPATH 544 **Fungal Genetics** (4) Fungal breeding systems, mating types, asexual restrictions and recombination, tetrad analysis, gene conversion and extra genetic elements.
Effective: Summer 2003
Prerequisite: 3 credits of mycology and introductory genetics

PPATH 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2008

PPATH 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

PPATH 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

PPATH 597A (US) **Diagnosis of Tropical Plant Diseases in Costa Rica** (3) Diagnosis of tropical plant diseases in Costa Rica.
Effective: Summer 2010 Ending: Summer 2010
Prerequisite: PPATH 425, PPATH 405 or the equivalent and permission of the program

PPATH 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

PPATH 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

PPATH 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised preparation and presentation of materials in lectures and laboratories, preparation and supervision of exams and student consultation and evaluation.
Effective: Fall 1983

PPATH 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

PPATH 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

PPATH 802 (AGBIO 802) **Plant Protection: Responding to Introductions of Threatening Pests and Pathogens** (3) This course provides knowledge of plant biosecurity, plant disease, regulations, and technologies using case study examples.
Effective: Summer 2010
Prerequisite: AGBIO 520

PPATH 853 (TURF 853) **Interpreting Turfgrass Science Literature** (3) Introduction to turfgrass research publications, interpretation of the data, and discussion of the significance of the results.
Effective: Summer 2010

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Plastics Engineering Technology (PL ET)

PL ET 400 **Plastics Management Issues** (3) Study of business management topics as they relate to the plastics industry.
Effective: Summer 1996
Prerequisite: PL ET 350, PL ET 370

PL ET 400W **Plastics Management Issues** (3) Study of business management topics as they relate to the plastics industry. Writing intensive.
Effective: Summer 1996
Prerequisite: PL ET 350, PL ET 370

PL ET 429 **Plastics Packaging** (3) Introduction to plastics packaging including production methods, economic concerns, aesthetics, color and transparency, environmental concerns, and package lifetimes.
Effective: Summer 1996
Prerequisite: PL ET 350

PL ET 430 **Packaging Design & Materials** (2) Study of design and materials for plastic packaging including blow molded, thermoformed and extruded products.
Effective: Summer 2005
Prerequisite: Prerequisite or concurrent:PL ET 304, PL ET 330

PL ET 440 **Advanced Mold Design Technologies** (4) This is the second course in mold design; focuses on mechanical aspects of designing and building a mold; includes CAD, CAM, and CAE technologies.
Effective: Spring 2007
Prerequisite: MCH T 213, MET 306, METBD 366, PL ET 340

PL ET 460 **Advanced Computer Applications in Plastics Design** (3) Advanced applications of computer-aided design, computer-aided manufacturing, computer-aided engineering, and finite element analysis to plastic product development.
Effective: Summer 1996
Prerequisite: PL ET 350 . Prerequisite or concurrent:PL ET 440

PL ET 462 **Advanced Injection Molding** (3) New and advanced injection molding technoliges, implementing statistical methods such as design of experiments.
Effective: Summer 2005
Prerequisite: PL ET 225, PL ET 227, PL ET 330

PL ET 464 **Plastics Failure Analysis** (3) Fundamentals of Plastics Materials Process and Design Failure Analysis.
Effective: Summer 2005
Prerequisite: PL ET 304

PL ET 465 **Advanced CAE for Plastics II** (3) Advanced Computer-Aided Engineering techniques for plastic part design.
Effective: Spring 2007
Prerequisite: PL ET 345, PL ET 350, MET 418

PL ET 467 **Secondary Operations** (3) Fundamentals of decoration and assembly methods used in the plastics industry.
Effective: Summer 2005
Prerequisite: Seventh semester standing

PL ET 468 **Rapid Commercialization** (3) Techniques to help get plastic products to market quicker and to build solids and surface modeling skills.
Effective: Summer 2005
Prerequisite: PL ET 350

PL ET 475 **Survey of New Plastics Processing Technologies** (3) Study of the latest trends and advances in plastics processing.
Effective: Summer 1996
Prerequisite: PL ET 370, PL ET 440

PL ET 494A **Plastics Projects** (1-12) Supervised student activities on research and/or design projects identified on an individual or small group basis. A specific title may be used in each instance and will be entered on the student's transcript.
Effective: Spring 2007
Prerequisite: or concurrent:MET 418, PL ET 350, PL ET 370

PL ET 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica or internships. Written and oral critique of activity required.
Effective: Summer 1992
Prerequisite: prior approval of proposed assignment by instructor

PL ET 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1992

PL ET 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in-depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1992

PL ET 497A **Plastics Product Development** (3) Covers product/business development process, including writing specifications, testing requirements, concept creation and selection, working with industrial design, marketing, and finance.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: PL ET 350

PL ET 497B (IL) **Plastics International Experience** (1-6) Formal courses given infrequently to explore, in-depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL ET 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010

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Polish (POL)

POL 499 (IL) **Foreign Studies** (12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Political Science (PL SC)

PL SC 403 **The Legislative Process** (3) Analysis of the policy process within the legislative system; the effects of environmental factors on policy alternatives and legislative decision making.
Effective: Spring 2001
Prerequisite: PL SC 001 orPL SC 003

PL SC 404 **Topics in International Politics** (3) An examination of the geographical factors underlying and affecting the relationships between states.
Effective: Fall 2007

PL SC 405 **The American Presidency** (3) An examination of the selection methods for, and powers of, the American presidency, as well as other chief executives.
Effective: Fall 1983
Prerequisite: PL SC 001

PL SC 410 **Game Theory in International Relations** (3) Game theoretic approaches to the study of international relations.
Effective: Spring 2005
Prerequisite: PL SC 014

PL SC 411W **Principles of International Cooperation** (3) An exploration of the forces that make conflict, or cooperation, more likely in international relations.
Effective: Summer 2006
Prerequisite: PL SC 014

PL SC 412 **International Political Economy** (3) The transnational politics of trade, investment, aid, raw materials, and the environment; nation-states, multinational corporations, and the U.N.
Effective: Fall 2007
Prerequisite: ECON 002, ECON 004, ECON 014, I B 303 orBUS 364

PL SC 413 **The Rise and Fall of the Soviet Union** (3) Background, organization, and operation of the Communist Party and the government of the Soviet Union.
Effective: Spring 2001
Prerequisite: 3 credits from:PL SC 003, PL SC 014, PL SC 155 orRUS 100

PL SC 415 **International Organization: Political and Security Functions** (3) Theory and evolution of international organization; political and security functions of the United Nations and regional organizations.
Effective: Spring 2003
Prerequisite: PL SC 014

PL SC 416 **International Negotiations** (3) The study of international negotiations from a strategic perspective.
Effective: Summer 2005
Prerequisite: PL SC 014

PL SC 417 **American Local Government and Administration** (3) Organization, powers, functions, and problems of American cities and metropolitan areas; modern trends and developments.
Effective: Winter 1978
Prerequisite: PL SC 001

PL SC 418 **International Relations Theory** (3) A survey of traditional and contemporary conceptual frameworks and theoretical approaches for the analysis of international relations.
Effective: Winter 1978
Prerequisite: PL SC 014

PL SC 418W **International Relations Theory** (3) A survey of traditional and contemporary conceptual frameworks and theoretical approaches for the analysis of international relations.
Effective: Spring 1999
Prerequisite: PL SC 014

PL SC 419 **The Bureaucratic State** (3) Overview of structural, technological, decision-making, behavioral, and political subsystems of bureaucracy; emphasis on bureaucratic dynamics within larger environmental, interorganizational contexts.
Effective: Fall 2007
Prerequisite: PL SC 001, PL SC 002 orPUBPL 304W

PL SC 422 **Comparative Urban Politics** (3) Relationships between structure and evolution of city systems and patterns of political behavior.
Effective: Spring 2001
Prerequisite: PL SC 003, PL SC 020, PL SC 022 orPL SC 417

PL SC 423 **Post-Soviet Politics** (3) Aspects of political transition and institutions of the fifteen Soviet successor republics; emphasis on Russia and republican confederation.
Effective: Fall 2007
Prerequisite: PL SC 003, PL SC 155 orRUS 100

PL SC 424 **Topics in Comparative Government and Institutions** (3) Topics in the comparative analysis of representative contemporary Western and non-Western governmental institutions.

Effective: Fall 2007
Prerequisite: 3 credits fromPL SC 003, PL SC 020, PL SC 022

PL SC 425 **Government and Politics of the American States** (3) Comparative analysis of political processes; executive, legislative, and judicial decision making and behavior; examination of systems functioning; selected public policies.
Effective: Winter 1978
Prerequisite: PL SC 001

PL SC 426 **Political Parties and Interest Groups** (3) Interest group basis of American politics, analysis of party and group behavior in electoral politics and the policy process.
Effective: Fall 1983
Prerequisite: PL SC 001

PL SC 427 **Political Opinion** (3) Nature and development of mass attitudes and opinions; political socialization; voting behavior; relation between opinions and public policy.
Effective: Spring 2001
Prerequisite: PL SC 001

PL SC 428 (US;IL) (WMNST 428) **Gender and Politics** (3) Gender in politics in the United States and around the world; major areas of women and politics research.
Effective: Fall 2007
Prerequisite: 3 credits in political science or women's studies

PL SC 429 **Analysis of Electoral Politics** (3) The new politics, its technology, and the strategic perspectives that underlie it.
Effective: Spring 2007
Prerequisite: PL SC 001

PL SC 430 **Selected Works in the History of Political Theory** (3) Detailed examination and analysis of a selected major work, thinker, or tradition in the history of political theory.
Effective: Spring 1998
Prerequisite: PL SC 017 orPL SC 007

PL SC 430W **Selected Works in the History of Political Theory** (3) Detailed examination and analysis of a selected major work, thinker, or tradition in the history of political theory.
Effective: Spring 2008
Prerequisite: PL SC 017 orPL SC 007

PL SC 431 **Ancient, Medieval, and Renaissance Political Theories** (3) Political theories of Plato and Aristotle; selected Greek, Roman, medieval, and Renaissance theorists through Machiavelli.
Effective: Spring 2003
Prerequisite: PL SC 017 orPL SC 007

PL SC 432 **Modern and Contemporary Political Theories** (3) Political theories of the seventeenth through the twentieth centuries, including Hobbes, Locke, Rousseau, Marx, Mill, Mosca, Weber, and selected theorists.
Effective: Spring 2003
Prerequisite: PL SC 017 orPL SC 007

PL SC 433 **Political Foundations of the Early American Republic** (3) The course introduces students to the major political and philosophical movements that influenced the founders of the early American republic.
Effective: Summer 2008
Prerequisite: PL SC 001 orHIST 020 orPL SC 017

PL SC 434 (IL) (AAA S 434) **War and Development in Africa** (3) This course will examine the relationship between war and development in sub-Saharan Africa in the post colonial era.
Effective: Spring 2008
Prerequisite: PL SC 114, PL SC 003, AAA S 110

PL SC 435 **Foundations of American Political Theory** (3) Political theories of colonial, revolutionary, and constitutional periods presented through works of selected thinkers and analysis of particular political problems.
Effective: Spring 2001
Prerequisite: PL SC 001, PL SC 017 orPL SC 007

PL SC 435W **Foundations of American Political Theory** (3) Political theories of the revolutionary and constitutional periods presented through works of selected political thinkers and political issues.
Effective: Spring 2001
Prerequisite: PL SC 001, PL SC 017 orPL SC 007

PL SC 437 **War in World Politics** (3) Causes, resolution, and consequences of crises and wars; testing theories of conflict using both case and statistical studies.
Effective: Summer 1997
Prerequisite: PL SC 014

PL SC 438 **National Security Policies** (3) Impact of national security on U.S. government and foreign policy; roles and interaction of President, Congress, government agencies, interest groups.
Effective: Spring 2001
Prerequisite: PL SC 001 orPL SC 014

PL SC 439 (CRIMJ 439) **The Politics of Terrorism** (3) Analysis of political terrorism as a violent alternative for peaceful change and traditional warfare in the nuclear age.
Effective: Spring 2008

Prerequisite: CRIMJ 100 orPL SC 014 or permission of program

PL SC 440 (US;IL) (AAA S 440, I B 440) **Globalization and Its Implications** (3) This course explores the socioeconomic implications of globalization.
Effective: Spring 2008
Prerequisite: AAA S 100 orAAA S 110 orPL SC 003 orPL SC 014 orPL SC 020 orPL SC 022

PL SC 441 **Transnational Corporations and Other Organizations in International Relations** (3) Analysis of the effects of transnational actor behavior on international relations.
Effective: Fall 2007
Prerequisite: ECON 333, I B 303, PL SC 014 orBUS 364

PL SC 442 **American Foreign Policy** (3) Principles of American foreign policy; processes of policy formulation; roles of the President, Congress, the State Department, and other government agencies.
Effective: Spring 2001
Prerequisite: PL SC 014

PL SC 443 (IL) (AAA S 443) **Ethnic Conflict in Africa** (3) This course explores the various causes and impacts of ethnic conflicts in the African context.
Effective: Spring 2008
Prerequisite: AAA S 100, AAA S 110, PL SC 001, PL SC 003, PL SC 007, PL SC 014, PL SC 017, PL SC 020 orAFRAS 301

PL SC 444 **Government and the Economy** (3) Interactions of governmental and economic activity in American life. Survey of governmental (national, state, local) promotional, regulatory, and ownership policies.
Effective: Winter 1978
Prerequisite: 3 credits in political science or economics

PL SC 445Y (US) (AAA S 445Y, LER 445Y) **Politics of Affirmative Action** (3) Examines history, politics, and economics of the use of special programs to advance racial interests in the U.S.
Effective: Spring 2008
Prerequisite: AAA S 100 level course andPL SC 001 orPL SC 007

PL SC 452 **Government and Politics of Central Europe** (3) Politics and society in the Communist Era, the revolutions of 1989, and problems of adjustment to democracy and market.
Effective: Fall 2007
Prerequisite: PL SC 003, PL SC 020, PL SC 022 orPL SC 155

PL SC 453 (IL) **Political Processes in Underdeveloped Systems** (3) Comparative analysis of the political, social, and economic problems characteristic of underdeveloped systems.
Effective: Fall 2007
Prerequisite: PL SC 003, PL SC 020 orPL SC 022

PL SC 454 (IL) (AAA S 454) **Government and Politics of Africa** (3) Contemporary African politics, institutions, and ideologies; patterns of change, social forces, and nation building in selected African states.
Effective: Summer 2005
Prerequisite: 3 credits from:AAA S 110, PL SC 003, PL SC 020 orPL SC 022

PL SC 455 **Governments and Politics of Western Europe** (3) Comparative analysis of political and governmental structures of major West European nations; main functions and processes of such structures.
Effective: Spring 2001
Prerequisite: PL SC 003 orPL SC 020

PL SC 456 **Politics and Institutions of Latin-American Nations** (3) Social forces and processes, governmental institutions, foreign policies of major states of Latin America.
Effective: Spring 2001
Prerequisite: HIST 179, PL SC 003, PL SC 020 orPL SC 022

PL SC 457 **International Politics of Latin America** (3-6) Relationships among the nations of Latin America and the social forces which determine and shape their direction.
Effective: Spring 2001
Prerequisite: HIST 179, PL SC 003, PL SC 014, PL SC 020 orPL SC 022

PL SC 458 **Government and Politics of East Asia** (3-6) Examination of political institutions, democratic and communist revolution, political leadership, political processes of major states of East Asia.
Effective: Summer 1996
Prerequisite: 3 credits fromPL SC 003, PL SC 020, PL SC 022

PL SC 459 (IL) (AAA S 459) **Culture and World Politics** (3) Role of culture in world politics.
Effective: Summer 2006

PL SC 460 (S T S 460) **Science, Technology, and Public Policy** (3) The all-pervasive importance of science and technology policy in modern societies and mechanisms and processes by which it is made.
Effective: Spring 1995
Prerequisite: 3 credits in natural sciences or engineering 3 credits in social and behavioral sciences

PL SC 462 **Marxist and Socialist Political Theory** (3) Analysis of major problems and key works in the Marxist and Socialist tradition; dialectical materialism, alienation, class warfare, etc.
Effective: Spring 2001
Prerequisite: PL SC 017, PL SC 007, PL SC 413 orPL SC 452

PL SC 464 (IL) (AAA S 464) **Globalization, Extractive Industries, and Conflict in Africa** (3) Socioeconomic and environmental impacts of extractive industries in Africa.
Effective: Summer 2008
Prerequisite: AAA S 110 or at least one of the following:PL SC 003 orPL SC 014 orPL SC 022

PL SC 467 **International Relations of the Middle East** (3) The international relations of the Middle East, stressing national security policies of regional and outside actors, and major contemporary conflicts.
Effective: Spring 1985
Prerequisite: PL SC 014 orHIST 181

PL SC 470W **Legal Brief Writing** (3) Writing of legal briefs as practiced in American courts.
Effective: Spring 1998
Prerequisite: PL SC 001

PL SC 471 **American Constitutional Law** (3) The origins of judicial review, landmark decisions of the Supreme Court, and their impact on the American form of government.
Effective: Fall 2007
Prerequisite: PL SC 001

PL SC 472 **The American Legal Process** (3) Analysis of the roles, procedures, and policies characterizing the American legal system.
Effective: Spring 2001
Prerequisite: PL SC 001

PL SC 473 **American Judicial Behavior** (3) Analyzes behavior of judges and other participants in the legal process; examines how and why courts function as policymaking bodies.
Effective: Fall 2007
Prerequisite: PL SC 001

PL SC 474 **Civil Liberties and Due Process** (3) Fundamental problems relating to civil liberities and due process.
Effective: Fall 2007
Prerequisite: PL SC 001

PL SC 480W **Congress and the Presidency** (3) Basic characteristics and processes of the national legislature and executive; roles and interaction of these institutions in the policy process.
Effective: Fall 2007
Prerequisite: PL SC 001

PL SC 481 **Global Political Economy** (3) This course examines states, markets, power, production, and the relations between the various transnational agents who act in these areas. Students may not receive credit for PL SC 481 and PL SC 412.
Effective: Spring 2007
Prerequisite: PL SC 014 orINTST 100

PL SC 482 **American State and Urban Politics** (3) Explores basic characteristics and processes of American state and urban politics; nature of intergovernmental relations involving these governmental levels.
Effective: Fall 2007
Prerequisite: PL SC 001

PL SC 484W **The Foreign Policy of Soviet Successor States** (3) Relations between Russia and The Newly Independent States (NIS); Russia's relations with selected foreign states and political Institutions; regional impact of the NIS in Baltic, Asian, and Central Asian areas.
Effective: Fall 2007
Prerequisite: PL SC 003

PL SC 487 **International Law and Organizations** (3) Major topics and issues of international law with special attention to institutional arrangements (international organizations) through which that law operates.
Effective: Fall 2007
Prerequisite: PL SC 003 orPL SC 014

PL SC 488 **Comparative Public Policy** (3) Comparative methodology and public policy implementation in postindustrial societies; selected case studies of policy output.
Effective: Fall 2007
Prerequisite: PL SC 003

PL SC 489 **Public Administration** (3) A survey of the major approaches to the management of most governmental agencies.
Effective: Fall 2007
Prerequisite: PL SC 001

PL SC 490 **Policy Making and Evaluation** (3) Advanced analysis of public policy, emphasizing policy evaluation and the factors that determine policy success and failure.
Effective: Fall 2007
Prerequisite: PL SC 001, PL SC 002 orPUBPL 304W

PL SC 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

PL SC 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or

small-group basis.
Effective: Fall 2007

PL SC 495 **Political Science Internship** (1-6) Combining experience in government offices, related agencies, or law firms, with appropriate readings and a research paper/report.
Effective: Fall 2007
Prerequisite: prior consent of supervisor adviser or department head; applicable departmental internship requirements such as satisfactory completion of required 300- or 400-level courses appropriate for the internship program selected

PL SC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

PL SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

PL SC 497A **International Relations of Africa** (3) This course will discuss the role of Africa in the intellectual development of world politics beginning in the 20th century.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 497A **International Relations of Africa - Advanced** (3) Throughout this course, we examine both the impact of Africa on world politics, as well as the impact of world politics on Africa.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PL SC 497B **Politics of the European Union** (3) The aim of this course is to introduce students to the history, institutions, and politics of the European Union.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 497B **Japanese and Korean Politics** (3) This course provides an overview of the major political actors and institutions in Japan and Korea.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PL SC 497C **Nationalism, Ethnicity & Immigration** (3) The course examines the concepts of ethnicity and nationalism and explores their connections to immigration and immigration policy.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 497D **Territoriality & Group Conflict in International Relations** (3) This course will explore the central theoretical role territory plays in international relations and focus on perspectives that suggest causes.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 497E **Democratization in Asia** (3) This course address the literature on democracy and democratization and then applies it to Asia.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 497F **Political Economy of Civil Wars** (3) This course examines the recent research about the factors that lead to the onset, duration, and termination of civil wars.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 497G **Dictators and Their Demise** (3) This course examines the political economy of authoritarian rule.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 497I (PUBPL 497A) **Public Affairs Capstone Course** (3) This course examines how to objectively examine contentious public policy controversies by relying on essential principles of scientific research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 497K (IL) **South Asian Politics** (3) This course will present an overview of the politics of modern South Asia focusing on Afghanistan, India and Pakistan.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 499 (IL) **Foreign Study--Government** (1-12) Study, in selected foreign countries, of political institutions.
Effective: Summer 2005
Prerequisite: PL SC 003 3 credits in economics history political science or sociology

PL SC 501 **Methods of Political Analysis** (3) Survey of important methods and approaches to the study of politics; introduction to research design.
Effective: Fall 1995

PL SC 502 **Statistical Methods for Political Research** (3) Basic concepts of statistics and their use in political research; data analysis, casual inference, regression analysis, computer applications.
Effective: Spring 1995

PL SC 503 **Multivariate Analysis for Political Research** (3) Analysis of selected issues in quantitative political analysis; introduction to advanced multivariate analysis techniques.
Effective: Spring 2003
Prerequisite: PL SC 501, PL SC 502

PL SC 511 **Professional Norms in Political Science** (1.5) An introduction to professional norms, the fundamentals of good research, and the basic skills necessary for good teaching.
Effective: Spring 2007

PL SC 513 **Writing and Professional Development in Political Science** (1.5) Professional development focusing on publishing research, writing dissertatins dissertations, and professional issues of advanced graduate students.
Effective: Fall 2007
Prerequisite: 3rd year standing in Political Science Ph.D. program

PL SC 518 (SOC 518) **Survey Methods I: Survey Design** (3) Research design of social, behaviorial and health surveys.
Effective: Fall 2007

PL SC 519 (SOC 519) **Survey Methods II: Analysis of Survey Data** (3) Intermediate course on the statistical analysis of survey data: topics include weighting, complex surveys, missing data, and contextual analysis.
Effective: Spring 2008
Prerequisite: PL SC 503 orSOC 575

PL SC 540 **American Government and Politics** (3) Survey of basic literature in major fields of U.S. government: public opinion, parties, voting, interest groups, presidency, congress, judiciary.
Effective: Fall 1995

PL SC 541 **American Political Institutions** (3-9) Research on a selected topic in United States political institutions such as the presidency, the courts, congress, bureaucracy, state governments.
Effective: Spring 1995

PL SC 542 **American Political Behavior** (3 per semester/maximum of 9) Research on a selected topic in United States political behavior such as public opinion, voting, parties, socialization, judicial behavior.
Effective: Spring 1995

PL SC 543 **American Public Policy** (3 per semester/maximum of 9) Research on topics in United States public policy and public law, such as environmental policy, development policy, individual and minority rights.
Effective: Spring 1995

PL SC 550 **Comparative Politics: Theory and Methodology** (3) Survey of basic literature and major research efforts in comparative political analysis.
Effective: Fall 1995

PL SC 551 **Comparative Political Institutions** (3 per semester/maximum of 9) Comparative study of the institutional structures of different political systems: the state, party systems, administrative structures.
Effective: Spring 1995

PL SC 552 **Comparative Political Behavior** (3 per semester, maximum of 9) Research on aspects of comparative political behavior, such as political culture, political change and development, interest groups, public opinion.
Effective: Spring 2003

PL SC 553 **Studies in Regional Politics** (3 per semester/maximum of 9) Research on political systems in selected regions of the world, such as Europe, Latin America, East and South Asia.
Effective: Spring 1995

PL SC 554 **The Politics of Development** (3) The course explores the origins of modernity, its proliferation globally, and problems associated with initiating and sustaining development.
Effective: Summer 2005

PL SC 560 **International Relations: Theory and Methodology** (3) Survey of major traditional and contemporary theory-building efforts and contemporary research techniques and orientations in international relations.
Effective: Summer 1995

PL SC 561 **American Foreign Policy** (3 per semester/maximum of 9) Research on the institutions, dynamics, and major themes of United States foreign policy.
Effective: Spring 2003

PL SC 562 **National Security Studies** (3 per semester/maximum of 6) Research on classical and modern conventional strategy, nuclear strategy, arms control, conflict management, and non-traditional security problems.
Effective: Spring 1995

PL SC 563 **International Political Economy** (3 per semester, maximum of 9) Research on international political economy with a focus on theory building; analysis of political causes and consequences of economic behavior.
Effective: Spring 2003

PL SC 564 **International Organization** (3 per semester/maximum of 6) Research on international governmental and non-governmental organizations in the international system, emphasizing the United Nations and collective security.
Effective: Spring 1995
Prerequisite: PL SC 415

PL SC 565 **International Conflict** (3) Research into the causes and consequences of international crises and wars, using various methodologies for theory assessment.
Effective: Spring 1996
Prerequisite: PL SC 560

PL SC 566 **Conflict Management, Termination, and Bargaining** (3) Research on termination and resolution of international conflicts, focusing on theory building and empirical assessment of theories of conflict resolution.
Effective: Fall 2008
Prerequisite: PL SC 560

PL SC 580 **Modern Democratic Political Theory** (3) Survey of major themes and problems in modern theories of democratic politics.
Effective: Spring 2003

PL SC 581 **History of Political Theory** (3 per semester/maximum of 9) Research on selected political theorists or historical traditions of political thought.
Effective: Spring 2003

PL SC 582 **Analytic Political Theory** (3 per semester/maximum of 6) Research on problems in contemporary theory construction.
Effective: Spring 1995
Prerequisite: PL SC 431 orPL SC 432

PL SC 583 **Modern Political and Social Theory** (3 per semester/maximum of 9) Research on major developments and issues in modern political and social theory, such as critical theory, modernism, and postmodernism.
Effective: Spring 2003

PL SC 586 **Theory of Bureaucratic and Administrative Politics** (3 per semester/maximum of 6) The role of the executive in government and politics; theories of administrative organization, organization behavior, and decision-making processes.
Effective: Spring 1998

PL SC 594 **Research in Political Science** (1-6) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Summer 1988

PL SC 595 **Internship in Political Science** (1-9) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1987
Prerequisite: Prior consent of supervisor advisor or department head; applicable departmental internship requirements such as satisfactory completion of required upper level courses appropriate for the internship program selected.

PL SC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses. A specific title may used in each instance and will be entered on the student's transcript.
Effective: Spring 1987

PL SC 596A **Maximum Likelihood Estimation for Generalized Linear Models** (3) This course introduces students to a number of useful statistical models that move beyond standard linear regression.
Effective: Summer 2010 Ending: Summer 2010

PL SC 596B **Regression Analysis III: Advanced Methods** (3) This course will extend the basic linear model framework in a number of directions in an attempt to fix potential problems in the analysis before they arise.
Effective: Summer 2010 Ending: Summer 2010

PL SC 596C **Time Series Analysis** (3) This course begins by focusing on the autoregressive and moving average components of time series, and then turns to estimation of univariate time series models using the Box-Jenkins approach.
Effective: Summer 2010 Ending: Summer 2010

PL SC 596D **Simultaneous Equation Models** (3) This course centers on simultaneous equation models -- models of more than one equation, to account for more than one dependent variable -- formerly called "causal models."
Effective: Summer 2010 Ending: Summer 2010

PL SC 596E **Longitudinal Analysis** (3) This course treats the statistical basis and practical application of linear models for longitudinal normal data and generalized linear models for longitudinal binary, count, and ordinal data.
Effective: Summer 2010 Ending: Summer 2010

PL SC 596F **Advanced Multivariate Statistical Models** (3) The purpose of this workshop is to discuss linear models that are useful for analyzing multivariate data.
Effective: Summer 2010 Ending: Summer 2010

PL SC 596G **Structural Equation Models w/Latent Variables** (3) This course will introduce participants to latent variable structural equation models (SEMs).
Effective: Summer 2010 Ending: Summer 2010

PL SC 596I **Complex System Models in Social Sciences** (3) This workshop will give an introduction to bottom-up approaches to computer modeling and compare them to more traditional mathematical (analytical) approaches.
Effective: Summer 2010 Ending: Summer 2010

PL SC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

PL SC 597A **Judicial Politics** (3) This is a course on judicial politics, taught from both an American and comparative politics perspective.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 597A **Civil Conflict** (3) This course will compare across types of civil conflict.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PL SC 597B **Mathematics for Political Science** (1.5) This course is an introduction to mathematical concepts and techniques used in statistical and formal approaches to political science.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 597B **Game Theory** (3) This course aims to give students an entry-level understanding of the basic concepts of game theory.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PL SC 597C **Quantitative Methods** (3) This course introduces a range of statistical models that generalize from linear-normal regression.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: PL SC 503 or its equivalent

PL SC 597C **Territoriality and Group Conflict in International Relations** (3) This course will focus on the central theoretical role territory plays in international relations.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PL SC 597D **Topics in Game Theory** (3) The course aims to give students and entry-level understanding of the basic concepts of game theory.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PL SC 597D **Robust Models, Exploratory Models and Machine Learning** (3) The course focuses on automated techniques for determining the robustness of a statistical model.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PL SC 597E **Seminar on Macro Polity** (3) This course will focus on aspects of American politics that can be studied at the macro level.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

PL SC 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1995

PL SC 599 (IL) **Foreign Studies** (1-12 per semester/maximum of 24) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005

PL SC 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

PL SC 601 **Ph.D. Disseration Full-Time** (0) No description.
Effective: Fall 1983

PL SC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) No description.
Effective: Spring 1995

PL SC 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2000

PL SC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

PL SC 611 **Ph.D. Dossertation Part-Time** (0) No description.
Effective: Fall 1983

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Portuguese (PORT)

PORT 405 **Advanced Composition and Conversation** (3) Intended to strengthen the advanced student's ability to speak, read, and write in modern Brazilian Portuguese.
Effective: Summer 1981
Prerequisite: PORT 003

PORT 456 **Brazilian Literature in English Translation** (3) Selected topics in the history of Brazilian literature, supplemented by readings, discussion, and lectures on cultural or literary questions.
Effective: Winter 1978

PORT 466 **Brazilian Literature, The Colonial Era Through Romanticism** (3) A survey of the major texts of Brazilian literature from its origins (1500) through its romantic period.
Effective: Summer 1991
Prerequisite: PORT 003

PORT 476 **Brazilian Literature, The Modern Era (1880 to the Present)** (3) A survey of the major texts of Brazilian literature from romanticism to the present.
Effective: Summer 1991
Prerequisite: PORT 003

PORT 480 **The Brazilian Novel** (3) A survey of the Brazilian novel from its origins to the present.
Effective: Spring 1993
Prerequisite: PORT 003, PORT 405

PORT 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

PORT 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

PORT 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

PORT 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

PORT 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

PORT 588 **Seminar in Portuguese and Brazilian Literature** (3-12) Common and individual research in special problems.
Effective: Winter 1978

PORT 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

PORT 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1988

PORT 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

PORT 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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Psychology (PSYCH)

PSYCH 400 **Intermediate Experimental Design** (3) Design and analysis of experiments on human and animal behavior, including application of the t, F, chi-square, and binomial distributions.
Effective: Spring 2007
Prerequisite: PSYCH 200 orSTAT 200

PSYCH 403 **Measurement and Decision Making** (3) Introduction to axiomatic measurement theory, scale construction, and behavioral decision theory. Algebraic and stochastic models; iterative scaling methods.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 404 (EDPSY 450) **Principles of Measurement** (3) Scale transformation, norms, standardization, validation procedures, estimation of reliability.
Effective: Spring 2007
Prerequisite: EDPSY 400, PSYCH 100 orPSYCH 200;STAT 200

PSYCH 405 **Mathematical Psychology** (3) Formalized psychological theories including models of social, biological, cognitive, and learning phenomena.
Effective: Spring 2007
Prerequisite: MATH 040 or equivalentPSYCH 200 orSTAT 200

PSYCH 406W **Advanced Research Projects in Psychology** (4) Advanced methodology focusing on the logic and practice of research culminating in the completion of a student designed research project.
Effective: Spring 2007
Prerequisite: PSYCH 301W

PSYCH 407 **Advanced Research Methods in Psychology** (3) Advanced methodology focusing on the logic and practice of research in a selected content area of psychology.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 200 orSTAT 200;PSYCH 301W

PSYCH 408 **Program Evaluation** (3) Examination of the theories and practice of program evaluation; emphasis on applied work utilizing a wide range of evaluation approaches.
Effective: Spring 2007
Prerequisite: PSYCH 100 orSOC 001;PSYCH 200 orSTAT 200;PSYCH 301W

PSYCH 410 **Child Development** (3) Study of the psychology of the growing person from conception through adolescence, focusing more on periods up to middle childhood.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 412 **Adolescence** (3) Physical, cognitive, and personality development during adolescence.
Effective: Spring 2007
Prerequisite: PSYCH 100

PSYCH 413 **Cognitive Development** (3) Development of reasoning and related cognitive skills, such as perception and language.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 212

PSYCH 414 **Social and Personality Development** (3) Development of social and personality attributes.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 212

PSYCH 415 **Topics in Developmental Psychology** (3) Special topics in developmental psychology.
Effective: Spring 2007
Prerequisite: PSYCH 413 orPSYCH 414

PSYCH 416 (HD FS 445) **Development Throughout Adulthood** (3) Processes of development and change of behavior from early adulthood through old age, emphasizing theory, method, and empirical research.
Effective: Spring 2007
Prerequisite: HD FS 249 orPSYCH 100;HD FS 312W orPSYCH 301W;PSYCH 200, STAT 200 or 3 credits of statistics ; 6 credtis in HD FS PSYCH or SOC.

PSYCH 420 **Advanced Social Psychology** (3) In depth study of selected research areas in human social behavior.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 421 **Self and Social Judgment** (3) Individual's perceptions, evaluations, and decision-making strategies about themselves, others, and social situations or issues.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 221

PSYCH 422 **Human Sexuality** (3) Psychological influences on human sexual behavior such as love, sexual orientation, gender, intercourse, contraception, sexually transmitted diseases, dysfunctions, and paraphilias.
Effective: Spring 2007

Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 423 **Social Psychology of Interpersonal/Intergroup Relationships** (3) In-depth study of relationships among individuals (e.g., intimate relationships) or groups (e.g., prejudice, cooperation, competition, aggression, and negotiation).
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 221

PSYCH 424 **Applied Social Psychology** (3) Application of social psychological theories and research methods to field settings and to the study of social issues.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 221

PSYCH 425 **Psychology of Human Emotion** (3) Reviews, critiques, and applies major historical and contemporary psychological theories of emotion experience, understanding, and expression.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 426 (LING 429) **Language and Thought** (3) Relations between language and cognition; cognitive implications of normal and impaired language development; cognition and bilingualism.
Effective: Spring 2007
Prerequisite: PSYCH 100 orLING 001 orLING 100

PSYCH 427 (LING 446) **L1 Acquisition** (3) How children learn their first language; psycholinguistic aspects of lexical, syntactic, semantic, and phonological development.
Effective: Spring 2010
Prerequisite: LING 100 orPSYCH 002 or permission of program

PSYCH 432 (US) **Multicultural Psychology in America** (3) This course focuses on the central role of culture, race, and ethnicity in the human condition.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 436 (RL ST 414) **Humanistic, Existential, and Religious Approaches to Psychology** (3) Existential, humanistic, and religious approaches to the psychology of experience, consciousness and will.
Effective: Spring 2007
Prerequisite: PSYCH 100 orRL ST 001

PSYCH 438 **Personality Theory** (3) Personality theories and their application to social and personality development and personality dynamics.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits PSYCH

PSYCH 439 **History and Systems of Psychology** (3) Historical antecedents to scientific psychology; development of contemporary psychological theories and research areas from the formal establishment of psychology.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 441 **Health Psychology** (3) Overview of the field with an emphasis on how psychological research contributes to an understanding of health and behavior.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 443 **Treatment and Education in Developmental Disabilities** (3) Covers etiology, classification, intervention (treatment and education), ethical and legal issues related to individuals with developmental disabilities.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 444 **Engineering Psychology** (3) Methods and results of experimental psychology pertinent to problems which involve man-machine relationships.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of GQ or PSYCH

PSYCH 445 **Forensic Psychology** (3) Relations between psychological theory and research and the law, legal processes, and social policy.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 238, PSYCH 243 orPSYCH 270

PSYCH 447 **Psychology of Discipline** (3) Provides theory and practice for effective discipline of children in a variety of situations.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits PSYCH

PSYCH 450 **Psychology of Consciousness** (3) Introduction to psychological and physiological aspects of consciousness as related to brain function and clinical psychology.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 451 **Psychology of Action** (3) Basic and applied science of action, from psychological, computational, and physiological perspectives.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 256

PSYCH 452 **Learning and Memory** (3) General survey of learning and memory processes as revealed in experimental work with animals and humans.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 256

PSYCH 453 **Sensation and Perception** (3) Fundamental processes and variables involved in the sensory and perceptual experiences of animals and humans.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 253

PSYCH 456 **Advanced Cognitive Psychology** (3) In depth study of complex mental processes: thinking, problem-solving, imagery, symbolic behavior, information-processing, attention, artificial intelligence, and language.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 457 **Psychology of Language** (3) Overview of psychological research and theory on language processes, including speech perception, word recognition, meaning representation, comprehension, and language acquisition.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 458 **Visual Cognition** (3) Overview of concepts and methods in cognitive visual-spatial processing.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 459 **Attention and Information Processing** (3) An examination of attentional processes. Contemporary informational processing approaches will be emphasized.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 200 orSTAT 200 ; 3 credits 400-level PSYCH

PSYCH 460 **Comparative Psychology** (3) Behavior from standpoint of phylogenetic growth and development; biological implications; comparison of different types of animals, including man.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 260

PSYCH 461 **Advanced Conditioning and Learning** (3) An examination of basic learning processes that have been determined within the context of classical, instrumental, and operant learning situations.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 462 **Physiological Psychology** (3) Study of the biological bases of behavior and experience, including the anatomy and physiology of the brain and nervous system.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 260 or 3 credits of BIOL

PSYCH 463 **Developmental Biopsychology** (3) Developmental neuroanatomy and neurophysiology of vertebrates as they relate to behavior; emphasis on early postnatal development of birds and mammals.
Effective: Spring 2007
Prerequisite: PSYCH 260

PSYCH 464 **Behavior Genetics** (3) Survey of gene mechanisms and gene-environment interactions in the determination of behavior; emphasis on deviant human behavior.
Effective: Spring 2008
Prerequisite: PSYCH 100;ANTH 021, BI SC 002, BIOL 133 orBIOL 222

PSYCH 470 **Abnormal Psychology** (3) Causes, dynamics, symptoms, and treatment of neuroses, psychoses, personality disorders, and other psychological disorders of adulthood.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 238, PSYCH 243 orPSYCH 270

PSYCH 471 **Psychology of Adjustment and Social Relationships** (3) Theory and application of psychological principles to problems in personal and social adjustment.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 473 **Behavior Modification** (3) Principles of advanced behavior modification techniques.
Effective: Spring 2007
Prerequisite: PSYCH 100 6 additional credits of PSYCH

PSYCH 474 **Psychological Intervention in Childhood** (3) Psychology of personal relationships in school situations.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 212, PSYCH 238, PSYCH 243 orPSYCH 270

PSYCH 475 **Psychology of Fear and Stress** (3) Description and evaluation of major trends in research on stress and fear in humans and other animals.
Effective: Spring 2007
Prerequisite: PSYCH 100 3 credits of BIOL statisticsPSYCH 200 orSTAT 200

PSYCH 476 **Child Psychopathology** (3) Etiology, diagnosis, and facilitation of adjustment of the mentally retarded, gifted, physically handicapped, and emotionally disturbed child.
Effective: Spring 2007

Prerequisite: PSYCH 100;PSYCH 212, PSYCH 238, PSYCH 243 orPSYCH 270

PSYCH 477 **Mental Health Practicum with Children** (3) Overview of interventions for children at risk for mental health disorders; emphasis on intervention strategies, program evaluation, and applied skills.
Effective: Spring 2007
Prerequisite: PSYCH 100 permission of program

PSYCH 478 **Clinical Neuropsychology** (3) Overview of functional human neuroanatomy and clinical neuropsychology, with emphasis on origin, assessment, and treatment of human brain damage.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 260

PSYCH 479 (US) (WMNST 471) **The Psychology of Gender** (3) Theories and research on gender differences and gender roles. Emphasis on women's and men's current positions in society.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 221

PSYCH 481 **Introduction to Clinical Psychology** (3) Diagnostic precedures, treatment approaches, occupational settings, and ethical considerations relevant to the profession of the clinical psychologist.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 238, PSYCH 243 orPSYCH 270

PSYCH 482 **Selection and Assessment in Organizations** (3) Background in personnel testing, performance measurement, selection strategies, with emphasis on validity and measurement reliability.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 200 orSTAT 200, PSYCH 281

PSYCH 484 **Work Attitudes and Motivation** (3) Survey of theory and research with respect to attitudes, morale, and motivation of employees and management.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 200 orSTAT 200 or 6 credits of GQ

PSYCH 485 **Leadership in Work Settings** (3) Review of research and application of behavior principles in the areas of management and supervision.
Effective: Spring 2007
Prerequisite: PSYCH 100;PSYCH 281 or 3 credits MGMT

PSYCH 490 **Senior Seminar in Psychology** (3) Capstone experience for senior psychology majors; review of current research literature; topics vary.
Effective: Spring 2007
Prerequisite: PSYCH 301W 6 credits 400-level PSY senior Psychology major

PSYCH 491H **Honors Thesis** (3) An opportunity to pursue an advanced research thesis or project to integrate studies within psychology.
Effective: Spring 2007
Prerequisite: HONOR 301H senior standing and permission of the program

PSYCH 492 **Current Topics in Psychology** (3) Current topics addressing significant contemporary developments in psychology.
Effective: Spring 2007
Prerequisite: PSYCH 100

PSYCH 493 **Senior Thesis** (3-6) Supervised senior thesis research in psychology.
Effective: Spring 2007
Prerequisite: approval of a thesis adviser in the department seventh-semester standing

PSYCH 494 **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2007

PSYCH 494H **Research Projects** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

PSYCH 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1998
Prerequisite: prior approval of proposed assignment by instructor

PSYCH 495K **Practicum with Hi-Risk Youth and Children** (2-3) Overview of interventions for children at risk for mental health disorders; emphasis on intervention strategies, program evalution, and applied skills. Continuation of PSYCH 477 held in Fall semester.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: prior approval of proposed assignment by instructor

PSYCH 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1985

PSYCH 496A **Applications of Survey Research** (1-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

PSYCH 496A **Undergraduate Teaching Assistant** (1-6) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

PSYCH 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1991

PSYCH 497A **Biopsychology** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

PSYCH 497B **Advanced Experimental Psychology** (3) This is an advanced survey course, providing a broad overview of the methods used in a variety of research areas in psychology.
Effective: Summer 2010 Ending: Summer 2010

PSYCH 497D (CRIMJ 497D, WMNST 497D, SOC 497D) **Family and Justice** (3) Examination of the relationship between the family and the criminal justice system in which the family operates.
Effective: Summer 2010 Ending: Summer 2010

PSYCH 499 (IL) **Foreign Studies** (12) Courses offered in foreign countries by individual or group instruction.
Effective: Spring 2007

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Public Administration (P ADM)

P ADM 401 **Introduction to Homeland Security** (3) This course provides foundational knowledge about homeland security, including policy, organization, and legal issues in the American context.
Effective: Summer 2008

P ADM 404 **Homeland Security and Defense in Practice** (3) This course analyzes, evaluates, and critiques homeland security plans in practice.
Effective: Summer 2008
Prerequisite: P ADM 401

P ADM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1993

P ADM 500 **Public Organization and Management** (3) Development of basic concepts and issues in public administration; administra- tive theory and public policy processes.
Effective: Spring 2003

P ADM 502 **Governmental Fiscal Decision Making** (3) Nature, function, and technique of governmental budgeting viewed as mechanism for allocating resources among alternative public uses.
Effective: Spring 2003
Prerequisite: P ADM 500

P ADM 503 (H ADM 503) **Research Methods** (1-3) Examination of research methodologies relevant to administration, planning, and public policy.
Effective: Spring 2006
Prerequisite: 3 credits statistics or permission of program and a demonstrated working knowledge of SPSS

P ADM 505 **Human Resources in the Public and Nonprofit Sectors** (3) Concepts and approaches contributing to effective use of human resources in public and non-profit organizations; legal issues and requirements.
Effective: Spring 2002
Prerequisite: P ADM 500

P ADM 506 (H ADM 506) **Management Information Systems for Public and Health Administration** (3) The design, implementation, and purpose of computerized management information systems in public and non-profit organizations.
Effective: Spring 2003

P ADM 507 **Introduction to Public Policy Analysis** (3) Introduction to the analysis of public policy within its organizational and political contexts, including an emphasis on an economic perspective.
Effective: Summer 2004
Prerequisite: 3 credits of American government and 3 credits of basic economics

P ADM 510 (H ADM 510) **Organizational Behavior** (3) Examination of concepts of human behavior in formal organizations, systems analysis, conceptual models, and decision processes.
Effective: Spring 2003

P ADM 511 **Organizational Change and Development** (3) Theory of organizational change and development; case analysis of applications in actual situations.
Effective: Spring 2003
Prerequisite: H ADM 510 orP ADM 510

P ADM 512 **Issues in Human Resources** (3) A survey of major human resource issues such as job stress, burnout, and the many forms of discrimination in organizations.
Effective: Spring 2003
Prerequisite: P ADM 505 ; andH ADM 510 orP ADM 510

P ADM 514 **Public Organization and Managerial Consultation** (3) This course will review the theories, approaches, methods, and expected outcomes of organization and management consultation.
Effective: Spring 2003
Prerequisite: P ADM 500 and eitherH ADM 510 orP ADM 510

P ADM 515 (MNGMT 515) **Labor Management Relations** (3) Labor relations issues; collective bargaining agreement, negotiations, and administration; legal framework of collective bargaining; labor relations in larger social context.
Effective: Spring 2003
Prerequisite: P ADM 505

P ADM 516 **Strategic Planning** (3) A survey of strategic planning purposes, approaches and methods, and expected outcomes in small and large organizations.
Effective: Summer 1999
Prerequisite: P ADM 500

P ADM 517 **Nonprofit Organizations: History and Evolution** (3) A study of the history, development and current role of nonprofit organizations as a distinguishing feature of American society.
Effective: Spring 2003
Prerequisite: Permission of Program.

P ADM 518 **Nonprofit Organizations: Management and Leadership** (3) A study of the theoretical and practical issues involved in management and leadership of nonprofit organizations.
Effective: Spring 2003
Prerequisite: Permission of Program.

P ADM 519 **Nonprofit Organizations: Resource Development and Management** (3) Process by which nonprofit organizations assure that resources are obtained and used effectively and efficiently toward the achievement of objectives.
Effective: Summer 2003

P ADM 522 **Government Financial Management** (3) Theories and techniques of financial planning and control, with emphasis on their application in government and nonprofit agencies.
Effective: Spring 2003
Prerequisite: P ADM 502

P ADM 523 **Governmental and Nonprofit Accounting** (3) Accounting, reporting, and auditing principles and procedures for public sector agencies and nonprofit organizations.
Effective: Summer 1998
Prerequisite: P ADM 502

P ADM 524 **Administrative Law** (3) Statutory and judicial controls upon administrative discretion. Administration of rule making, rate setting, licensing, adjudication. Judicial review and citizen advocacy.
Effective: Spring 2003
Prerequisite: P ADM 500

P ADM 531 **Environmental Policy** (3) The course examines contemporary environmental and natural resources policies at every level within the United States government and at the global level.
Effective: Spring 2003

P ADM 532 **Urban Government** (3) Administrative processes and policy problems associated with managing urban communities; political, intergovernmental, fiscal, structural, and analytical concepts in urban government.
Effective: Winter 1978

P ADM 533 **Local Planning Law and Administration** (3) Structure and function of local and regional government from perspective of local planning law and its administration.
Effective: Spring 2003
Prerequisite: P ADM 500

P ADM 534 **Managing Economic Development** (3) Theoretical and operational aspects of economic development emphasizing the role of local and regional government.
Effective: Spring 2003
Prerequisite: permission of program

P ADM 535 **Policy Analysis and Planning** (3) The course will cover the theoretical issues in and basic methods of policy analysis and planning (prospective policy analysis).
Effective: Summer 2004
Prerequisite: P ADM 503

P ADM 550 **Policy and Program Evaluation** (3) The course will cover the theoretical issues in and basic methods of policy and program evaluation (retrospective policy analysis).
Effective: Spring 2005
Prerequisite: P ADM 503

P ADM 554 **Master's Project** (1-3) Student independently executes an applied professional or research project involving the analysis of a management or a public policy problem.
Effective: Winter 1981
Prerequisite: P ADM 503

P ADM 556 **State Government Administration** (3) Study of structures, systems, processes, problems, and issues affecting state government administration; case studies, field observations, and research.
Effective: Spring 2003
Prerequisite: P ADM 500

P ADM 557 **Federalism and Intergovernmental Relations** (3) Study of the impact of a federal system of government on the administration of public functions. National-state-local dimensions.
Effective: Spring 2003
Prerequisite: P ADM 500

P ADM 558 **Legislative Processes** (3) Legislatures in American government, emphasizing comparative state legislatures: constitutional patterns; organization, administration; interaction with bureaucracy, constituencies, and organized interests.
Effective: Spring 2003
Prerequisite: P ADM 500

P ADM 570 **Scope and Methods of Public Administration** (3) Examination of theoretical approaches to public administration and the role of theory in the field.
Effective: Spring 2005
Prerequisite: P ADM 500, P ADM 503, P ADM 507, P ADM 510

P ADM 571 **Seminar in Organizational Theory** (3) Selected theories of organizations and their applications to the study of public organizations.
Effective: Spring 1988
Prerequisite: P ADM 570

P ADM 572 **Research and Theory in Political Institutions** (3) Selected research paradigms and their application in the study of political institutions.
Effective: Spring 1988
Prerequisite: P ADM 570

P ADM 573 **Research and Theory in Public Policy and Governance** (3) An introduction to policy analysis, the stages of the policy process, and key theoretical issues. applications to real world problems.
Effective: Spring 2005
Prerequisite: P ADM 570 or permission of program

P ADM 574 **Research and Theory in Public Management** (3) Theoretical and empirical bases for selected functions of public managers.
Effective: Spring 1988
Prerequisite: P ADM 570

P ADM 575 **Advanced Research Design** (3) Experimental, quasi-experimental, survey, aggregate, and other research designs applied to organizational, managerial, and policy analysis research problems.
Effective: Spring 1988
Prerequisite: P ADM 570

P ADM 576 **Multivariate Statistical Methods** (3) Multivariate statistical methods, with special emphasis on their use in organizational, managerial, and policy analysis research settings.
Effective: Spring 1988
Prerequisite: P ADM 575

P ADM 577 **Design for Effective Public/Nonprofit Organizations: Seminar in Advanced Organization Theory** (3) Theories, research, and process of designing effective organizations.
Effective: Spring 2005
Prerequisite: P ADM 570 andP ADM 571 or permission of program

P ADM 578 **Topics in Policy Analysis and Governance** (3) Topics in policy analysis and governance, culminating in a substantial research paper.
Effective: Summer 2004
Prerequisite: P ADM 570 andP ADM 573

P ADM 579 **Public Leadership and Ethics** (3) Examination of theory and research in leadership and public ethics, and their application to the field of Public Management.
Effective: Summer 2004
Prerequisite: P ADM 570 andP ADM 574 or permission of program

P ADM 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

P ADM 591 **Readings in Public Administration** (3) Directed readings in selected areas of public administration.
Effective: Spring 1999
Prerequisite: P ADM 570 and permission of program

P ADM 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1996

P ADM 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1995

P ADM 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

P ADM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

P ADM 597A **Performance Management and Analysius** (3) This course will address basic issues, concepts and practices

in the measurement and analysis of performance in the public sector.
Effective: Summer 2010 Ending: Summer 2010

P ADM 600 **Thesis Research** (1-15) No description.
Effective: Spring 1990

P ADM 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 2000

P ADM 801 (HLS 801) **Homeland Security Administration: Policies and Programs** (3) Foundation for understanding homeland security history, the development of homeland security policies and organizations, and current management approaches.
Effective: Summer 2010

P ADM 802 **Multifaceted Approaches to Homeland Security** (3) Examination of the roles of the public and private sectors and the military in preparing, mitigating, and responding to disasters.
Effective: Fall 2008
Prerequisite: P ADM 401

P ADM 803 **Strategic Planning and Organizational Imperatives in Homeland Defense and Security** (3) The Homeland Security framework depends on strategic planning and organization. This course examines the key issues associated with these.
Effective: Fall 2008
Prerequisite: P ADM 401

P ADM 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2007

P ADM 897B **Security and Intelligence Communities** (3) Introduction to national and homeland security and intelligence communities. Examines structure of these communities and career opportunities.
Effective: Summer 2010 Ending: Summer 2010

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Public Hlth Prepared (PHP)

PHP 410 (HLS 410) **Public Health Preparedness for Disaster and Terrorist Emergencies I** (3) Analyzes the history of terrorism and explores the preparation and response to specific terrorist threats, natural disasters, and conventional catastrophes.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: Undergraduate StudentsBIOL 011 andBIOL 012 orCHEM 110 andCHEM 111 orMICRB 106 andMICRB 107 ; Graduate Students - Enrollment in the MHS program the Post- Baccalaureate Credit Certificate in Homeland Security or permission from the instructor.

PHP 510 (HLS 510) **Public Health Preparedness for Disaster and Terrorist Emergencies II** (3) A public health perspective on the preparation necessary to develop a coordinated response to a disaster or terrorist emergency.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: permission of the instructor

PHP 527 (HLS 527) **Public Health Evaluation of Disasters and Bioterrorism** (3) Introduces students to the design of exposure assessment and health effect studies applicable to disasters and terrorism.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: HLS 510 or permission of the instructor

PHP 527 (HLS 527) **Public Health Evaluation of Disasters and Bioterrorism** (3) Introduces students to the design of exposure assessment and health effect studies applicable to disasters and terrorism.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: HLS 510 or permission of the instructor

PHP 530 (HLS 530) **Critical Infrastructure Protection of Health Care Delivery Systems** (3) Investigates the impact that terrorist incidents may have on healthcare facilities or their ability to deliver healthcare services.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: HLS 510 permission of the instructor

PHP 530 (HLS 530) **Critical Infrastructure Protection of Health Care Delivery Systems** (3) Investigates the impact that terrorist incidents may have on healthcare facilities or their ability to deliver healthcare services.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: HLS 510 permission of the instructor

PHP 553 (CAS 553, HLS 553) **Disaster Communication** (3) This seminar provides students with a comprehensive understanding of the multifaceted nature of disaster communication across phases of a disaster.
Effective: Fall 2010 Future: Fall 2010

PHP 558 (PSY 558, HLS 558) **Disaster Psychology** (3) Explores psychological impact of disasters and terrorist attacks on victims, families, rescuers, and society and methods of reducing negative effects.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: HLS 510 or permission of the instructor

PHP 594 (HLS 594) **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: Completion of at least 15 credits in the program includingHLS 510 andHLS 527 or permission of the instructor

PHP 594 (HLS 594) **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: Completion of at least 15 credits in the program includingHLS 510 andHLS 527 or permission of the instructor

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Public Policy (PUBPL)

PUBPL 415 (CRIMJ 415) **Drug Control Policy in Comparative Perspective** (3) Examines the history of drug control policy in the United States; comparisons and contrasts with other countries' experiences.
Effective: Summer 2004
Prerequisite: CRIMJ 200 orPL SC 001 orPL SC 014 orSOC 001

PUBPL 419 **Western Constitutional Traditions** (3) This course reviews the major political, economic and social movements that shaped the development of the US Constitution.
Effective: Spring 2005
Prerequisite: HIST 001, HIST 002, I HUM 311, I HUM 312, PL SC 001, PUBPL 420 orPUBPL 421

PUBPL 480 **Seminar in Urban Policy** (3) Work in this course will focus upon governmental institutions and public policy problems in metropolitan areas.
Effective: Fall 1998
Prerequisite: seventh-semester standing

PUBPL 481 **Seminar in Environmental Policy** (3) Fundamentals of evolution; impacts on natural resources; interaction of environmental issues, current decision-making process policy, enforcement mechanisms; future actions.
Effective: Fall 1983
Prerequisite: seventh-semester standing

PUBPL 482 **Seminar in Health Policy** (3) Introduction to policy analysis of issues of current interest and importance to public administrators in the health industry.
Effective: Fall 1983
Prerequisite: seventh-semester standing

PUBPL 483 **Seminar in National Security Policy** (3) Course will examine the inter-relationship of foreign, military and economic policy.
Effective: Fall 1983
Prerequisite: seventh-semester standing

PUBPL 484 **Seminar in Transportation Policy** (3) Transportation policy; a consideration of its formulation and application in the Federal system.
Effective: Fall 1983
Prerequisite: seventh-semester standing

PUBPL 485 **Seminar in Welfare Policy** (3) Course examines the origins, development, and impact of welfare programs.
Effective: Fall 1998
Prerequisite: seventh-semester standing

PUBPL 490 **Seminar in Public Policy** (3) A survey of the major policy issues, actors and institutions involved in the policy-making system of contemporary society. (May be repeated for credit.)
Effective: Fall 1983
Prerequisite: seventh-semester standing

PUBPL 495 **Internship** (3-12) Experience in a public service agency related to knowledge gained through academic course work, reading, and discussion.
Effective: Fall 1983
Prerequisite: seventh-semester standing

PUBPL 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Fall 1983

PUBPL 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010

PUBPL 497A (PL SC 497I) **Public Affairs Capstone Course** (3) This course examines how to objectively examine contentious public policy controversies by relying on essential principles of scientific research.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Quality Control (Q C)

Q C 450 **Quality Control and Quality Improvement** (3) Review of quality control and improvement methods including SPC applications, acceptance sampling, regression analysis, and design of experiments.
Effective: Spring 2007
Prerequisite: MATH 141 orMATH 210

Q C 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

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Quality and Manufacturing Management (QMM)

QMM 491 **Introduction to Business Concepts for Manufacturing** (3) Introduction to business, topics in marketing, accounting, and finance for nonbusiness students in manufacturing management.
Effective: Fall 2001
Prerequisite: students taking this course CAN NOT be a Business major and must be in their senior year

QMM 492 **Introduction to Engineering Design Principles** (3) Engineering principles including different engineering fields, graphics, design, solid modeling and failure analysis.
Effective: Fall 2001
Prerequisite: students taking this course CAN NOT be an Engineering major and must be in their senior year

QMM 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2008

QMM 552 **Applied Statistical Process Control and Experimental Design** (3) Concepts and techniques of statistical process control and the design of experiments.
Effective: Fall 2008
Prerequisite: QMM 851

QMM 561 **Manufacturing Systems Planning and Control I** (3) Systems, components and configurations, flow of material and information in a manufacturing system.
Effective: Spring 1996
Prerequisite: admission to the QMM program

QMM 562 **Manufacturing Systems Planning and Control II** (3) Flow of material and information in a manufacturing system; emphasis on systems integration.
Effective: Spring 1996
Prerequisite: QMM 561

QMM 581 **Manufacturing Processes of Materials** (3) Characteristics of materials with respect to their properties and associated choices of processing to create a range of products.
Effective: Spring 1996
Prerequisite: admission to the QMM program

QMM 582 **Manufacturing and Supply Chain Strategy** (3) Strategic decision context of manufacturing and its supply chains with linkage to corporate and business strategy.
Effective: Fall 2001
Prerequisite: enrollment in the QMM program

QMM 593 **Field Experience in Manufacturing** (1-2) Experiential learning through the firsthand study of manufacturing plants and by interacting with manufacturing leaders.
Effective: Spring 2001
Prerequisite: admission to the Quality and Manufacturing Management (QMM) Program

QMM 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1997

QMM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1997

QMM 851 **Quality Management** (3) Concepts of design, assessment, and improvement of quality systems; customer needs analysis, identification of opportunities for application of measurement techniques.
Effective: Fall 2008
Prerequisite: admission to the QMM program

QMM 871 **Design Practice for Manufacturing I** (3) Contemporary concepts in design and design practice with emphasis on engineering, business, and human strategic issues.
Effective: Fall 2008
Prerequisite: or concurrent:QMM 491 orQMM 492

QMM 872 **Design Practice for Manufacturing II** (3) Contemporary concepts in design and design practice with emphasis on logistics, risk, design and manufacturing readiness, and production.
Effective: Spring 2009
Prerequisite: QMM 871

QMM 891 **Communication and Leadership Skills for Manufacturing Managers** (1-3) Applied principles of managerial, visual, and written communication that support the needs of manufacturing leaders.
Effective: Fall 2008
Prerequisite: admission to the QMM Program

QMM 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2007

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Quantification (QUANT)

No courses for department code **QUANT** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Radiological Sciences (RADSC)

No courses for department code **RADSC** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Real Estate (R EST)

R EST 409 (FIN 409) **Real Estate Finance and Investment** (3) The sources and uses of credit; instruments and methods of financing; the theory and practice of real estate investment analysis.
Effective: Spring 2004
Prerequisite: B A 301

R EST 420 **Analysis of Real Estate Markets** (3) Historical performance, land use issues, market valuation, real estate development, public policy issues.
Effective: Summer 2005
Prerequisite: R EST 301 orR EST 460 orR EST 470

R EST 424 (B LAW 424) **Real Estate Law** (3) Analysis of contemporary law applicable to various types of ownership interests and rights, methods of transferring ownership, and use of real property.
Effective: Spring 2005
Prerequisite: B LAW 346

R EST 425 (B LAW 425) **Environmental Law, Property, and Commerce** (3) Examines the impacts of major federal environmental laws on business relations and property interests.
Effective: Summer 1995
Prerequisite: B A 243, B LAW 243 orE R M 151

R EST 440 **Advanced Techniques in Real Estate Analysis** (3) Theories and methods of modern financial analysis including specialized computer applications, valuation of mortgage securities, portfolio applications, and option pricing.
Effective: Spring 2004
Prerequisite: B A 301

R EST 450 **Urban Property Rights and Land Use Issues** (3) International perspectives on real estate as property, evaluation of land use regulations, and differences in real estate markets across countries.
Effective: Spring 2005 Ending: Fall 2010
Prerequisite: B A 301

R EST 450 **Urban Property Rights and Land Use Issues** (3) International perspectives on real estate as property, evaluation of land use regulations, and differences in real estate markets across countries.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: B A 301 orFIN 301

R EST 460 (FIN 460) **Real Estate Financial Analysis** (3) Debt and equity financing capital structure, "creative financing," risk analysis, corporate asset management.
Effective: Summer 2005
Prerequisite: FIN 305W

R EST 470 (FIN 470) **Real Estate and Capital Markets** (3) Analysis of publicly-traded real estate of both the equity, (REITs) and debt (MBSs) sides. The course also provides international perspectives.
Effective: Summer 2005
Prerequisite: FIN 305W

R EST 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2003

R EST 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

R EST 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

R EST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

R EST 497A **Real Estate Case Competitions** (2) This course provides skills and expertise in analyzing actual real estate cases in preparation for national case competitions.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

R EST 497A **Real Estate Case Competitions** (2) This course provides skills and expertise in analyzing actual real estate cases in preparation for national case competitions.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

R EST 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

R EST 510 **Real Estate Financial Analysis** (3) Real estate finance and investment analysis. Topics include housing; demand and supply of credit, and real estate investment strategies.
Effective: Fall 1983

R EST 515 (I B 515) **Property Rights in a Global Economy** (2) Analysis of economic, financial, legal, and political factors affecting international real estate decision making.
Effective: Spring 2009

R EST 525 **Environmental Law** (3) Analysis of legal, economic, and social factors affecting the environmental quality of real property and its associated rights.
Effective: Spring 1998

R EST 540 **Real Estate Financial Analysis II** (3) Theories and methods of advanced real estate financial analysis.
Effective: Summer 1995

R EST 560 **Real Estate Financial Analysis** (2) This course provides a modern framework for the valuation and analysis of real property using both theoretical and empirical approaches.
Effective: Summer 2002
Prerequisite: B A 531

R EST 570 **Institutional Real Estate Investment** (2) A survey of the latest developments of real estate as an institutional investment.
Effective: Summer 2002
Prerequisite: B A 531

R EST 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall ouside the scope of formal courses.
Effective: Spring 1987

R EST 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

R EST 597B **Real Estate Research** (3) This will be an advanced course in Real Estate for Ph D students.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

R EST 599 (IL) **Foreign Study--Real Estate** (1-12) Full-time graduate-level foreign study at an overseas institution with whom linkages have been established.
Effective: Summer 2005
Prerequisite: acceptance in establsihed exchange program

R EST 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

R EST 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 2005

R EST 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) No description.
Effective: Summer 1985

R EST 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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Recreation, Park and Tourism Management (RPTM)

RPTM 410 **Marketing of Recreation Services** (3) Theoretical/practical application of marketing/advertising strategies in the development/delivery of recreation services.
Effective: Spring 2005
Prerequisite: fifth-semester standing or above

RPTM 415 **Commercial Recreation Management** (3) Planning, developing, and managing profit-oriented recreation opportunities.
Effective: Spring 2005
Prerequisite: RPTM 210 andRPTM 410

RPTM 420 **Outdoor Recreation Behavior** (3) Overview of participation patterns in outdoor recreatino activities; factors affecting outdoor recreation participation; identification of implications for planning and management.
Effective: Spring 2005
Prerequisite: RPTM 120

RPTM 425 **Principles of Interpretive Materials** (3) Principles, practices, application of non-personal interpretive activities common to natural/cultural history, including exhibits, audio-visual and illustrative materials.
Effective: Spring 2005
Prerequisite: RPTM 325

RPTM 430 (AEE 430) **Environmental Education Methods and Materials** (3) Methods and materials for developing, implementing, and evaluating environmental education programs within formal and non-formal educational settings.
Effective: Spring 2005
Prerequisite: AEE 100 orRPTM 325

RPTM 433W **Program Evaluation and Research in Recreation Services** (3) Systematic, structured problem-solving process for decision making in recreation and parks. Research techniques/evaluation procedures; quantitative, qualitative methodologies; deductive, inductive reasoning.
Effective: Spring 2005
Prerequisite: RPTM 356 3 credits in statistics

RPTM 434 **Recreational Facility Development** (3) Park planning as a role of recreation professionals, emphasizing physical support provisions and elimination of architectural barriers.
Effective: Spring 2005
Prerequisite: RPTM 320

RPTM 435 **Recreation Facilities Planning and Management** (3) Planning and management of selected facilities with empahsis upon maintenance, activity, and support provisions.
Effective: Spring 2005
Prerequisite: fifth-semester standing or above

RPTM 440 **Adventure-based Programming and Administration** (3) Utilization of wilderness/backcountry environments and participant challenge; history, models, theories; survey of organizations; program design, administration; and issues.
Effective: Spring 2005
Prerequisite: or concurrent:RPTM 330 orRPTM 356

RPTM 460 **Political and Legal Aspects of Recreation Services** (3) Role of local, state, federal government in provision of recreation services. Legislative and judicial systems.
Effective: Spring 2005
Prerequisite: RPTM 101

RPTM 470 **Recreation and Park Management** (3 Management of recreation and park services in public/non-profit settings; planning, budgeting fiscal development, resources allocation, decision- , making, computer applications.
Effective: Spring 2005
Prerequisite: RPTM 320

RPTM 476 **Leisure Education in Therapeutic Recreation** (3) Theoretical and practical application of leisure education in the therapeutic recreation process.
Effective: Spring 2005
Prerequisite: RPTM 277 andRPTM 386

RPTM 480 **Senior Management Seminar** (1) Current management issues will be examined relative to professional management strategies, ethics, and leadership in leisure services.
Effective: Spring 2005
Prerequisite: sixth-semester standing in RPTM

RPTM 486 **Facilitation Techniques in Therapeutic Recreation** (3) Intervention strategies, therapeutic approaches, and group facilitation techniques in therapeutic recreation.
Effective: Spring 2005
Prerequisite: RPTM 376 andRPTM 386

RPTM 490 **Management and Issues in Therapeutic Recreation Services** (3) Topics related to management and professional issues in therapeutic recreation services in both clinical and community settings.
Effective: Summer 2004
Prerequisite: RPTM 376 andRPTM 386

RPTM 495A **Internship in Recreation Services** (12) Meet educational objectives through participation in organized practical experience; direct observation and professional supervision in full-time work experience.
Effective: Spring 2005
Prerequisite: RPTM 394 ; seventh-semester standing; 300 hours practical experience; and a 2.0 grade-point average; current and valid certification in advanced first aid and cardiopulmonary resuscitation

RPTM 495B **Internship in Golf Management** (1-4) Observation and participation under supervision in golf operations in public, private, municipal, or military settings.
Effective: Spring 2005
Prerequisite: RPTM 395B ; 2.00 cumulative grade point average; current and valid certification in advanced first aid and cardiopulmonary resuscitation

RPTM 495C **Internship in Golf Management** (1-4) Observation and participation under supervision in golf operations in public, private, municipal, or military settings.
Effective: Spring 2005
Prerequisite: RPTM 495B ; 2.00 cumulative grade point average

RPTM 495D **Internship in Golf Management** (1-4) Observation and participation under supervision in golf operations in public, private, municipal, or military settings.
Effective: Spring 2005
Prerequisite: RPTM 495C ; 2.00 cumulative grade point average

RPTM 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2005

RPTM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2005

RPTM 497A **International Tourism Field Study - Australia** (4) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 497B **Introduction to Arena Management** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

RPTM 497B **Introduction to Arena Management** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 497B **Introduction to Arena Management** (4) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 497C **Outdoor Consortium** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 497D **Ecological Investigations** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 497D **Peer Mentoring** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 497E **Outdoor & Experiential Education** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 497E **Outdoor and Experiential Education** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 497F **National Curricular Workshop** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 497F **National Curricula** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 497G **Golf Operations** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 497I **Canoeing Leadership** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 497I **Canoe Leadership** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 497J **Peer Mentoring** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 497K **Administrative Golf Operation III** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 497K **Discovery Trip** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2006

RPTM 498B **Wilderness First Responder Certification** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 498C **National Association of Interpretation Certification Class** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 498D **Backpacking Leadership** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 498D **Backpacking Leadership** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 498F **Rock Climbing Leadership** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 498F **Rock Climbing Leadership** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 498G **Player Development/Tournament Golf** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 498G **Player Development/Tournament Golf** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 498K **Administration of Golf Operations IV** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 501 **Leisure Studies Foundations** (3) This course provides general background knowledge about the literature and research methods central to the field of leisure studies.
Effective: Spring 2008

RPTM 510 **Tourism Behavior: An interdisciplinary Approach** (3) An exploration of the various approaches that have been taken in the social sciences to understand tourism behavior.
Effective: Spring 2008
Prerequisite: 3 credits in statistics; 3 credits in behavioral science

RPTM 515 **Program Development and Evaluation** (3) Critical analysis of political and social determinants of recreation program development; research and evaluation procedures.
Effective: Spring 2008

RPTM 525 **Behavioral Patterns of the Outdoor Recreationist** (3) Patterns of time and space use; user characteristics; meaning of participation; facilitation of environment-use enhancement.
Effective: Spring 2008

RPTM 527 **Social Psychology of Leisure** (3) Application of the methods, constructs, and theory of social psychology to the study of leisure, outdoor recreation, and therapeutic recreation.
Effective: Spring 2008
Prerequisite: PSYCH 420, SOC 403

RPTM 530 **Research Methods in Leisure Studies** (3) Research techniques, including methods, research design, techniques for data collection, as applied to relevant problems in the leisure studies field.
Effective: Spring 2008

RPTM 533 **Leisure Studies, Surveys, and Appraisals** (3) Advanced procedures related to leisure, recreation, and park research.
Effective: Spring 2008
Prerequisite: RPTM 530 ; 3 credits in statistics

RPTM 540 **Public and Private Recreation Lands and Waters** (3) Public and private roles and interactions, allocation of resources, use policies, open space concepts, private enterprise developments, legal controls.
Effective: Spring 2008

RPTM 545 **Philosophical and Social Bases of Leisure** (3) Philosophical and social bases of leisure; analysis of critical issues of leisure for philosophical and social implications.
Effective: Spring 2008

RPTM 550 **Seminar in Leisure Studies** (1-6) No description.
Effective: Spring 2008

RPTM 560 **Administrative Problems of Leisure Service Organizations** (3) Special problems of recreation and park departments; legal powers and liability; departmental organization, financing, personnel policies, and staff development.
Effective: Spring 2008

RPTM 570 **Conceptual Bases for Therapeutic Recreation** (3) Issues in the application of concepts in therapeutic recreation from a multidisciplinary perspective; evaluation and research.
Effective: Spring 2008
Prerequisite: R P M 477

RPTM 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 2008

RPTM 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2008

RPTM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2008

RPTM 597A **Foundations of Tourism** (3) Formal courses given on a topical or special interest subject which may be

offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RPTM 597A **Leisure, Health and Wellness** (3) Addresses the role of leisure on physical, cognitive, mental, social, and spiritual health.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 597B **Scholarly Writing in RPTM** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 597D **World Views, Sustainability and Environmental Education** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

RPTM 600 **Thesis Research** (1-15) No description.
Effective: Spring 2008

RPTM 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Spring 2008

RPTM 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Spring 2010

RPTM 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 2008

RPTM 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 2008

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Rehab & Human Servic (RHS)

RHS 400W **Case Management and Communication Skills** (3) Principles and practices of obtaining, recording, evaluating, and utilizing case data in rehabilitation planning; implementation of rehabilitation plans.
Effective: Spring 2009
Prerequisite: RHS 300

RHS 401 **Community Mental Health Practice and Services** (3) Community mental health roles, historical points, current trends, and ethical standards; funding and impact on service provision.
Effective: Spring 2009
Prerequisite: 6 credits in psychology and/or sociology

RHS 402 **Children and Families in Rehabilitation Settings and Human Services** (3) Contemporary family issues, child development, legal considerations, cultural and familial factors within rehabilitation and human services practice will be addressed.
Effective: Summer 2008
Prerequisite: RHS 301

RHS 403 **Medical Aspects of Disability** (3) Common disabling illnesses, injuries, and congenital defects; their symptomatology, prognosis, and treatment; implications for personal, social, and vocational adjustment.
Effective: Spring 2009
Prerequisite: 6 credits in psychology and/or sociology

RHS 495A **Rehabilitation and Human Services Internship** (15) Full-time practicum in rehabilitation and related human services agencies and institutions providing psychosocial, vocational, educational, and/or residential services to people with disabilities.
Effective: Spring 2009
Prerequisite: students must have successfully completed all other required coursework for the major (grade of "C" or higher) as well as fulfilled general education requirements.

RHS 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2008

RHS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical of of special interest.
Effective: Summer 2008

RHS 497A **Foundations of Addictions Counseling** (3) Study of the fundamental principles of counseling individuals with a wide variety of addictions.
Effective: Summer 2010 Ending: Summer 2010

RHS 497A **Rehabilitation in Corrections** (3) An overview of rehabilitation in different correctional settings focusing on the history, classification, risk assessment, intervention strategies and community reentry.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Rehabilitation (REHAB)

REHAB 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2003

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Religious Studies (RL ST)

RL ST 400 **Theories of Religion** (3) Comparative and interdisciplinary study of two or more systematic theories of religion: anthropological, psychological, sociological, philosophical/theological.
Effective: Fall 1983
Prerequisite: 6 credits in religious studies or seventh-semester standing

RL ST 401 (IL) **Studies in Comparative Religion** (3) An intensive study of comparable phenomena from two or more religious traditions.
Effective: Spring 2006
Prerequisite: 6 credits in religious studies

RL ST 402 **Contemporary Religious Thought** (3) Writings of outstanding contemporary religious thinkers in the Jewish, Protestant, and Roman Catholic traditions and their impact on our culture.
Effective: Fall 1983
Prerequisite: 6 credits in humanities

RL ST 407Y (IL) (HIST 409Y, J ST 409Y) **European Anti-Semitism from Antiquity to the Present** (3) Surveys the history of anti-Semitism in Europe from antiquity through the Middle Ages to the present.
Effective: Summer 2005

RL ST 408 (US;IL) **Hindu Studies** (3) Special topics in Hindu studies.
Effective: Summer 2005
Prerequisite: 3 credits in religious studies

RL ST 409 (US;IL) **Buddhist Studies** (3) Special topics in Buddhist studies.
Effective: Spring 2006
Prerequisite: 3 credits in religious studies

RL ST 410 (US;IL) (HIST 410, J ST 410) **Jews in the Medieval World** (3) Trends in medieval Jewish society under Islam and Western Christendom.
Effective: Spring 2006

RL ST 411 (US;IL) (J ST 411) **Jewish Studies** (3) Study of the life and thought of a particular period or movement in the history of Judaism.
Effective: Spring 2006
Prerequisite: 3 credits in religious studies

RL ST 412 (J ST 412) **American Judaism** (3) The development of Jewish religion and culture in America from the colonial era to the present.
Effective: Summer 1999
Prerequisite: HEBR 010 orJ ST 010

RL ST 414 (PSYCH 436) **Humanistic, Existential, and Religious Approaches to Psychology** (3) Existential, humanistic, and religious approaches to the psychology of experience, consciousness, and will.
Effective: Spring 2007
Prerequisite: PSYCH 100 orRL ST 001

RL ST 420 **Major Christian Thinkers** (3) Systematic inquiry into the religious thought of one or more Christian thinkers, such as Paul, Augustine, Luther, Calvin, Kierkegaard, or Tillich.
Effective: Fall 1983
Prerequisite: 3 credits in religious studies

RL ST 422 (AM ST 422) **Religion and American Culture** (3 per semester/maximum of 6) Selected topics, problems, or historical movements in American religion. Relation between religion and American culture.
Effective: Summer 1996

RL ST 424H (HIST 424H, J ST 424H, PHIL 434H) **Monotheism and the Birth of the West** (3) The birth of monotheism and its relation to social organization, the idea of individuality, and science.
Effective: Spring 2002
Prerequisite: RL ST 004, RL ST 102, RL ST 110 orRL ST 120

RL ST 440Y (US;IL) (RUS 440Y) **The Orthodox Christian Tradition** (3) History, culture, and beliefs of the Eastern Orthodox religious tradition with special reference to Russia.
Effective: Spring 2006
Prerequisite: RL ST 004, RL ST 124, RL ST 125, RUS 100 orRUS 110

RL ST 461 (US;IL) (SOC 461) **Sociology of Religion** (3) Contemporary religion in the United States: beliefs, structure, and function of major denominations and religious cults.
Effective: Spring 2006
Prerequisite: 3 credits of sociology or religious studies

RL ST 471Y (IL) (HIST 471Y) **Classical Islamic Civilization, 600-1258** (3) Pre-Islamic Arabia; Muhammad; Arab conquest; Islamic beliefs and institutions; literary, artistic, and scientific achievements; relations with Europe; breakdown of unity.

Effective: Spring 2006

RL ST 478 (J ST 478, PHIL 478) **Ethics After the Holocaust** (3) Explores the philosophical effects of the Holocaust for thinking about the primary question: Is ethics possible?
Effective: Spring 2005
Prerequisite: one course in Jewish Studies or Philosophy

RL ST 479 **Religion and Culture in Freudian Thought** (3) Readings, lectures, and discussion on major psychoanalytic claims about individual and cultural mental life, focusing on the theory of religion.
Effective: Spring 2007
Prerequisite: PSYCH 100

RL ST 481 (IL) **Religion and Japanese Culture** (3) A study of the impact of the traditional religions, Shinto and Buddhism, on the intellectual and cultural history of Japan.
Effective: Spring 2006
Prerequisite: 3 credits fromHIST 172, HIST 173, HIST 174, HIST 175, PHIL 111, RL ST 003, RL ST 104 orRL ST 181

RL ST 483 (IL) **Zen Buddhism** (3) The development and current state of Zen Buddhist thought and practice.
Effective: Spring 2006
Prerequisite: HIST 172, HIST 173, HIST 174, HIST 175, PHIL 111, RL ST 003, RL ST 104 orRL ST 181

RL ST 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

RL ST 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

RL ST 495 **Internship** (1-18) Supervised off-campus, non-group instruction, including field experience, practica, or internships.
Effective: Summer 2004
Prerequisite: prior approval of proposed assignment by instructor

RL ST 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

RL ST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

RL ST 497B (J ST 497B) **Cultural History of Food From Biblical Times to the Modern Era** (3) Historical exploration of the Jewish food traditions in the Bible as they now find expression in modern "food movements."
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RL ST 499 (IL) **Foreign Study--Religious Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

RL ST 499E (IL) (HIST 499E, CAMS 499E) **Petra, the Spice Route, and the Decapolis Cities in Roman Palestine** (3) Study tour of Roman Palestine and the Nabateans in Jordan and Israel.
Effective: Summer 2010 Ending: Summer 2010

RL ST 510 (HIST 510) **Topics in Medieval Church History** (3 per semester, maximum of 6) Institutional and doctrinal development of the Christian Church in medieval Europe.
Effective: Spring 1995

RL ST 560 (HIST 560) **Topics in American Religion** (3 per semester, maximum of 6) The social, political, and intellectual contexts of American religious thought.
Effective: Spring 1995

RL ST 561 (HIST 561) **Topics in Western Religion** (3 per semester, maximum of 6) Major issues and themes in the historical development of Christianity and Judaism.
Effective: Spring 1995

RL ST 562 (HIST 562) **Topics in Comparative Religions** (3 per semester, maximum of 6) Comparative studies of world religions.
Effective: Spring 1995

RL ST 563 (HIST 563) **Religion and Society** (3 per semester, maximum of 6) Social and political implications of religious belief and practice.
Effective: Summer 1994

RL ST 564 (HIST 564) **Topics in Asian Religions** (3 per semester, maximum of 6) Topics in Asian religions.
Effective: Spring 1995

RL ST 565 (HIST 565) **Research in Religious Studies** (3) Approaches and methodologies in the critical study of religion.
Effective: Summer 1995

RL ST 566 (HIST 566) **Islamic Studies** (3) Studies in Islamic history, historiography, theology, law, and religious life.
Effective: Spring 1997

RL ST 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

RL ST 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

RL ST 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

RL ST 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2002

RL ST 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Romanian (ROM)

No courses for department code **ROM** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Rural Sociology (R SOC)

R SOC 402 **Consumer Behavior and Agricultural Business** (3) The principles of consumer behavior applied to the marketing of agricultural products and farm supplies.
Effective: Winter 1980
Prerequisite: 3 credits in agricultural economics or economics and 3 credits in rural sociology sociology or psychology

R SOC 417 (CED 417) **Power, Conflict, and Community Decision Making** (3) Impact of institutions on human interdependence and behavior, the structure of power, and community decision making and public policy.
Effective: Spring 2010
Prerequisite: R SOC 011 orSOC 001

R SOC 420 (US;IL) (CED 420, WMNST 420) **Women in Developing Countries** (3) Analysis of women's work, experiences, and development policies and practices in Africa, Asia, and Latin America.
Effective: Fall 2009

R SOC 422 (US) **Family in Rural Society** (3) The relationship between the family and rural society, including critical review of theories, research and problems, issues, and trends.
Effective: Spring 2006
Prerequisite: 6 credits in the social sciences

R SOC 425 **Poverty Analysis: People and Programs** (3) Social and economic situations contributing to deprivation in rural society; intervention programs and policy development.
Effective: Winter 1978
Prerequisite: 6 credits in sociology economics or related areas

R SOC 444 **Social Change in Rural America** (3) Analysis of causes of social change and its consequences for individuals, families, and organizations in rural communities.
Effective: Fall 1984
Prerequisite: R SOC 011 or 3 credits in related social science

R SOC 452 (CEDEV 452) **Rural Organization** (3) Social organization and change in rural communities; use of sociological principles in analysis of rural problems and rural development.
Effective: Fall 2000
Prerequisite: 6 credits in rural sociology sociology or psychology

R SOC 470 (CEDEV 470) **Comparative Community Development** (3) Crosscultural community development projects and the problems encountered in each of the different cultural contexts.
Effective: Spring 2001 Ending: Summer 2010
Prerequisite: 6 credits in social or behavioral science

R SOC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

R SOC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

R SOC 499 (IL) **Foreign Study--Rural Sociology** (1-12) Study in selected countries of rural social institutions and current rural sociological problems.
Effective: Summer 2005

R SOC 501 **Development of Rural Sociology** (3) Historical development with emphasis on American rural sociology. Odd years.
Effective: Fall 1985

R SOC 502 **Use of Theory in Rural Sociology** (3) Examine and evaluate metasociology of alternative theoretical systems applicable to rural society, with emphasis on American society.
Effective: Fall 1983
Prerequisite: 24 credits in sociology including 6 in rural sociology and 3 in sociological theory

R SOC 505 (CEDEV 505, AEE 505) **Leadership Development** (3) Exploration, understanding, and application of leadership roles, strategies, and principles in group and community settings.
Effective: Spring 2010

R SOC 508 **Sociology of Agriculture** (3) Sociological analysis of changes in the organization of agriculture and food systems in the United States and developing countries.
Effective: Summer 1992

R SOC 515 (AEE 515) **Engagement Through Outreach Scholarship in Higher Education** (3) To develop an understanding of outreach scholarship as a nonformal educational system and its relationship to relevant social systems.
Effective: Summer 2002
Prerequisite: 9 credits in education communication and/or social sciences

R SOC 516 (CEDEV 516) **Change in Rural Society** (3) Social change in rural society, emphasizing prediction and control of the change process. Even years.
Effective: Fall 2000

R SOC 517 (CEDEV 517) **International Rural Social Change** (3) Implications of planned change for international rural societies, considering basic structural constraints, known institutional linkages, and potential synergetic consequences.
Effective: Fall 2000

R SOC 520 (SOC 520) **Applied Sociological and Policy Research** (3) A survey of the conceptual and methodological issues in applied sociology and policy research conducted by sociologists.
Effective: Fall 2001
Prerequisite: SOC 573

R SOC 522 **Data Analysis in Rural Sociology** (1) Analysis of research data in rural sociology using computer library programs.
Effective: Fall 1987
Prerequisite: or concurrent:AG 400

R SOC 525 **Fertility, Population Change, and Development** (3) Fertility and population growth in less-developed countries; theories of fertility change, agricultural development, and population policies.
Effective: Summer 1987
Prerequisite: SOC 423 or prior work in population

R SOC 530 **Sociology and Demography of Poverty in the United States** (3) An in-depth treatment of sociological and demographic dimensions of poverty in rural and urban areas of the United States.
Effective: Spring 1998

R SOC 552 **Theoretical Frameworks for Rural Community Research** (3) Application of community theories to the study of communities in rural areas.
Effective: Summer 2000
Prerequisite: R SOC 452

R SOC 555 (S T S 555) **Human Dimensions of Natural Resources** (3) Identification of the interrelationships and influence of human behavior and natural resources.
Effective: Spring 1999

R SOC 573 **Methods of Survey Data Analysis** (3) Use of multivariate procedures in the analysis of survey data in the rural social sciences.
Effective: Spring 1988
Prerequisite: AG 400

R SOC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

R SOC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

R SOC 597A **Data Analysis** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

R SOC 597A **Issues in Data Analysis** (1-3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

R SOC 597C **Qualitative Methods** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

R SOC 597E **Contemporary Social Theory** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

R SOC 600 **Thesis Research** (1-15) No description.

Effective: Fall 1983

R SOC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

R SOC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Provides advanced standing graduate students from a research oriented curriculum the opportunity to receive experience/supervision in resident instruction in higher education.
Effective: Fall 1983

R SOC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

R SOC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

1 Students may take only one course for General Education credit from R SOC 011 GS or SOC 001 GS.

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Russian (RUS)

RUS 400 (IL) **Senior Seminar in Russian Culture** (3) Senior seminar devoted to topics in Russian culture; conducted in Russian.
Effective: Spring 2006
Prerequisite: RUS 204, RUS 214, RUS 304

RUS 412 (IL) **Russian Translation** (3 per semester/maximum of 6) Translation from Russian into English of complex texts from the humanities, social sciences, and technical fields.
Effective: Spring 2006
Prerequisite: 9 credits of Russian at the 200 level or higher

RUS 426 (IL) **Dostoevsky** (3) Study of representative works by Dostoevsky in the original Russian.
Effective: Spring 2006
Prerequisite: 9 credits of Russian at the 200 level or higher

RUS 427 (IL) **Tolstoy** (3) Study of representative works by Tolstoy in the original Russian.
Effective: Spring 2006
Prerequisite: 9 credits of Russian at the 200 level or higher

RUS 430 **Methods and Materials for Teaching Russian** (3) Research, analysis, and demonstration of pedagogical problems in the teaching of Russian.
Effective: Fall 1987
Prerequisite: LING 100, 9 credits of Russian at the 200 level or higher

RUS 440Y (US;IL) (RL ST 440Y) **The Orthodox Christian Tradition** (3) History, culture, and beliefs of the Eastern Orthodox religious tradition with special reference to Russia.
Effective: Spring 2006
Prerequisite: RL ST 004, RL ST 124, RL ST 125, RUS 100 orRUS 110

RUS 450 (IL) **History of the Russian Language** (3) Relationship of Russian to other Indo-European languages and changes within Russian from the time of the earliest records to the present.
Effective: Spring 2006
Prerequisite: 9 credits of Russian at the 200 level or higher

RUS 460 (IL) **Linguistic Analysis of Contemporary Russian** (3) Detailed study of the phonology, morphology, and syntax of Modern Standard Russian and the major dialects.
Effective: Spring 2006
Prerequisite: 9 credits of Russian at the 200 level or higher

RUS 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

RUS 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

RUS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

RUS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

RUS 497A (IL) **Great Works of Short Russian Fiction** (3) A survey of great short works of Russian fiction from the 18th century to the present day, read in Russian.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

RUS 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

RUS 501 **Readings in Russian Literature** (3-6) No description.
Effective: Spring 1987
Prerequisite: RUS 204

RUS 525 **Pushkin** (3) Pushkin's significance in Russian literature; his relation to other European literatures; Eugene Onegin and selected shorter works.
Effective: Winter 1978

RUS 530 **Seminar in Nineteenth-Century Russian Literature and Culture** (3 per semester/maximum of 6) Major issues in nineteenth-century literature and culture (novel and social thought, the short story, drama before Chekhov, and others).
Effective: Spring 1998
Prerequisite: RUS 304, RUS 400

RUS 540 **Eighteenth-Century Russian Literature** (3) Study of the major writers and literary developments in this period of the secularization and modernization of Russian literature.
Effective: Winter 1978

RUS 542 **Seminar in Twentieth-Century Russian Literature** (3-6) Major works and issues in Twentieth-century Russian literature and culture.
Effective: Fall 1997
Prerequisite: RUS 304 orRUS 440

RUS 560 **History of the Russian Literary Language** (3) Historical development of the Russian literary language and tradition.
Effective: Spring 1998
Prerequisite: RUS 304, RUS 360

RUS 570 **Old Russian Literature** (3) Analysis of Russian literary monuments in the original, 1100-1700.
Effective: Winter 1978
Prerequisite: SLAV 550

RUS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2001

RUS 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

RUS 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching RUS 001, 002, or 003 under the supervision of a full-time faculty member.
Effective: Fall 1983

RUS 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

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School Psychology (S PSY)

S PSY 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

S PSY 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1990

S PSY 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

S PSY 500 **Professional Issues in School Psychology** (1-3) Orientation to the field through study of unique problems, current issues, ethical and legal matters, unique cases, and research projects.
Effective: Summer 1990

S PSY 510 **Supervision of Pupil Service Personnel** (1-10) Program supervision and professional leadership in university clinics and school systems.
Effective: Summer 1990
Prerequisite: S PSY 595A

S PSY 530 **Psychoeducational Interventions** (3) Development of empirically validated psychoeducational interventions for academic and behavioral problems experienced in school by children and adolescents.
Effective: Fall 2003

S PSY 535 **School-Based Psychological Interventions for Children and Youth** (3) Development of empirically supported psychological and psychoeducational interventions for behavioral and emotional concerns among school-aged children.
Effective: Spring 2007
Prerequisite: EDPSY 450, EDPSY 475, PSYCH 461

S PSY 543 (CN ED 543) **Prevention** (3) Addresses prevention program development, implementation, and evaluation, along with theoretical and empirical underpinnings, ethical, and multicultural issues related to prevention.
Effective: Spring 2003

S PSY 554 **Psychological and Educational Evaluation of Exceptional Children** (3) Administration and interpretation of individual tests other than the Stanford- Binet, WISC, WAIS.
Effective: Summer 1990
Prerequisite: S PSY 559

S PSY 556 **Psychological Assessment of Preschool and School-Aged Children** (2) Study of cognitive/affective tests; use of systems--analytic, multivariate statistical, actuarial methods of data combination in decision-making processes.
Effective: Summer 1990
Prerequisite: EDPSY 400, EDPSY 450;EDPSY 554 orS PSY 559

S PSY 559 (PSY 559) **The Individual Psychological Examination** (3) Demonstrations and practice in widely used ability and aptitude tests; psychological report writing.
Effective: Summer 1990
Prerequisite: 15 credits in psychology and a course in measurement

S PSY 561 **Consultation in Educational Settings** (3) Prepares students to consult with teachers, administrators, parents, and other professionals about academic, behavioral, social-emotional, and programmatic issues.
Effective: Spring 2000
Prerequisite: EDPSY 450, SPLED 401

S PSY 595A **Practicum in School Psychology** (1-6) Clinical experience with children under supervision in a variety of settings requiring service, including practice in synthesizing data and observations.
Effective: Spring 1997
Prerequisite: PA Act 34 clearance required. In addition non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)

S PSY 595B **Internship in School Psychology** (1-10) Long-term placement in settings providing work for school psychologists with children, parents, teachers, administrators, and service agencies, under supervision.
Effective: Spring 1997
Prerequisite: PA Act 34 clearance required. In addition non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)

S PSY 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

S PSY 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject that may be offered infrequently; several different topics may be taught in one year or semester. A specific title may be used in each instance and will be entered on the student's transcript. Multiple offerings may be accommodated by the use of suffixes, A, B, etc.
Effective: Fall 2003

S PSY 597C **Special Education Law & School Change** (3) This course will provide a basic framework of how school systems operate in order to help school psychologists and other potential school leaders effect change.
Effective: Summer 2010 Ending: Summer 2010

S PSY 600 **Thesis Research** (1-15) No description.
Effective: Summer 1990

S PSY 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1990

S PSY 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1990

S PSY 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1990

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School of Science, Engineering, and Technology (SSET)

SSET 495 **Internship** (1-18) Supervised off-campus, individual training including practical field experiences of internships where written and oral critique of the activity is required.
Effective: Summer 2003
Prerequisite: prior approval of the proposed assignement by the program

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Science (SC)

SC 400 **Consequences of Science** (1) A series of lecture/discussions in which science faculty members show the social implications of their research specialty.
Effective: Winter 1978

SC 401 **Basic Science and Disease** (1) Clinical aspects of various disease and how basic scientific information contributes towards understanding and treating disease.
Effective: Summer 2008
Prerequisite: 4th semester standing or higher standing plus 3 credits in biology and 3 credits in chemistry

SC 494 **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1994

SC 494H **Research Project Courses** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

SC 495 **Science Co-op Work Experience III** (1-3) A supervised work experience where the student is employed in a scientific position. To be offered for SA/UN grading.
Effective: Spring 2007
Prerequisite: SC 395

SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1996

SC 497C **Corporate Organizations, Opportunities, and Expectations** (1) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

SC 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 1997

SC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1996

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Science Education (SCIED)

SCIED 410 **Using Technology to Enhance Science Teaching** (3) This course explores contemporary practice and research associated with applications of technology to enhance science learning and teaching.
Effective: Summer 2000
Prerequisite: admission to one of the science teaching options in SECED

SCIED 411 **Teaching Secondary Science I** (3) Introduction to teaching secondary school science, including curriculum, learning theory, media, evaluation as they relate to student progress.
Effective: Spring 1994
Prerequisite: C I 295 ; appropriate courses for certification option and approval of department

SCIED 412 **Teaching Secondary Science II** (3) Implementation of science instruction using a variety of modern approaches.
Effective: Spring 2001
Prerequisite: SCIED 410, SCIED 411 Concurrent: C I 412W

SCIED 454 **Science in Early Childhood Education** (3) Philosophy, techniques, materials, and evaluation in teaching science to young children (N-3); a briefing of science concepts for young children.
Effective: Winter 1978

SCIED 455 **Field Natural History for Teachers** (3) Ecologically oriented field study course to provide teachers with basic knowledge of natural science resources in school environments.
Effective: Winter 1978
Prerequisite: 3 credits in biological science

SCIED 457 **Environmental Science Education** (3) Philosophy, techniqus, and skills for teaching environmental science, including curriculum development, fieldwork, and the use of appropriate technologies.
Effective: Fall 2003
Prerequisite: 3 credits of calculus 9 credits of sciences 400-level teaching methods course

SCIED 458 **Teaching Science in the Elementary School** (3) Interpreting children's science experiences and guiding development of their scientific concepts; a briefing of science content material and its use.
Effective: Spring 2007
Prerequisite: LL ED 400, LL ED 401, LL ED 402, PSYCH 212 three credits each in biological earth and physical sciences
Concurrent: C I 495A OR C I 495B ; MTHED 420 SS ED 430W

SCIED 470 **Selected Studies in Science Education** (1-6) Intensive work on particular issues, trends, or developments in science education for elementary and secondary school teachers.
Effective: Winter 1978
Prerequisite: Instructional I certification and teaching experience

SCIED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

SCIED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

SCIED 497A **Global Climate Change for Educators** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SCIED 497C **Robotics for Elementary Teachers** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SCIED 497D **Insect Connections for Educators** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SCIED 497F (ENGR 497F) **Fundamentals of Science, Technology & Engineering** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SCIED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

SCIED 498A **School of Fish - Fish Biology Concepts and Aquatic Wildlife Ecosystems (K-12)** (1) Participants will learn about the affect of human interaction on the environment.
Effective: Summer 2010 Ending: Summer 2010

SCIED 498B **Developing Natural Gas in the Classroom** (1) Students will learn the affect of human interaction (i.e., natural gas development) on the environment, especially our water resources and ways to preserve and protect our natural resources.
Effective: Summer 2010 Ending: Summer 2010

SCIED 551 **History, Philosophy, & Sociology of Science and Science Teaching** (3) Examination of the implications of history, philosophy, and sociology of science for science teaching.
Effective: Summer 2006
Prerequisite: graduate standing

SCIED 552 **Science Teaching and Learning** (3) Exploration of the theoretical and empirical foundations of the teaching and learning of science.
Effective: Summer 2009

SCIED 556 **The Supervision of Science Curriculum** (3) Supervision of elementary and secondary science teachers as they develop K-12 programs in the public schools.
Effective: Winter 1978
Prerequisite: 6 credits in science methods 20 credits in science or equivalent and teaching experience

SCIED 558 **Research Problems in Science Teaching** (3) Problems and research dealing with curriculum, materials, evaluation, and supervision of science teaching and learning.
Effective: Fall 1983
Prerequisite: SCIED 412 orSCIED 458 ; teaching experience

SCIED 559 **Analysis of Instruction in Elementary Science Education** (3) Analysis of the history, issues, trends, and research in elementary science education.
Effective: Winter 1978
Prerequisite: teaching experience 3 credits in elementary science methods and 18 credits of science courses

SCIED 590 **Colloquium** (1-3) continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1992

SCIED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

SCIED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

SCIED 597A **Readings in SCIED** (1-3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

SCIED 597B **SCIED Projects** (3-6) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

SCIED 597C **Computer Tools for Inquiry-based Science Teaching** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

SCIED 597C **Science Education Curriculum** (3) An overview of history and research on curriculum in science education. Includes curriculum development and analysis, current research on inquiry- based curriculum, influence of state and national standards, learning progressions and diversity perspectives.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

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Science, Engineering, and Technology (SE&T)

SE&T 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1992

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Science, Technology, and Society (S T S)

S T S 407 (PHIL 407) **Technology and Human Values** (3) Interrelationships of twentieth-century technological change and human values. Emphasis on the social and ethical aspects of technological progress.
Effective: Spring 1999
Prerequisite: 9 credits in philosophy includingPHIL 107 or 6 credits of philosophy at the 200 level

S T S 408 (COMM 408) **Cultural Foundations of Communications** (3) Examination of oral, scribal, print, industrial and electronic cultures; analysis of impact of technology on communications and social structure.
Effective: Spring 2009
Prerequisite: select 3 credits fromCOMM 100, COMM 110, COMM 118, COMM 150, COMM 180, COMM 251, COMM 260W, COMM 320, COMM 370 ; or 3 credits of S T S

S T S 416 (US;IL) (AAA S 416, WMNST 416) **Race, Gender and Science** (3) The class will focus on race and gender as products of science, and how societal values shape scientific activity.
Effective: Summer 2008
Prerequisite: 6 credits in S T S WMNST or AAA S

S T S 420 (EM SC 420, SOC 420) **Energy and Modern Society** (3) Technology and economics of energy resources, production, and consumption; environmental factors, exhaustion, new technology.
Effective: Spring 1991

S T S 427W (CED 427W, SOC 427W) **Society and Natural Resources** (3) Analysis of the relationship between societal development and enhancement and natural resources.
Effective: Summer 2008
Prerequisite: R SOC 011 orSOC 001

S T S 428 (IL) (HIST 428) **The Darwinian Revolution** (3) The origins and implications of evolutionary theory.
Effective: Spring 2006
Prerequisite: An introductory Science course and a history course.

S T S 430 (IL) (NUTR 430) **Global Food Strategies: Problems and Prospects for Reducing World Hunger** (3) Technological, social, and political solutions to providing basic food needs; food resources, population, and the environment; current issues.
Effective: Summer 2005

S T S 432 (PHIL 432) **Medical and Health Care Ethics** (3) Examines ethical, political, and social issues in the research, implementation, and practice of medicine, medical technologies, and healthcare.
Effective: Fall 1998
Prerequisite: fifth-semester standing

S T S 433 (PHIL 433) **Ethics in Science and Engineering** (3) Ethical issues arising in the practice of science and engineering and their philosophical analysis.
Effective: Fall 1995

S T S 435 (PHIL 435) **The Interrelation of Science, Philosophy, and Religion** (3) The historical and transformative interactions between science and Western philosophical and religious views of nature, humanity, and God.
Effective: Spring 1996

S T S 457 (US;IL) (HIST 457, WMNST 457) **The History of Women in Science** (3) Critical analysis of the role women, gender, and minorities have played in the natural sciences.
Effective: Spring 2006
Prerequisite: HIST 116, HIST 117, WMNST 001, WMNST 003 orWMNST 005

S T S 460 (PL SC 460) **Science, Technology, and Public Policy** (3) The all-pervasive importance of science and technology policy in modern societies and mechanisms and processes by which it is made.
Effective: Spring 1995
Prerequisite: three credits in Natural Sciences or Engineering three credits in Social and Behavioral Sciences

S T S 470 **Technology Assessment and Transfer** (3) Nature of technology assessment and technology transfer in product design and development process from federal and university labs, and internationally.
Effective: Summer 1996

S T S 471 **Radiation, Reactors, and Society** (3) Societal problems and benefits associated with nuclear power, including energy needs, radiation effects, safety, and thermal effects.
Effective: Spring 1991

S T S 476 **Technology and War** (3) A survey and analysis of the interaction of technology, ethics, and warfare in the past and present society.
Effective: Summer 2007

S T S 490 **Peace and Conflict Studies Seminar** (3) Advanced study of major contemporary issues of peace and conflict; includes anthropological, technological, psychological, and economic perspectives.
Effective: Fall 1994
Prerequisite: PL SC 014, S T S 090

S T S 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1992

S T S 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

S T S 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1991

S T S 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 1991

S T S 497A **Representing Nanotechnology** (3) This is an advanced rhetoric of science and technology course with an emphasis on nanotechnology, with the nanofab facility serving as our field site.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

S T S 497G (NUTR 497G) **Community Food Security** (3) Through active learning, students explore how communities can reshape food systems, increasing access to wholesome food while increasing economic opportunities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

S T S 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in-depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

S T S 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

S T S 500 **Integrating Science and Technology Into Society** (3) Interdisciplinary analysis of critical issues for science, technology, and society.
Effective: Spring 1991
Prerequisite: Graduate standing at Penn State

S T S 555 (R SOC 555) **Human Dimensions of Natural Resources** (3) Identification of the interrelationships and influence of human behavior and natural resources.
Effective: Summer 1998

S T S 589 **Ethics and Values in Science and Technology** (3) Study interrelationships of 20th century technological change and human values with emphasis on social and ethical aspects of technological progress.
Effective: Summer 1994

S T S 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1991
Prerequisite: Graduate standing at Penn State

S T S 591 **Research and Writing in Science, Technology, and Society** (3) Overview of current research in STS with training on doing STS research and preparing research reports for publication.
Effective: Summer 1994
Prerequisite: second-semester graduate standing

S T S 594 **Research Topics** (1-18) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Spring 1991

S T S 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1994

S T S 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered

infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1991
Prerequisite: Graduate standing at Penn State

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Security & Rsk Analy (SRA)

SRA 468 **Visual Analytics for Security Intelligence** (3) Introduce visual analytic techniques for security informatics and intelligence. It covers analytical techniques on visualizing threats, risk, and vulnerability.
Effective: Spring 2008
Prerequisite: IST 110, SRA 111

SRA 471 **Informatics, Risk, and the Post-Modern World** (3) Provides in-depth study of how security informatics is influenced by the risk and post-modern culture.
Effective: Spring 2008
Prerequisite: IST 110, SRA 231

SRA 472 **Integration of Privacy and Security** (3) Exploration of technological, operational, organizational and regulatory issues related to maintenance of individual privacy, confidentiality of organizations, and information protection.
Effective: Spring 2008
Prerequisite: SRA 211 orSRA 221 or equivalent

SRA 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2007

SRA 497A **Statistical Analysis for Information Sciences** (3) Intermediate-level statistics course emphasizing understanding hypothesis testing and experimental design, a broad array of statistical techniques applied to data analysis, and computer tools to support testing and analysis; specifically applied to information sciences and technology applications.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Serbo-Croatian (S CR)

S CR 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

S CR 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

S CR 499 (IL) **Foreign Studies** (12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Slavic (SLAV)

SLAV 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

SLAV 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

SLAV 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1998

SLAV 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

SLAV 500 **Bibliography and Research Techniques** (3) Tools and methods of research, designed for students preparing to do independent investigation of problems in Slavic languages and literatures.
Effective: Winter 1978

SLAV 510 **Structure of the South Slavic and West Slavic Languages** (3-12; 3 credits per language) Linguistic analysis of a particular South Slavic (Bulgarian, Macedonian, Serbo-Croatian, Slovenian) or West Slavic (Czech, Lusatian, Polish, Slovak) language.
Effective: Spring 1987
Prerequisite: RUS 460 or one graduate course in linguistics

SLAV 550 **Old Church Slavic** (3) Reading and study of that corpus of religious and liturgical documents representing the first written records of a Slavic tongue.
Effective: Winter 1978

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Social Science (SO SC)

SO SC 480W **Quantitative Methods in the Social Sciences** (4) Students will learn to conduct, analyze and write up quantitative social scientific research according to appropriate professional standards.
Effective: Spring 2008
Prerequisite: permission of program

SO SC 481 **Qualitative Research Methods in the Social Sciences** (4) Students will learn how to conduct, analyze and write up qualitative social research according to appropriate professional standards.
Effective: Spring 2008
Prerequisite: permission of program

SO SC 492 **Current Topics in the Social Sciences** (3) This course allows for various current topics to be offered as suitable to the needs of the program.
Effective: Spring 2008
Prerequisite: permission of program

SO SC 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2008

SO SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2008

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Social Studies Education (SS ED)

SS ED 411 **Teaching Secondary Social Studies I** (3) Teaching social studies, including individual differences, curricular overview, application of learning theories, identification and measurement of learning outcomes.
Effective: Spring 1996
Prerequisite: ANTH 045, C I 295, HIST 020, HIST 021, PL SC 001 ; 12 credits from history and/or geography and/or sociology and/or economics

SS ED 412W **Teaching Secondary Social Studies II** (3) Writing-intensive course focusing on study of the social studies teacher's role in planning instruction; strategies for teaching.
Effective: Summer 2010
Prerequisite: SS ED 411 Concurrent: C I 412W

SS ED 430W **Teaching Social Studies in the Elementary Grades** (3) Principles underlying use of social studies in the elementary school; practical demonstration of desirable methods.
Effective: Spring 2007
Prerequisite: LL ED 400, LL ED 401, LL ED 402, PSYCH 212 nine credits in history and the social sciences Concurrent: C I 495A OR SCIED 458 MTHED 420 C I 495B ;

SS ED 470 **Issues in Social Studies Education** (1-6) Concentration on particular issues, trends, and developments in the social studies.
Effective: Winter 1978
Prerequisite: Instructional I certificate and teaching experience

SS ED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

SS ED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

SS ED 497A **Heritage Interpretation Education** (3) Principles of interpretation for natural and cultural sites; earn Certified Interpretative Guide certification offered by National Association for Interpretation.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SS ED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

SS ED 498A **AP World History** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SS ED 498B **Ap US History** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SS ED 498C **AP US Government & Politics** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SS ED 530 **Instructional Practices in the Social Studies** (3) Social studies innovations in the classroom, new programs, new materials, new methods, and evaluation.
Effective: Winter 1978
Prerequisite: one year of teaching experience

SS ED 532 **Curriculum Models in Social Studies Education** (3) Study of past and proposed curricula in elementary and secondary social studies. Various means of judging curricula will be offered.
Effective: Spring 1985
Prerequisite: C I 495D

SS ED 533 **Research in the Teaching of Social Studies** (3) Procedures and methods of research for the teaching of social studies, strategies of investigation, and review of research literature.
Effective: Fall 1983
Prerequisite: 12 credits in the social sciences at the 400 or 500 level and teaching experience

SS ED 590 **Colloquium** (1-3) Graduate seminar for new doctoral students in social studies education.
Effective: Summer 1998
Prerequisite: graduate standing in social studies education

SS ED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

SS ED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

SS ED 597A **Readings in Social Studies Education** (1-3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

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Sociology (SOC)

SOC 400W **Senior Research Seminar** (3) Major concepts and principles of sociology through reading, data analysis, and writing. Capstone course for senior Sociology majors.
Effective: Fall 2001
Prerequisite: SOC 470

SOC 401 **Social Institutions** (3) Development, nature, and function of major social institutions and their impact on individual life in modern society.
Effective: Spring 2001
Prerequisite: 6 credits in Sociology

SOC 403 **Advanced Social Psychology** (3) Analysis of the major theoretical approaches and research findings of contemporary social psychology.
Effective: Fall 1983
Prerequisite: SOC 003

SOC 404 **Social Influence and Small Groups** (3) The study of social influence, leadership and status, and social cohesion and commitment processes in small groups.
Effective: Spring 2007
Prerequisite: SOC 003 orPSYCH 420

SOC 405 **Sociological Theory** (3) Overview of the development of sociological theory; current issues and controversies.
Effective: Spring 2001
Prerequisite: 3 credits in the Sociology

SOC 406 (CRIMJ 406, CRIM 406) **Sociology of Deviance** (3) Theory and research concerning deviant behaviors and lifestyles viewed as significant departures from a group's normative expectations.
Effective: Spring 2008
Prerequisite: SOC 012, SOC 013 orSOC 005 or permission of program

SOC 408 **Urban Ecology** (3) Spatial and temporal aspects of urban structure; urban growth, neighborhoods, racial and ethnic groups, mental illness; cross-cultural perspectives.
Effective: Fall 1983
Prerequisite: 3 credits in sociology

SOC 409 (US) (AAA S 409) **Racial and Ethnic Inequality in America** (3) The impact of inequality and discrimination on individual and group identity among various racial and ethnic groups.
Effective: Summer 2005
Prerequisite: 3 credits in Sociology

SOC 409U (US) (AAA S 409U) **Racial and Ethnic Inequality in America** (3) The impact of inequality and discrimination on individual and group identity among various racial and ethnic groups.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: 3 credits in Sociology

SOC 411 (US) (HD FS 416) **Racial and Ethnic Diversity and the American Family** (3) This course will explore the nature and determinants of racial and ethnic variation in family processes in the United States.
Effective: Spring 2005
Prerequisite: 3 credits in sociology

SOC 412 (CRIMJ 412, CRIM 412) **Crime, Social Control, and the Legal System** (3) Legal and extralegal control; public opinion on crime; criminal justice and correctional processes; legal sanctions; control strategies. Field trip.
Effective: Spring 2008
Prerequisite: SOC 012, SOC 013 orSOC 005

SOC 413 (CRIM 413, CRIMJ 413) **Advanced Criminological Theory** (3) This course provides an in-depth look at theories of crime and examines influential empirical studies designed to these theories.
Effective: Spring 2008
Prerequisite: SOC 012, CRIMJ 250W

SOC 414 (CRIMJ 414, CRIM 414) **Criminal Careers and the Organization of Crime** (3) Research on and theory of criminal careers and crime organizations, emphasizing recruitment and disengagement; offender characteristics and life- styles; policy implications.
Effective: Spring 2008
Prerequisite: SOC 012, SOC 013 orSOC 005

SOC 416 (US) (EDTHP 416) **Sociology of Education** (3) The theoretical, conceptual, and descriptive contributions of sociology to education.
Effective: Spring 2006
Prerequisite: 3 credits in Sociology

SOC 419 (US) **Race and Public Policy** (3) Seminar format course in which sociological theory and research are applied to current race policy issues.
Effective: Spring 2006
Prerequisite: 3 credits in Sociology

SOC 420 (EM SC 420, S T S 420) **Energy and Modern Society** (3) Technology and economics of energy resources, production, and consumption; environmental factors, exhaustion, new technology.
Effective: Spring 2001
Prerequisite: 3 credits in Sociology

SOC 422 **World Population Diversity** (3) Survey of world diversity in national population growth/composition; the impacts of demographic change on the economic/social life of nations/people.
Effective: Spring 2001
Prerequisite: 3 credits in Sociology

SOC 423 **Social Demography** (3) Social demographic perspectives on fertility, mortality, morbidity, migration, population density, demographic transitions, social mobility, family, the aged, and minorities.
Effective: Spring 2001
Prerequisite: SOC 023 orSOC 422

SOC 424 **Social Change** (3) Critical review of classical and recent theories of social change, emphasizing the transformations occurring in the modern world.
Effective: Fall 1983
Prerequisite: 3 credits in sociology

SOC 425 **Social Conflict** (3) An analysis of the variables affecting intergroup and international conflict and cooperation.
Effective: Fall 2007
Prerequisite: general behavioral science general psychology or general sociology

SOC 427W (CED 427W, S T S 427W) **Society and Natural Resources** (3) Analysis of the relationships between societal development and enhancement and natural resources.
Effective: Summer 2008
Prerequisite: R SOC 011 orSOC 001

SOC 428 **Homelessness in America** (3) Survey of social science research on homelessness in the contemporary United States.
Effective: Spring 2001
Prerequisite: 3 credits in Sociology

SOC 429 **Social Stratification** (3) Structure and dynamics of class, caste, and status systems; class differentials and social mobility; current theoretical and methodological issues.
Effective: Winter 1978
Prerequisite: 3 credits in sociology

SOC 430 **Family in Cross-Cultural Perspective** (3) Sociological analysis of family systems in various cultures and subcultures.
Effective: Spring 2001
Prerequisite: 3 credits in Sociology

SOC 431 (HD FS 431) **Family Disorganization: Stress Points in the Contemporary Family** (3) Focuses on divorce, remarriage, incest, family violence as well as problems associated with family formation and parent-child relations.
Effective: Spring 1994
Prerequisite: 6 credits of human development and family studies psychology or sociology

SOC 432 **Social Movements** (3) Why and how people mobilize to promote or retard social change. Factors predicting success or failure of social movements.
Effective: Fall 1983
Prerequisite: 3 credits in sociology

SOC 435 (HD FS 434) **Perspectives on Aging** (3) An analysis of the demographic, social, and cultural factors affecting the aged population in American society.
Effective: Fall 2007
Prerequisite: 3 credits in Sociology

SOC 436 **Polling and Public Opinion** (4) Methods of public opinion polling; attitude theory and research.
Effective: Spring 2001
Prerequisite: 3 credits in Sociology

SOC 437 **Biosocial Perspectives on the Family** (3) The implications of knowledge from behavioral endocrinology, behavior genetics, and evolutionary psychology for understanding family relationships and child development.
Effective: Fall 2001
Prerequisite: six credits of SOC or HD FS

SOC 440 (HD FS 440) **Family Policy** (3) An in-depth examination of family policy.
Effective: Spring 2007
Prerequisite: 3 credits of SOC or HD FS

SOC 444 **Complex Organizations** (3) Analysis of the nature and types of complex organizations and their impact on the social life of modern nations.
Effective: Fall 1983
Prerequisite: 3 credits in sociology

SOC 446 **Political Sociology** (3) Sociological analysis of types of political organization and their relations with other elements of social life.
Effective: Winter 1978
Prerequisite: 3 credits in sociology

SOC 447 **Environment, Energy, and Society** (3) Sociological perspectives on causes and consequences of natural resource scarcity and pollution, with emphasis on environmental policies in industrial societies.
Effective: Spring 2001
Prerequisite: 3 credits in Sociology

SOC 448 **Environmental Sociology** (3) Examination of the relationship between the physical environment and society.
Effective: Fall 2007
Prerequisite: 60 credits at least 9 of which are in the social sciences graduate status or permission of the program

SOC 449 **Environmental Movements** (3) Comparative exploration of environmental movements within the context of classical and new social movement theory.
Effective: Fall 2007
Prerequisite: 90 credits at least 9 of which are in the social sciences or which include SOCIO/CMPSY 470 graduate status or permission of the program

SOC 450 **Justice and the Environment** (3) Considers notions of justice in relation to environmental philosophy, environmental movements, and general environmental concerns.
Effective: Fall 2007
Prerequisite: 90 credits graduate status or permission of the program

SOC 454 (US) **The City in Postindustrial Society** (3) Postindustrial social organization in the United States and Europe; consequences for metropolitan social stratification, community power, and environmental quality.
Effective: Spring 2006
Prerequisite: 3 credits in Sociology

SOC 455 **Work and Occupations** (3) Work and occupational life in modern society; work in the past, present, and future.
Effective: Fall 1983
Prerequisite: 3 credits in sociology

SOC 456 (WMNST 456) **Gender, Occupations, and Professions** (3) The role of gender in shaping contemporary North American patterns of employment, occupational roles, and statuses.
Effective: Spring 2001
Prerequisite: WMNST 001 or 3 credits in Sociology

SOC 457 (US;IL) (ANTH 457, J ST 457) **Jewish Communities: Identity, Survival, and Transformation in Unexpected Places** (3) Examines the global array of smaller Jewish communities that have flourished outside the main urban centers of Jewish settlement.
Effective: Summer 2006
Prerequisite: ANTH 001 orANTH 045, HEBR 010, J ST 010, SOC 001, SOC 005, SOC 007, SOC 015

SOC 461 (US;IL) (RL ST 461) **Sociology of Religion** (3) Contemporary religion in the United States: beliefs, structure, and function of major denominations and religious cults.
Effective: Spring 2006
Prerequisite: 3 credits in sociology or religious studies

SOC 467 (CRIM 467, CRIMJ 467) **Law and Society** (3) Law and society studies the social origins of law and legal systems; occupational careers, and decision-making of legal officials.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orCRIMJ 113 or permission of program

SOC 468 **Mood-Altering Substances in Society** (3) Perspectives of cultures throughout the world toward mood-altering substances are reviewed in light of public policy, benefits, and problems.
Effective: Fall 2007

SOC 469 **Techniques in Small Group Facilitation** (1-4 per semester/maximum of 12) This course is the training course for students working as facilitators with the Race Relations Project.
Effective: Summer 2010
Prerequisite: SOC 119 andSOC 300

SOC 470 **Intermediate Social Statistics** (4) Descriptive and inferential statistics in social research: central tendency and variation, normal distribution, measures of association, confidence intervals, hypothesis testing.
Effective: Fall 2001
Prerequisite: SOC 207

SOC 471 **Qualitative Research Methods in Sociology** (3) Theory, methods, and practice of qualitative data collection, including observation, participant observation, interviewing; supervised projects in natural settings.
Effective: Spring 2001
Prerequisite: 3 credits in Sociology

SOC 481H **Senior Honors Seminar in Sociology** (1) Supervised experience in planning and writing the honors thesis.
Effective: Spring 1999
Prerequisite: sociology major senior standing and admission to the Schreyer Honors College

SOC 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

SOC 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or

small-group basis.
Effective: Fall 2007

SOC 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2000
Prerequisite: prior approval of proposed assignment by instructor

SOC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

SOC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

SOC 497A **Immigration** (3) This class examines theories of immigration and immigrant adaptation, effects, and policy.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SOC 497B **Facilitation Training** (1-3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SOC 497D **Family and Justice** (3) Examination of the relationship between the family and the criminal justice system in which the family operates.
Effective: Summer 2010 Ending: Summer 2010

SOC 499 (IL) **Foreign Study--Sociology** (2-6) Study, in selected foreign countries, of groups, institutions, and social problems.
Effective: Summer 2005
Prerequisite: 3 credits in Sociology

SOC 500 **Introduction to Graduate Study in Sociology** (1) Required of all incoming graduate students in sociology.
Effective: Fall 1983

SOC 501 **Proseminar in Sociology** (3 per semester/maximum of 6) An in-depth introduction to the major specialty areas of Sociology.
Effective: Summer 1998
Prerequisite: admission to the graduate program

SOC 502 **Theories of Society I** (3) Review and analysis of trends and controversies in sociological theory from late eighteenth-century beginnings through the nineteenth century.
Effective: Fall 1983

SOC 503 **Theories of Society II** (3) Review and analysis of trends and controversies in sociological theory in the twentieth century.
Effective: Fall 1983

SOC 504 **Issues in Sociological Theory** (3) Seminar in the sociology of sociology, sociology of knowledge, and the philosophy of science, focused on current theory and methodology.
Effective: Fall 1983

SOC 512 (CLJ 512) **Criminological Theories** (3) Survey of theoretical and substantive issues in deviance and criminology, with emphasis on critical review of theories.
Effective: Fall 2005

SOC 513 **Sociological Research Methods** (3) Critical review of methodological issues; research designs; analysis and interpretation of findings.
Effective: Fall 1983

SOC 514 **Research Design and Data Collection Methods** (3) Chief techniques for collecting data in social research: interviews and questionnaires, laboratory and field observation, unobtrusive measures.
Effective: Fall 1998
Prerequisite: SOC 513 or equivalent course in research methods.

SOC 515 (CLJ 515) **Research Methods in Criminology and Deviance** (3) Review of methodological issues; design and conduct of research; analysis and interpretation of findings; ethical and policy issues.
Effective: Spring 1996

SOC 518 (PL SC 518) **Survey Methods I: Survey Design** (3) Research design for social, behavioral and health surveys.
Effective: Fall 2007

SOC 519 (PL SC 519) **Survey Methods II: Analysis of Survey Data** (3) Intermediate course on the statistical analysis of survey data: topics include weighting, complex surveys, missing data, and contextual analysis.
Effective: Spring 2008
Prerequisite: PL SC 503 orSOC 575

SOC 520 (R SOC 520) **Applied Sociological and Policy Research** (3) A survey of the conceptual and methodological issues in applied sociology and policy research conducted by sociologists.
Effective: Fall 2001
Prerequisite: SOC 573

SOC 521 **Family Demography** (3) Current family demographic research on nuptiality, divorce, household composition, female employment, migration, and fertility.
Effective: Spring 1985

SOC 522 **Demography of the Life Course** (3) The theoretical bases, critical concepts, and methods of life course analysis in the study of demographic transitions.
Effective: Spring 1994
Prerequisite: SOC 423, SOC 473

SOC 523 **Internal and International Migration** (3) Examination of theories, frameworks, and policies related to internal and international migration causes and consequences in developed and developing nations.
Effective: Spring 1997
Prerequisite: SOC 423 or prior work in population or human ecology

SOC 524 **The Demography of Human Fertility** (3) Overview of major issues and methodological approaches in the demographic study of human fertility in developing and developed countries.
Effective: Fall 2000

SOC 528 **Homelessness in America** (3) Survey of social science research on homelessness in the contemporary United States.
Effective: Fall 2000

SOC 530 **Sociology of Family** (3) An in-depth introduction to the sociological study of the family.
Effective: Spring 2002

SOC 531 (HD FS 531) **Family Disorganization: Stress Points in the Contemporary Family** (3) Focuses on divorce, remarriage, incest, family violence as well as problems associated with family formation and parent-child relations.
Effective: Summer 1994

SOC 535 **Sociology of Aging** (3) Current research and methodological issues in the sociological study of aging.
Effective: Fall 1983

SOC 537 (HD FS 537) **Biosocial Perspectives on the Family** (3) The implications of knowledge from behavioral endocrinology, behavior genetics, and evolutionary psychology for understanding family relationships and child development.
Effective: Summer 2002

SOC 538 (EDTHP 538) **Sociology of Education** (3) Provides students with an overview of dominant sociological theoretical perspectives on schools, schooling, and education in modern society.
Effective: Summer 2007

SOC 544 **Current Issues in Complex Organizations** (3) Critical survey of recent developments in sociological study of organizations and the theory of bureaucracy, including reciprocal effects on environments.
Effective: Fall 1983
Prerequisite: SOC 444

SOC 545 **Economy and Society** (3) Major social theorists' views on relationship of economy and society; competing sociological and economic models in contemporary social research.
Effective: Spring 1989

SOC 546 **Seminar in Political Sociology** (3) Analysis of issues and problems in political sociology. Topical emphasis varies.
Effective: Fall 1983
Prerequisite: SOC 446

SOC 547 **Environmental Sociology** (3) The development of environmental sociology; research issues in the study of social organization, natural resources, and social change.

Effective: Fall 1983

SOC 551 **Social Stratification and Social Change** (3) Origin and development of stratification systems and inequality among and within societies; social mobility; change in stratification systems.
Effective: Fall 1983

SOC 553 (CI ED 553, EDTHP 553, HI ED 553) **Education Mobility in Comparative Perspective** (3) Role of education in social mobility, using quantitative, qualitative, and historical methods; focuses comparatively on Britian, East Asia, South America.
Effective: Summer 2002

SOC 554 **Small Community Population Growth, Human Ecology, and Social Change** (3) Small-town population growth and ecology; images and realities of small-town life.
Effective: Fall 1983

SOC 555 **Current Research in Work and Occupation** (3) Topical seminar on nature and trends of research in the sociology of work, occupations, and professions.
Effective: Fall 1983

SOC 557 (EDTHP 557, HI ED 557) **Sociology of Higher Education** (3) Reviews theory and current sociology research on student access, achievement, and governance in postsecondary education, with applications to policy analysis.
Effective: Fall 2000
Prerequisite: graduate students only except with permission of instructor; EDTHP/SOC 416 is recommended

SOC 560 **Urban Sociology** (3) Examination of the structure and dynamics of North American cities and of residents' experiences in such settings.
Effective: Fall 2000

SOC 573 **Demographic Techniques** (3) Models and measures of vital processes (fertility, mortality, migration) and their effects on growth and age structure of human populations.
Effective: Fall 2001
Prerequisite: STAT 200

SOC 574 **Statistical Methods for Social Research** (3) Basic concepts of statistics; linear regression; computer software; analysis of social surveys; causal inferences from nonexperimental data.
Effective: Fall 1983
Prerequisite: 3 credits in statistics and 3 credits in research methods.

SOC 575 **Statistical Models for Nonexperimental Research** (3) Causal models for quantitative and qualitative data; path analysis and structural equations; logistic regression; duration models.
Effective: Spring 1989
Prerequisite: SOC 574

SOC 576 **Applied Mathematical Demography** (3) Survey of mathematical models used in the study of population: models of growth, suvivorship, fertility, migration, stability, kinship, projection.
Effective: Fall 1986
Prerequisite: ANTH 408 orSOC 473 ; calculus

SOC 577 **Techniques of Event History Modeling** (3) Survival analysis theory and methods for discrete dependent variables.
Effective: Summer 1998
Prerequisite: SOC 575

SOC 578 **Multilevel Regression Models** (3) Covers multilevel regression models for the analysis of nested or hierarchical data, including both contextual and longitudinal applications.
Effective: Summer 2006
Prerequisite: SOC 575

SOC 579 (ANTH 579) **Spatial Demography** (3) This graduate course will expose students to spatial analysis tools and analytical methods applied to demographic research.
Effective: Spring 2008
Prerequisite: Graduate course in statistics e.g. SOC 574 or ANTH 509

SOC 583 **Research Seminar in Social Psychology** (3) Design and conduct of research in areas of contemporary social psychology.
Effective: Fall 1983

SOC 584 (PSY 584) **Attitude Formation and Change** (3) Theory and method in research on attitude formation and change with emphasis on critical analysis.
Effective: Spring 2007
Prerequisite: PSYCH 420 orSOC 403 ; 3 credits in statistics

SOC 585 (PSY 585) **Interaction Processes Within and Between Groups** (3) Interactions in personal, group, and intergroup relations; theory and observational methods.

Effective: Spring 2007
Prerequisite: SOC 403 orPSYCH 420

SOC 587 (PSY 587) **Socialization** (3) Behavioral, cognitive, developmental, symbolic, interactionist, and role theories of socialization; emphasis on current theory and research.
Effective: Spring 2007
Prerequisite: SOC 403 orPSYCH 420

SOC 588 (PSY 588) **The Social Organization of Attribution** (3) Principles of attribution and their relevance to such topics as power relations, authority, equity, injustice, and social movements.
Effective: Spring 2007
Prerequisite: SOC 403 orPSYCH 420

SOC 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

SOC 591 (CLJ 591) **Teaching Sociology/Crime, Law, and Justice** (1) Preparation for teaching sociology and/or crime, law, and justice at the college level.
Effective: Fall 2000

SOC 592 **Writing for Publication in the Social Sciences** (3) Systematic, collective review of unpublished student manuscripts with an eye toward revision for publication.
Effective: Spring 2007
Prerequisite: Master's thesis or permission of program

SOC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

SOC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

SOC 597A **Assimilation** (3) This course will examine theories and research of the assimilation of immigrants and their descendants.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SOC 597A **Race, Ethnicity, and Residence** (3) Comparative analysis of the residential experiences of racial and ethnic groups in contemporary U.S.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

SOC 597B **Advanced SEM Methods** (4) This is an advanced course on measurement and modeling in the social sciences using modern structural equation models and methods.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SOC 597B (EDTHP 597B, CI ED 597B) **Children and Childhood in Sociological Perspective** (3) This course investigates social, cultural, political, and economic forces that shape childhood around the world, viewed through an educational lens.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

SOC 597C **Sociology of Religion** (3) This seminar uses classical and contemporary perspectives to develop social scientific tools for analyzing religion in the contemporary world. .
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SOC 597C **Race, Ethnicity and Family Processes** (3) This course will explore the nature and determinants of racial and ethnic variation in family processes in the contemporary U.S.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

SOC 597D **A Seminar in the Sociology of Religion** (3) An introductory, graduate-level survey of the sociology of religion designed to help participants conduct and critique social and scientific research.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

SOC 597E **Health Disparities** (3) This course studies cross-national health disparities and roles that socioeconomic status and race/ethnicity play in indicators of health status.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SOC 597E **Health Disparities** (3) This course studies cross-national health disparities and roles that socioeconomic status and race/ethnicity play in indicators of health status.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

SOC 597F **Work, Family, and Policy** (3) Theory and evidence on the interrelationships between gender, family, employment, and earnings; work-family conflict; and potential policy solutions.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SOC 597F **U.S. Inequality, Family Demography and Immigration** (3) This course explores the consequences of social stratification for demographic processes and social and economic inequality.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

SOC 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

SOC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

SOC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Students will teach introductory level courses as required by staffing and students' needs.
Effective: Fall 1983

SOC 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Summer 2005

SOC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

SOC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

1 Students may take only one course for General Education credit from SOC 001 GS or R SOC 011 GS.

2 Students may take only one course for General Education credit from SOC 030 or HD FS 129 GS.

Last Import from UCM: July 10, 2010 3:00 AM

Sociology-CI (SOCIO)

SOCIO 476 **Sociology of Science and Technology** (3) Examines the constitutive relationship between society, science and technology and ethical concerns arising from these relationships.
Effective: Spring 2003
Prerequisite: 60 credits at least 6 of which are in the social sciences or graduate status or permission of the program

Last Import from UCM: July 10, 2010 3:00 AM

Software Engineering (SWENG)

SWENG 400 **Introduction to Software Engineering Studio** (3) Provides an introduction to the principles of software engineering and includes complementary instruction in one programming language.
Effective: Summer 1999
Prerequisite: senior standing or above

SWENG 411 **Software Engineering** (3) Software engineering principles including life cycle, dependability, process modeling, project management, requires specification, design analysis, implementation, testing, and maintenance.
Effective: Spring 2008
Prerequisite: CMPSC 122 Concurrent: SWENG 311

SWENG 421 **Software Architecture** (3) The analysis and design of software systems using canonical design patterns.
Effective: Summer 2008
Prerequisite: SWENG 411

SWENG 431 **Software Verification, Validation, and Testing** (3) Introduction to methods of software verification, validation, and testing; mathematical foundations of testing, reliability models; statistical testing.
Effective: Spring 2008
Prerequisite: SWENG 411;STAT 301

SWENG 452W **Embedded Real Time Systems** (3) The design and implementation of real time systems.
Effective: Summer 2008
Prerequisite: CMPSC 472 orCMPSC 473 orCMPEN 441

SWENG 480 **Software Engineering Design** (3) Concepts of engineering ethics, economy, and project management, senior capstone project selection, and technical communication skills.
Effective: Spring 2009
Prerequisite: SWENG 431

SWENG 481 **Software Engineering Project** (3) Capstone group design projects in software engineering.
Effective: Spring 2008
Prerequisite: SWENG 480

SWENG 494 **Research Project** (1-12) Supervised student activites on research projects identified on an individual or small-group basis.
Effective: Summer 2010

SWENG 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 2008
Prerequisite: prior approval of proposed assignment by instructor

SWENG 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2010

SWENG 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1999

SWENG 497A **Software Integration** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SWENG 497A **Human Computer Interface** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SWENG 497B **Software Documentation** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SWENG 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2010

SWENG 500 **Software Engineering Studio** (3) The 500-level studio provides an opportunity for students to undertake a substantial software project.
Effective: Summer 1999

SWENG 505 **Software Project Management** (3) Analysis and construction of project plans for the development of complex software products; how to manage change and cost control.
Effective: Fall 2003

SWENG 537 **Software System Design** (3) Best practices in the requirements, analysis, and design of large software systems including the Unified Modeling language and the Unified Process.
Effective: Spring 2008
Prerequisite: CMPSC 483W or equivalent knowledge with instructor's permission

SWENG 541 **Advanced Database Design Concepts** (3) Practical benefits of a Database Management System; three-stage process to create and implement a relational database to meet defined requirements.
Effective: Summer 2002
Prerequisite: IN SC 521 or approval of instructor or department

SWENG 545 **Data Mining** (3) Practical benefits of data mining will be presented; data warehousing, data cubes, and underlying algorithms used by data mining software.
Effective: Summer 2002
Prerequisite: IN SC 521 or approval of instructor or department

SWENG 552 **Bioinformatics** (3) Introduction to information processing problems in computational biology and a unified treatment of machine learning methods for solving these problems.
Effective: Summer 2002
Prerequisite: MATH 451

SWENG 560 **Web Based Systems** (3) Autonomous intelligent software agent mechanisms, Java's database connectivity, and the emerging architectures for the development of Web based information systems.
Effective: Spring 2001
Prerequisite: students should have completed the core curriculum of the Master of Software Engineering degree prior to scheduling this course or have instructor's permission

SWENG 564 **Electronic Commerce** (3) Web languages, platforms, browsers, host standards, communications, database interfaces and the reliability, responsiveness, and security of E-Commerce Systems.
Effective: Spring 2001

SWENG 566 **Enterprise Resource Planning** (3) Examination of enterprise-wide integrated software solutions; application planning, business process re-engineering, vendor provided ERP solutions, testing and migration issues.
Effective: Spring 2001

SWENG 568 **Enterprise Integration** (3) Advances in design, development, and deployment of control and management software for enterprise and production information systems.
Effective: Fall 2003

SWENG 569 **Service Oriented Architecture** (3) The principles of service oriented architecture; modeling, design and implementation of services; mapping business processes to services.
Effective: Spring 2009

SWENG 580 **Advanced Software Engineering** (3) Description of tools and techniques in the software development lifecycle; Mitigation and managing time-to-market and quality of large software systems.
Effective: Spring 2001
Prerequisite: SWENG 537 or equivalent knowledge with instructor's permission

SWENG 581 **Software Testing** (3) This course provides a rigorous formal framework and practical information on this the testing of software throughout its life cycle.
Effective: Summer 2005
Prerequisite: SWENG 537 or instructor's permission

SWENG 582 **Real-Time Software Design and Analysis** (3) A holistic, systems-based approach to design and analysis of real-time systems; design and implementation of a small real-time system.
Effective: Summer 2002
Prerequisite: completion of all IN SC or SWENG core courses or with instructor or division approval

SWENG 584 **Genetic Algorithms** (3) Application of genetic algorithms to problems in engineering and science including combinatorial optimization, multi-criteria optimization, biology, chemistry, and neural networks.
Effective: Summer 2002
Prerequisite: completion of a course in data structures and algorithms or on approval of department

SWENG 585 **Pattern Oriented Design** (3) This class examines well-known heuristics, principles and patterns in the design and construction of reusable frameworks, packages and components.
Effective: Spring 2006
Prerequisite: SWENG 537

SWENG 586 **Requirements Engineering** (3) Theory and applications of requirements elicitation, analysis, modeling, validation, testing, and writing for hardware and software systems.
Effective: Summer 2008

SWENG 587 **Software Systems Architecture** (3) Software systems architecture; architectural design principles/patterns; documentation/evaluation of software architectures; reuse of architectural assets through frameworks/software product lines.
Effective: Summer 2008

SWENG 588 **Program Understanding** (3) Techniques for the analysis and visualization of large software systems to assess the quality of the design and architecture.
Effective: Spring 2009

SWENG 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Summer 1999

SWENG 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1999

SWENG 594A **Masters Research Paper** (3) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2010 Ending: Summer 2010

SWENG 594A **Masters Research Paper** (3) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SWENG 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1999

SWENG 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1999

SWENG 597A **Formal Methods** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Soil Science (SOILS)

SOILS 401 **Soil Composition and Physical Properties** (3) Advanced study of mineralogical and physical properties of soils which affect soil-plant-water relationships.
Effective: Spring 2001
Prerequisite: SOILS 101

SOILS 402 **Soil Nutrient Behavior and Management** (3) Chemical and biological behavior of soil nutrients; management for plant availability and fate in the environment. Laboratory emphasizes soil testing and soil-plant relationships.
Effective: Spring 2009
Prerequisite: CHEM 112, SOILS 101

SOILS 404 **Urban Soils** (3) This course introduces the student to natural and human-influenced soils.
Effective: Summer 2010
Prerequisite: SOILS 101

SOILS 405 (GEOSC 405) **Hydropedology** (3) Soil and water interactions across scales, integrated studies of landscape-soil-water relationships, fundamental processes of water flow and chemical transport.
Effective: Spring 2008
Prerequisite: SOILS 101

SOILS 412W **Soil Ecology** (3) Introduction to soil organisms; includes interactions between organisms, their processes, and metabolism with a major focus on microorganisms.
Effective: Spring 2008
Prerequisite: BIOL 011, BIOL 127 orBIOL 110

SOILS 415 **Soil Morphology, Mapping, and Land Use** (3) Soil profile, soil mapping, application of principles of soil morphology and mapping to land use; remote sensing.
Effective: Spring 2001
Prerequisite: GEOSC 001, GEOSC 020, GEOSC 071 orSOILS 101

SOILS 416 **Soil Genesis and Classification** (3) Pedological evolution, classification, and world distribution of soils.
Effective: Spring 2001
Prerequisite: SOILS 101

SOILS 418 (AGECO 418, AN SC 418) **Nutrient Management in Agricultural Systems** (3) Comprehensive review of nutrient flow in animal agricultural systems, environmental regulations, and environmental stewardship practices.
Effective: Summer 2003

SOILS 419 (GEOSC 418) **Soil Environmental Chemistry** (3) Introduction to chemical constituents and processes occurring in soils. Topics include mineral weathering, soil solution chemistry and adsorption of solutes.
Effective: Summer 2007
Prerequisite: CHEM 112

SOILS 420 **Remediation of Contaminated Soils** (3) Basic principles and technical aspects of remediation of contaminated soils.
Effective: Summer 2007
Prerequisite: CHEM 112

SOILS 422 **Natural Resources Conservation and Community Sustainability** (3) Conservation, land-use, and community (soil, water, air, plants, animals, and humans) impacting quality of life and sense of place.
Effective: Spring 2006
Prerequisite: SOILS 101

SOILS 450 **Environmental Geographic Information Systems** (3) Use of geographic information systems (GIS) and digital spatial databases to characterize landscapes for environmental assessment and management.
Effective: Summer 1999
Prerequisite: SOILS 101

SOILS 489 **Supervised Experience in College Teaching** (1-3) Participate with instructors in teaching an undergraduate soil science course; assist with teaching and evaluation and with development of instrucitonal materials.
Effective: Summer 1993
Prerequisite: SOILS 101 approval of instructor

SOILS 490 (AGRO 490) **Colloquium** (1) Continuing written and oral presentations developed by students in consultation with the course instructor.
Effective: Fall 1993
Prerequisite: seventh-semester standing

SOILS 494 **Senior Thesis** (1-6) Supervised data collection and analysis on a topic of interest to the student culminating in a formal thesis.
Effective: Spring 2000
Prerequisite: permission of the course coordinator

SOILS 494H **Senior Thesis** (1-6) Supervised data collection and analysis on a topic of interest to the student culminating in a formal thesis.

Effective: Fall 2007
Prerequisite: permission of the course coordinator

SOILS 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1990
Prerequisite: prior approval of proposed assignment by instructor

SOILS 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

SOILS 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in-depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1990

SOILS 497A **Soil Genesis, Classification, and Mapping** (4) Lecture and laboratory course on the genesis of soils, their classification, mapping, and interpretation for land use.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: SOILS 101 or permission of program

SOILS 502 **Soils Properties and Functions** (3) Introduction to soil science for graduate students including fundamentals of and applications to plant production and environmental sustainability.
Effective: Summer 2008

SOILS 506 (GEOSC 513) **Soil Processes: Chemical and Biogeochemical** (3) Colloid chemistry of soils; (a)biotic aspects of mineral formation/dissolution and redox reactions in soils; biogeochemical processes affecting elemental cycles.
Effective: Summer 2007 Ending: Summer 2010
Prerequisite: SOILS 419, CHEM 450

SOILS 507 **Soil Physics** (3-4) Soil physical properties emphasizing water, heat, gas, and ion movement in unsaturated soils. Laboratory included with 4 credits.
Effective: Summer 1992
Prerequisite: 6 credits each of calculus physics and soils

SOILS 510 **Geographic Information System Applications** (3) Soil data bases, image processing, and geographic information systems will be used to model and understand land and water resources.
Effective: Spring 1993
Prerequisite: GEOG 457

SOILS 512 **Environmental Soil Microbiology** (3) Biology and ecology of microorganisms in terrestrial environments; microbiological and molecular analysis methods; microbial processes in carbon and nitrogen cycling.
Effective: Spring 2008
Prerequisite: two years of chemistry andMICRB 400, B M B 401, A B E 308 or equivalent

SOILS 513 (GEOSC 513) **Soil Environmental Chemistry** (3) Chemical constituents and processes occurring in soils. Discussion of soil components, reactions at the solid-solution interface, and soil chemical processes.
Effective: Fall 2010 Future: Fall 2010
Prerequisite: CHEM 450

SOILS 516 **Soil Genesis** (1 per semester, maximum of 4) Field trip to study the genesis, classification, and geomorphology of the major soils of the northeastern United States.
Effective: Summer 1992
Prerequisite: SOILS 416 or 6 credits in geology or physical geography

SOILS 519 **Nature of Soil Minerals** (3) Constituent minerals of soils: modern methods for identification; relations to soil formation and agricultural practices.
Effective: Fall 2001

SOILS 571 **Ecosystem Nutrient Cycles** (3) Ecological theory and applications related to water, carbon, nitrogen, phosphorus, and cation cycling in managed and unmanaged terrestrial ecosystems.
Effective: Fall 2008

SOILS 590 (AGRO 590) **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 1993

SOILS 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1992

SOILS 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1992

SOILS 597A **Vadose Zone Transport** (3) Lecture and literature discussion course covering water and contaimnant transport through the unsaturated zone with an emphasis on soils.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011
Prerequisite: SOILS 101 or permission of program

SOILS 600 **THESIS RESEARCH** (1-15) NO DESCRIPTION.
Effective: Summer 1992

SOILS 601 **PH.D. DISSERTATION FULL-TIME** (0) NO DESCRIPTION.
Effective: Summer 1992

SOILS 602 **SUPERVISED EXPERIENCE IN COLLEGE TEACHING** (1-3 PER SEMESTER, MAXIMUM OF 6) GRADUATE STUDENT INVOLVEMENT IN PREPARATION, PRESENTATION, AND EVALUATION OF COURSE MATERIALS FOR UNDERGRADUATE FORMAL COURSES.
Effective: Spring 1992

SOILS 610 **Thesis Research Off-Campus** (1-15) No description.
Effective: Summer 1992

SOILS 611 **PH.D. DISSERTATION PART-TIME** (0) NO DESCRIPTION.
Effective: Summer 1992

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Spanish (SPAN)

SPAN 410 **Advanced Oral Expression and Communication** (3) Emphasis on achieving practical command of spoken Spanish and the comprehension of native speech. Use of journalistic materials.
Effective: Fall 1995
Prerequisite: SPAN 200

SPAN 412 **Translation** (3) Techniques of oral and written translation from Spanish to English and vice versa, particularly for business, literature, and social work.
Effective: Spring 2008
Prerequisite: SPAN 300

SPAN 414 **Spanish Phonology** (3) Spanish phonetics and phonemics; systematic means of correcting pronunciation defects; other audio-lingual applications.
Effective: Spring 2001
Prerequisite: SPAN 200

SPAN 415 **Spanish Morphology and Syntax** (3) The Spanish grammatical system; analysis of morphemic units and their organization into syntactic structures.
Effective: Spring 2001
Prerequisite: SPAN 200

SPAN 418 **The Evolution of Spanish** (3) The emergence and development of the sounds and forms of Spanish.
Effective: Spring 1995
Prerequisite: SPAN 414

SPAN 420 **Spanish for Business and International Trade** (3) Introduction to the Spanish of international business and to the social and cultural norms of negotiation in Spanish-speaking countries.
Effective: Spring 2008
Prerequisite: SPAN 300

SPAN 439 **Don Quijote** (3) Thorough study of the masterpiece, including its sources, genesis, language, style, success, and influence.
Effective: Spring 2008
Prerequisite: SPAN 300

SPAN 440 **Teaching of Romance Languages** (3) Theories of second language acquisition. Current classroom practices in the teaching of Romance languages.
Effective: Spring 2001
Prerequisite: SPAN 200

SPAN 472 **The Contemporary Spanish American Novel** (3) The regionalist and social novel since 1910, together with the social background.
Effective: Spring 2008
Prerequisite: SPAN 300, SPAN 354

SPAN 476 **Masterpieces of Spanish American Literature** (3) Reading, analysis, and discussion of selected major works representative of Spanish American prose and poetry.
Effective: Spring 2008
Prerequisite: SPAN 253W, SPAN 300

SPAN 490 **Masterpieces of Spanish Prose** (3) Reading, analysis, and discussion of selected masterpieces of Spanish novels, short stories, etc.
Effective: Spring 2008
Prerequisite: SPAN 253W, SPAN 300

SPAN 491 **Masterpieces of Spanish Drama and Poetry** (3) Reading, analysis, and discussion of selected masterpieces of Spanish drama and poetry.
Effective: Spring 2008
Prerequisite: SPAN 253W, SPAN 300

SPAN 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

SPAN 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

SPAN 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

SPAN 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject

which may be topical or of special interest.
Effective: Fall 1983

SPAN 497A **Mexico: History, Culture, and Contemporary Social Trends** (3) An intensive, on-site study of the history, culture, and contemporary issues in Mexico, particularly Guanajuato and central Mexico.
Effective: Summer 2010 Ending: Summer 2010

SPAN 497A **1492: Spanish Language at the Crossroads** (3) External factors (social history, contact w/other languages and ethnic groups, territorial expansion) and effect on development of Spanish language.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: SPAN 215 orSPAN 414 orSPAN 418

SPAN 497C **Destination Barcelona: Literary, Artistic and Cultural Represenations of the City** (3) Acquaint students with textual, visual and musical representations of one of the world's most fashionable cities.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPAN 497D **Voices From the Margin: The Poetry and Drama of Federico Garcia Lorca** (3) Focus on poetry and drama of Frederico Garcia Lorca, placed within historical, political, and social contexts.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPAN 499 (IL) **Foreign Study--Spanish** (1-12) Contemporary Spanish life and civilization. Emphasis on post-Civil War period: literature, arts, and sociopolitical problems.
Effective: Summer 2005
Prerequisite: SPAN 100, SPAN 110 orSPAN 120

SPAN 502 **Theory and Techniques of Teaching Spanish** (1-3) Audio-lingual orientation.
Effective: Winter 1978

SPAN 507 **Hispano-Romance Linguistics** (3 per semester/maximum of 9) History, development, and linguistic description of Old Spanish and related Romance languages of the Iberian Peninsula.
Effective: Fall 1983

SPAN 510 **Spanish Descriptive Linguistics: Phonology** (3) No description.
Effective: Winter 1978

SPAN 511 **Spanish Transformational-Generative Linguistics** (3) No description.
Effective: Winter 1978

SPAN 513 **Acquisition of Spanish as a Second Language** (3) Analysis of research on the acquisition of syntax, phonology, lexicon, discourse.
Effective: Spring 2002
Prerequisite: introduction to Hispanic linguistics

SPAN 514 **Hispanic Dialectology** (3 per semester/maximum of 6) Early fragmentation among the peninsular dialects; their status today, Judeo- Spanish; descriptive analysis of modern Spanish American dialects.
Effective: Fall 1983

SPAN 516 **Medieval Spanish Literature** (3 per semester/maximum of 9) Topics vary: juglaria and clerecia, emergence of lyric and brief narrative; history and didacticism; origins of novel; balladry; fifteenth-century innovations.
Effective: Fall 1983

SPAN 521 **The Celestina and the Literature of the Spanish Pre-Renaissance** (3) Chief trends and works of the period of the Catholic monarchs, with special emphasis on Fernando de Rojas's masterpiece La Celestina.
Effective: Fall 1983

SPAN 526 **Sixteenth-Century Spanish Literature** (3 per semester/maximum of 9) Prose and poetry of major authors: works and trends of the Renaissance and the early Golden Age.
Effective: Fall 1983

SPAN 528 **Seventeenth-Century Spanish Literature** (3 per semester/maximum of 9) Prose and poetry of major authors: works and trends of the late Golden Age and Baroque period.
Effective: Fall 1983

SPAN 537 **Golden Age Theatre** (3 per semester/maximum of 6) Major works of Lope de Vega, Tirso de Molina, Calderon, and others.
Effective: Fall 1983

SPAN 540 **Cervantes** (3 per semester/maximum of 9) The literary works of Cervantes: Don Quijote, other novels, dramatic works, and poetry.
Effective: Fall 1983

SPAN 544 **Spanish Romanticism** (3 per semester, maximum of 9) The major authors and works of peninsular romanticism, including poetry, drama, and prose.
Effective: Spring 2001

SPAN 550 **Spanish Realism** (3 per semester, maximum of 9) The major figures of the period.
Effective: Spring 2001

SPAN 553 **Writings of the "Generation of 1898"** (3 per semester/maximum of 6) Novels, plays, short stories, essays, poetry of Valle-Inclan, Azorin, Benavente, Unamuno, Machado, Maeztu, and Baroja in the context of generation concept.
Effective: Fall 1983

SPAN 560 **The Contemporary Novel in Spain** (3 per semester, maximum of 9) The novel since 1941: Cela, Laforet, Zunzunegui, Suarez Carreno, Matute, and others.
Effective: Spring 2001

SPAN 563 **Contemporary Drama in Spain** (3) Contemporary drama: Garcia Lorca, Casona, Beuro Vallejo, Sastre, Olmo, Muniz, Recuerda, Rodriguez Mendez, Nieva, Riaza, Arrabal, Pedrera, and others.
Effective: Summer 1992

SPAN 566 **Contemporary Spanish Poetry** (3) Various currents in Spanish poetry from the generation of 1927: Lorca, Aleixandre, Salinas, Guillen, Alonso, Alberti, Hernandez, Otero, and others.
Effective: Fall 1983

SPAN 568 **Early Spanish American Literature** (3 per semester/maximum of 9) Content varies; selected topics from colonial period, romanticism, and the nineteenth century before modernism.
Effective: Fall 1983

SPAN 570 **Modernismo** (3) The movement, its antecedents, and its followers, with special emphasis on Ruben Dario.
Effective: Winter 1978

SPAN 574 **The Spanish American Novel** (3 per semester/maximum of 9) Content varies; selected works from the late nineteenth century through the contemporary period.
Effective: Fall 1983

SPAN 575 **The Spanish American Essay** (3) Tracing the history of ideas in Spanish America through major essayists.
Effective: Winter 1978

SPAN 576 **Twentieth-Century Spanish American Poetry** (3) Influential poets and literary movements after Modernismo.
Effective: Winter 1978

SPAN 577 **Spanish American Drama** (3) Dramatic literature in Spanish America from colonial times to the present.
Effective: Winter 1978

SPAN 581 **The Spanish American Short Story** (3) Critical analysis of the major writers and movements from Echeverria to the present.
Effective: Winter 1978

SPAN 587 **Stylistic and Literary Criticism** (3) Major theories of literary criticism applied to Hispanic literature.
Effective: Winter 1978

SPAN 588 **Seminar in Hispanic Literature** (3-12) Common and individual research in special problems in Spanish or Spanish American literature.
Effective: Summer 1988

SPAN 589 (CMLIT 589, FR 589, GER 589) **Technology in Foreign Language Education: An Overview** (3) Approaches to the uses and research applications of multimedia and other educational technologies applied to the teaching of foreign languages. (also crosslisted with APLNG 589)
Effective: Spring 2004

SPAN 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual

basis and which fall outside the scope of formal courses.
Effective: Spring 1987

SPAN 596A **Syntax and Variation** (3) Survey of problems in Hispanic Linguistics, particularly in Syntax.
Effective: Summer 2010 Ending: Summer 2010

SPAN 596B **Women of the Golen Age** (3) Theater and prose of the Golden Age, written by women or featureing women protagonists.
Effective: Summer 2010 Ending: Summer 2010

SPAN 596C **Field Methodologies** (3) Explore the basics of sociolinguistic fieldwork through hands-on experience in the community of San Basilio de Palenque.
Effective: Summer 2010 Ending: Summer 2010

SPAN 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1988

SPAN 597A **The City as Text: Theorizing Urban Landscape** (3) Using several Spanish and European authors from 19th and 20th century, explore questions concerning the city as text.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPAN 597C (LING 597C) **Pidgin and Creole Languages** (3) Study of pidgins (reduced vehicular languages) and creole languages (restructured native languages), principally derived from Spanish and Portuguese, and also from French and English.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPAN 597D **Advanced Studies in Child Language Acquisition** (3) Focus on children's native language acquisition with special attention to: research methods, crosslinguistic data and explanations from linguistic theory.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPAN 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

SPAN 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

SPAN 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Summer 1999

SPAN 603 **Foreign Academic Experience** (1-12) Foreign study and/or research constituting progress toward the degree at a foreign university.
Effective: Spring 2001

SPAN 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

SPAN 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

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Special Education (SPLED)

SPLED 400 **Inclusive Special Ed Foundations: Legal, Characteristics, Collaboration, Assessment, and Management** (4) Legal issues, learner characteristics, collaboration skills, assessment, and behavior management related to educating students with disability in inclusive settings.
Effective: Spring 2010
Prerequisite: EDPSY 014 andEDPSY 010 or relevant child development course (e.g. HD FS 229 HD FS 239). Fifth semester standing or higher

SPLED 401 **Motivating Exceptional Learners** (4) Group and individual techniques to promote student task engagement and prosocial behavior.
Effective: Spring 2001
Prerequisite: or concurrent: a grade of C or better required inSPLED 395W

SPLED 402 **Human Rights: Historical and Current Issues in Special Education** (3) Litigation, legislation, regulation, and advocacy issues impacting on educational and related services for individuals with academic and/or physical disabilities.
Effective: Fall 2001
Prerequisite: or concurrent:SPLED 400 orSPLED 425

SPLED 403A **Evidence-Based Instruction for Elementary Students with Disabilities in Reading, Math, and Writing** (3) Evidence-based methods for design, delivery, and adaption of instruction for elementary students with disabilities in reading, mathematics, and writing.
Effective: Summer 2009
Prerequisite: SPLED 400

SPLED 403B **Evidence-Based Methods for Teaching Secondary Students with Disabilities in Inclusive Settings** (3) Evidence-based methods for designing, delivering, and adapting instruction for students with disabilites in inclusive secondary education settings.
Effective: Summer 2009
Prerequisite: SPLED 400

SPLED 404 **Working with Families and Professionals in Special Education** (3) Strategies for productive interactions between special educators and others such as colleagues, employers, parents, service providers, professionals, and students.
Effective: Spring 1997
Prerequisite: or concurrent: a grade of C or better required inSPLED 425

SPLED 409A **Fundamental Literacy Skills for Students with Special Needs** (3) Effective reading curriculum and teaching methods to teach students with special needs.
Effective: Summer 2006
Prerequisite: A grade of C or better required inSPLED 425, SPLED 395W, SPLED 401, SPLED 412, SPLED 454, SPLED 495E
Concurrent: SPLED 495G

SPLED 409B **Writing and Content Literacy for Students with Special Needs** (3) Effective curriculum and materials for teaching writing and content literacy to students with special needs.
Effective: Summer 2006
Prerequisite: a grade of C or better required inSPLED 425, SPLED 395W, SPLED 401, SPLED 409A, SPLED 412, SPLED 454, SPLED 495E Concurrent: SPLED 495G

SPLED 409C **Mathematics Instruction for Students with Special Needs** (3) Research-based practices for teaching mathematics skills to students with special needs.
Effective: Summer 2006
Prerequisite: a grade of C or better required inSPLED 425, SPLED 395W, SPLED 401, SPLED 409A, SPLED 412, SPLED 454, SPLED 495E Concurrent: SPLED 495G

SPLED 411 **Intervention for Students with Severe Disabilities** (3) Assessment, teaching strategies, curricula, materials, and assistive techniques for use with individuals having severe disabilities (mental and physical).
Effective: Spring 1997
Prerequisite: a grade of C or better required inSPLED 395W, SPLED 401, SPLED 425 Concurrent: a grade of C or better in SPLED 495E

SPLED 412 **Instruction for Students with Mild Disabilities** (4) Appropriate teaching strategies, curriculum sequences, and materials selection and evaluation for children with mild special needs.
Effective: Spring 2007
Prerequisite: a grade of C or better required inSPLED 395W, SPLED 401, SPLED 425, SPLED 454 Concurrent: a grade of C or better required in SPLED 454

SPLED 415 **Early Special Education** (3-4) Includes early identification methods, assessment, curricula, parent involvement, and program evaluation for exceptional preschoolers in mainstreamed or segregated settings.
Effective: Summer 1994
Prerequisite: a grade of C or better required in the following coursesC & S 401 orSPLED 454 ; a course in child development

SPLED 418 **Technologies for Persons with Disabilities** (2) Sensory aids, communication systems, computer systems, expert systems, simulations, and other technologies for students who are academically or physically challenged.
Effective: Spring 2001

Prerequisite: SPLED 400 orSPLED 425

SPLED 425 **Orientation to Human Variation and Special Education Services** (3) An intensive overview of exceptional individuals being served in special education programs across their life-spans, from infancy through adulthood.
Effective: Spring 2007
Prerequisite: declaration of major or minor in Special Education

SPLED 430 **Foundational Skills for Working with Students with Special Education Needs in General Education Classrooms** (1) Introduction to working with students with special education needs in the general education classroom, including history and legal foundation.
Effective: Spring 2009
Prerequisite: teacher certification or permission of instructor

SPLED 431 **Evidenced-Based Methods for Monitoring Student Progress and Making Instructional Decisions** (2) Evidence-based methods for assessing student progress and making data-based instructional decisions.
Effective: Spring 2009
Prerequisite: SPLED 430

SPLED 432 **Evidence-Based Practices for Inclusive Behavior Management** (2) Managing and motivating learners with special needs in general education settings based upon principles of Applied Behavior Analysis.
Effective: Spring 2009
Prerequisite: SPLED 430, SPLED 431

SPLED 433 **Effective and Explicit Instruction for Students with Learning Difficulties** (2) Evidence-based methods for designing, delivering, and adapting academic instruction for students with mild, moderate, and severe learning difficulties.
Effective: Spring 2009
Prerequisite: SPLED 430

SPLED 434A **Evidence-Based Practices for Inclusive Elementary Classrooms** (2) Evidence-based methods to effectively serve special needs students in elementary general education settings, including reading, writing, and mathematics instruction.
Effective: Spring 2009
Prerequisite: SPLED 430, SPLED 431, SPLED 432, SPLED 433

SPLED 434B **Evidenced-Based Practices for Inclusive Secondary Classrooms** (2) Evidence-based methods to effectively serve special needs students in secondary general education settings.
Effective: Spring 2009
Prerequisite: SPLED 430, SPLED 431, SPLED 432, SPLED 433

SPLED 444 **Inclusive Education and Assessment** (6) Knowledge and skills needed to educate students with special needs in urban schools.
Effective: Summer 1994
Prerequisite: ELEDM 400 Concurrent: URBED 395W

SPLED 454 **Assessment for Instruction** (4) Orientation to evaluation of special students with emphasis on the creation, use, and interpretation of teacher-made assessment procedures.
Effective: Spring 2007
Prerequisite: a grade of C or better required inEDPSY 101 Concurrent: a grade of C or better in SPLED 412

SPLED 460A **Fundamentals of Reading Instruction in Special Education** (3) Topics include the interactive nature of reading, recent findings of the National Reading Panel, explicit instruction principles and reading assessments.
Effective: Summer 2006

SPLED 460B **Teaching and Assessing Reading Skills of Students with Special Needs** (3) Topics include methods for assessing and teaching reading skills including fluency, word level decoding and comprehension.
Effective: Summer 2006
Prerequisite: SPLED 460A

SPLED 460C **Specialized Reading Applications in Special Education** (3) Topics include methods for assessing and teaching reading skills in vocational competence, functional reading, reading for students with sensory impairment.
Effective: Summer 2006
Prerequisite: SPLED 460A andSPLED 460B

SPLED 461 **Autism: Issues and Concerns** (1) Overview of issues, characteristics, and evidenced-based assessment strategies, and approaches for individuals with autism/PDD.
Effective: Summer 2006

SPLED 462 **Autism and Applied Behavior Analysis** (4) Basic principles of applied behavior analysis (ABA) and empiricism. Emphasis will be given to ABA principles in educational settings.
Effective: Summer 2006
Prerequisite: SPLED 461

SPLED 463 **Communication and Social Competence** (3) Overview of deficits and strategies in speech, language, and communication across the Autism Spectrum Disorder.
Effective: Summer 2006
Prerequisite: SPLED 461

SPLED 464 **Assessment and Curriculum** (3) Overview of screening, diagnosis, and identification of skills in developmental

domains and curricula for individuals with autism.
Effective: Summer 2006
Prerequisite: SPLED 461

SPLED 465 **Asperger Syndrome** (1) Characteristics, assessment, intervention, and curricula for individuals with Asperger syndrome. Emphasis will be given to social skill development.
Effective: Summer 2006

SPLED 495E **Experience with Exceptional Children** (3) Supervised activities with exceptional children in a variety of possible settings, e.g., schools, institutions, day care centers, vocational settings.
Effective: Spring 2001
Prerequisite: a grade of C or better required inSPLED 395W, SPLED 401, SPLED 425, SPLED 454 . PA Act 34 clearance required. In addition non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers) Concurrent: a grade of C or better in SPLED 411 SPLED 412

SPLED 495F **Practicum in Special Education** (15) Teaching experience with mildly/moderately disabled children in age appropriate settings, e.g., infant/preschools, schools, vocational/job sites.
Effective: Summer 1997
Prerequisite: a grade of C or better required inSPLED 495G . PA Act 34 clearance required. In addition non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)

SPLED 495G **Experience with an Integrated Inclusion Classroom** (4) Supervised teaching in integrated general classrooms with activities in assessment, diagnosis, and direct intervention with students in need or with disabilities.
Effective: Spring 2004
Prerequisite: a grade of C or better required inSPLED 425, SPLED 395W, SPLED 401, SPLED 412, SPLED 454, SPLED 495E . PA Act 34 clearance required. In addition non-Pennsylvania residents must provide evidence of an FBI background information check (Forms: 228 Chambers). Concurrent: a grade of C or better required in SPLED 409

SPLED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

SPLED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1990

SPLED 497A **Teaching Exceptional Students in General Education Settings** (3) Instruction and foundational skills (assessment and management) and knowledge (laws, etiologies, collaboration) for those working with students with special education needs in general education classrooms.
Effective: Summer 2010 Ending: Summer 2010

SPLED 497B **Special Topics in Autism** (1) This course, associated with the Autism Conference is designed to provide practitioners with information about effective instructional and behavior management techniques.
Effective: Summer 2010 Ending: Summer 2010

SPLED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1992

SPLED 498A **Teaching Students with Autism in Inclusive Settings** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SPLED 498A **Autism and Applied Behavior Analysis** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPLED 498B **Inclusion in the Classroom** (2) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SPLED 498B **Teaching Students with Autism and Inclusive Settings** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPLED 498C **Autism and Applied Behavior Analysis** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SPLED 498C **Inclusion in the Classroom** (2) Formal courses given infrequently to explore, in depth, a comparatively

narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPLED 498D **Introduction to Autism Spectrum Disorders** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SPLED 498D **Practicum in Applied Behavior Analysis** (4) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPLED 498E **A Focus on Improving Student Achievement Through Effective Practices** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SPLED 498F **Understanding Deafblindness: Student-Centered Assessment for Severe and Sensory Impairment** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SPLED 498G **Practicum in Applied Behavior Analysis** (4) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SPLED 500 **Seminar in Special Education** (1-9) Continuing series of professional seminars designed to provide a forum for discussion of current and classical research concerning exceptional children.
Effective: Summer 1990
Prerequisite: EDPSY 400 ; 6 credits in special education

SPLED 501 **Administration and Supervision of Educational Programs for Exceptional Children** (2-3) Problems connected with the instituting and organizing of classes for atypical children; the legal phases, finances, teaching personnel, pupil personnel, housing, equipment, courses of study, curriculum, etc.
Effective: Summer 1990
Prerequisite: SPLED 401 andEDLDR 480 or teaching or administrative or supervisory experience

SPLED 503A **Applied Behavior Analysis for Special Education: Basic Principles I** (4) Topics include a history of applied behavior analysis; underlying assumptions; dimensions and characteristics of ABA; ethics; basic terminology and principles.
Effective: Summer 2007

SPLED 503B **Applied Behavior Analysis for Special Education: Basic Principles II** (4) Topics include functional assessment of behavior, ethics, methods to increase and decrease behavior, and generalization.
Effective: Summer 2007
Prerequisite: SPLED 503A

SPLED 503C **Applied Behavior Analysis for Special Education: Extended Applications I** (4) Topics include assessment and intervention for challenging behavior, systems support, classroom applications of ABA, and review of ABA Certification Exam.
Effective: Summer 2007
Prerequisite: SPLED 503A, SPLED 503B

SPLED 505 **Single-Case Research** (3) Overview of research methods associated with collecting and evaluating repeated measures on single cases.
Effective: Summer 2008

SPLED 510 **Problems in the Education of the Mentally Retarded** (2-4) Study of existing curriculums, instructional practices, educational programs; experimentation in curriculum building and materials construction.
Effective: Fall 1994
Prerequisite: SPLED 305;SPLED 401 orSPLED 411

SPLED 515 **Infants and Toddlers with Special Needs** (3) Comparison of typical and atypical development of infants and toddlers; applicable instructional strategies in education.
Effective: Spring 1997
Prerequisite: at least one year teaching experience with elementary-age children

SPLED 516 **Assessment in Early Educational Intervention** (2-3) Describes and illustrates models, methods, and materials for assessing infants and preschoolers with developmental delays and disabilities.
Effective: Summer 1994
Prerequisite: SPLED 415

SPLED 530 **Problems in the Education of the Learning Disabled** (2-4) Review of the research and theoretical implications in the educational and behavioral management of learning disabled children.
Effective: Summer 1994

Prerequisite: SPLED 305

SPLED 540 **Orientation to PhD Study in Special Education** (3) Information and skills needed for successful completion of Ph.D. study in Special Education for those targeting academic careers.
Effective: Spring 2007
Prerequisite: admission to Ph.D. study in Special Education

SPLED 550 **Professional Seminar in Special Education** (1) Professional competencies and ethical issues related to obtaining and retaining positions in higher education.
Effective: Spring 1993
Prerequisite: successful completion of candidacy in special education

SPLED 555 **Curriculum-Based Assessment for Handicapped Learners** (2) Development and use of diagnostic procedures for planning and evaluating instructional programs for handicapped pupils.
Effective: Summer 1990
Prerequisite: SPLED 305 orSPLED 400;SPLED 454

SPLED 570 **Problems in the Education of the Emotionally Disturbed** (2-4) Current issues, methods, and problems associated with the education of the emotionally/behaviorally disturbed.
Effective: Summer 1994
Concurrent: SPLED 305 SPLED 401

SPLED 573 **Introduction to Research in Special Education** (3) A seminar to review and design research in special education.
Effective: Spring 2007
Prerequisite: SPLED 454

SPLED 575 **Grant-Proposal Development in Special Education** (3) Designed to facilitate development of grants and proposal writing techniques for submission and funding by student researchers.
Effective: Spring 1998
Prerequisite: EDPSY 400, SPLED 573

SPLED 594 **Reserach Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1991

SPLED 595 **Internship** (1-12) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required. A specific title may be used in each instance and will be entered on the student's transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.
Effective: Spring 2004

SPLED 595A **Practicum** (1-6) Supervised clinical experience on campus in University-managed diagnostic and remedial settings.
Effective: Spring 1998
Prerequisite: SPLED 412 . PA Act 34 clearance required. In addition non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)

SPLED 595B **Field Experiences in Off-Campus Laboratories** (1-10) Supervised off-campus field experiences in selected laboratory settings with exceptional children.
Effective: Fall 2001
Prerequisite: SPLED 412, SPLED 595A . PA Act 34 clearance required. In addition non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)

SPLED 595C **Internship in Special Education Supervision** (1-6) Internship in day/residential school setting under supervision of field supervisor and University faculty.
Effective: Summer 1990
Prerequisite: SPLED 595B

SPLED 595D **Internship in Special Education** (2-10) Internship to take place in schools or educational situations where student is not regularly employed, under supervision of graduate faculty.
Effective: Spring 1992
Prerequisite: SPLED 495F or teaching experience

SPLED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1990

SPLED 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 1990

SPLED 597A **Evidence-Based Practices in Management of Special Education** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

SPLED 597A **Evidence-Based Practices in Management of Special Education** (3) Formal courses given on a topical or

special interest subject which may be offered infrequently.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SPLED 597B **Practices for Teaching Adolescents with Learning Disabilities in General Education Classrooms** (3) Evidence-based Practices for Teaching Adolescents with Learning Disabilities in General Education Classrooms.
Effective: Summer 2010 Ending: Summer 2010

SPLED 597C **Evidence-based Instruction for Students with Learning Difficulties: The Strategic Intervention Model** (3) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Summer 2010 Ending: Summer 2010

SPLED 597G **Applied Behavior Analysis for Special Education: Extended Applications II** (3) Applied Behavior Analysis for Special Education application of behavior principles in classroom and community settings.
Effective: Summer 2010 Ending: Summer 2010

SPLED 600 **Thesis Research** (1-15) No description.
Effective: Summer 1990

SPLED 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1990

SPLED 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Experience in structuring and teaching a college course supervised by a graduate faculty member.
Effective: Summer 1990

SPLED 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1990

SPLED 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1990

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Statistics (STAT)

STAT 401 **Experimental Methods** (3) Random variables; probability density functions; estimation; statistical tests, t-tests; correlation; simple linear regression; one-way analysis of variance; randomized blocks.
Effective: Spring 1988
Prerequisite: MATH 111 orMATH 141

STAT 402 **Statistical Analysis II** (3) Two-sample problems, single and multifactor ANOVA, simple and multiple regression, categorical data.
Effective: Fall 2007
Prerequisite: STAT 301 . 400 level needed for honors program

STAT 414 (MATH 414) **Introduction to Probability Theory** (3) Probability spaces, discrete and continuous random variables, transformations, expectations, generating functions, conditional distributions, law of large numbers, central limit theorems. Students may take only one course from STAT(MATH) 414 and 418.
Effective: Fall 2001
Prerequisite: MATH 230 orMATH 231

STAT 415 (MATH 415) **Introduction to Mathematical Statistics** (3) A theoretical treatment of statistical inference, including sufficiency, estimation, testing, regression, analysis of variance, and chi-square tests.
Effective: Fall 1989
Prerequisite: MATH 414

STAT 416 (MATH 416) **Stochastic Modeling** (3) Review of distribution models, probability generating functions, transforms, convolutions, Markov chains, equilibrium distributions, Poisson process, birth and death processes, estimation.
Effective: Spring 1984
Prerequisite: STAT 318 orSTAT 414;MATH 230

STAT 418 (MATH 418) **Probability** (3) Fundamentals and axioms, combinatorial probability, conditional probability and independence, probability laws, random variables, expectation; Chebyshev's inequality. Students may take only one course from STAT(MATH) 414 and 418 for credit.
Effective: Fall 2001
Prerequisite: MATH 230 orMATH 231

STAT 440 **Computational Statistics** (3) Topics related to computing in statistics, including numerical linear algebra, optimization, simulation, numerical integration, and bootstrapping.
Effective: Spring 2006
Prerequisite: STAT 200 or equivalentSTAT 415, MATH 220

STAT 460 **Intermediate Applied Statistics** (3) Review of hypothesis testing, goodness-of-fit tests, regression, correlation analysis, completely randomized designs, randomized complete block designs, latin squares.
Effective: Fall 2006
Prerequisite: STAT 200, STAT 220, STAT 240, STAT 250, STAT 301 orSTAT 401

STAT 461 **Analysis of Variance** (3) Analysis of variance for single and multifactor designs; response surface methodology.
Effective: Fall 2007
Prerequisite: STAT 200, STAT 220, STAT 240, STAT 250, STAT 301 orSTAT 401

STAT 462 **Applied Regression Analysis** (3) Introduction to linear and multiple regression; correlation; choice of models, stepwise regression, nonlinear regression.
Effective: Fall 2006
Prerequisite: STAT 200, STAT 220, STAT 240, STAT 250, STAT 301 orSTAT 401

STAT 463 **Applied Time Series Analysis** (3) Identification of models for empirical data collected over time; use of models in forecasting.
Effective: Spring 2006
Prerequisite: STAT 462

STAT 464 **Applied Nonparametric Statistics** (3) Tests based on nominal and ordinal data for both related and independent samples. Chi-square tests, correlation.
Effective: Fall 2006
Prerequisite: STAT 200, STAT 220, STAT 240, STAT 250, STAT 301 orSTAT 401

STAT 466 **Survey Sampling** (3) Introduction to design and analysis of sample surveys, including questionnaire design, data collection, sampling methods, and ratio and regression estimation.
Effective: Spring 2006
Prerequisite: STAT 200, STAT 220, STAT 240, STAT 250, STAT 301 orSTAT 401

STAT 470W **Problem Solving and Communication in Applied Statistics** (3) Provide problem solving and communication skills through development of writing ability, interaction with peers and the SCC, and oral presentations.
Effective: Spring 2000
Prerequisite: STAT 460, STAT 462, STAT 480

STAT 480 **Introduction to SAS** (1) Introduction to SAS with emphasis on reading, manipulating and summarizing data.
Effective: Spring 2008
Prerequisite: 3 credits in statistics

STAT 481 **Intermediate SAS for Data Management** (1) Intermediate SAS for data management.
Effective: Summer 2007
Prerequisite: STAT 480

STAT 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Fall 2007
Prerequisite: 6 credits in statistics

STAT 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Fall 2007
Prerequisite: 6 CREDITS IN STATISTICS

STAT 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships.
Effective: Fall 2007
Prerequisite: 6 credits in statistics

STAT 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

STAT 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

STAT 497A **Advanced Topics in SAS** (1) Advanced statistical procedures in SAS, including ANOVA, GIM, CORR, REG, MANOVA, FACTOR, DISCRIM, LOGISTIC, MIXED, GRAPH, EXPORT, and SQL.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: STAT 480, STAT 481

STAT 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

STAT 500 **Applied Statistics** (3) Descriptive statistics, hypothesis testing, power, estimation, confidence intervals, regression, one- and 2-way ANOVA, Chi-square tests, diagnostics.
Effective: Spring 1999
Prerequisite: one undergraduate course in statistics

STAT 501 **Regression Methods** (3) Analysis of research data through simple and multiple regression and correlation; polynomial models; indicator variables; step-wise, piece-wise, and logistic regression.
Effective: Fall 2006
Prerequisite: STAT 500 or equivalent; matrix algebra

STAT 502 **Analysis of Variance and Design of Experiments** (3) Analysis of variance and design concepts; factorial, nested, and unbalanced data; ANCOVA; blocked, Latin square, split-plot, repeated measures designs.
Effective: Fall 1995
Prerequisite: STAT 462 orSTAT 501

STAT 503 **Design of Experiments** (3) Design principles; optimality; confounding in split-plot, repeated measures, fractional factorial, response surface, and balanced/partially balanced incomplete block designs.
Effective: Fall 1983
Prerequisite: STAT 462 orSTAT 501;STAT 502

STAT 504 **Analysis of Discrete Data** (3) Models for frequency arrays; goodness-of-fit tests; two-, three-, and higher-way tables; latent and logistic models.
Effective: Fall 1983
Prerequisite: STAT 460 orSTAT 502 orSTAT 516 ; matrix algebra

STAT 505 **Applied Multivariate Statistical Analysis** (3) Analysis of multivariate data; T2-tests; particle correlation; discrimination; MANOVA; cluster analysis; regression; growth curves; factor analysis; principal components; canonical correlations.
Effective: Spring 2003
Prerequisite: MATH 441, STAT 501, STAT 502

STAT 506 **Sampling Theory and Methods** (3) Theory and application of sampling from finite populations.
Effective: Fall 1983
Prerequisite: calculus; 3 credits in statistics

STAT 507 **Epidemiologic Research Methods** (3) Research and quantitative methods for analysis of epidemiologic observational studies. Non-randomized, intervention studies for human health, and disease treatment.
Effective: Spring 2005
Prerequisite: STAT 250 or equivalent

STAT 508 **Applied Statistical Distribution Theory** (3) Analysis of data involving non-normal families of distributions; model building and selection, parameterizations, inferential algorithms, transformations, simulations, displays,

interpretations.
Effective: Spring 1988
Prerequisite: STAT 401 orSTAT 409

STAT 509 **Design and Analysis of Clinical Trials** (3) An introduction to the design and statistical analysis of randomized and observational studies in biomedical research.
Effective: Fall 2004
Prerequisite: STAT 500

STAT 510 **Applied Time Series Analysis** (3) Identification of models for empirical data collected over time. Use of models in forecasting.
Effective: Fall 1983
Prerequisite: STAT 462 orSTAT 501 orSTAT 511

STAT 511 **Regression Analysis and Modeling** (3) Multiple regression methodology using matrix notation; linear, polynomial, and nonlinear models; indicator variables; AOV models; piece-wise regression, autocorrelation; residual analyses.
Effective: Fall 2006
Prerequisite: STAT 500 or equivalent; matrix algebra; calculus

STAT 512 **Design and Analysis of Experiments** (3) AOV, unbalanced, nested factors; CRD, RCBD, Latin squares, split-plot, and repeatd measures; incomplete block, fractional factorial, response surface designs; confounding.
Effective: Spring 1984
Prerequisite: STAT 511

STAT 513 **Theory of Statistics I** (3) Probability models, random variables, expectation, generating functions, distribution theory, limit theorems, parametric families, exponential families, sampling distributions.
Effective: Summer 1986
Prerequisite: MATH 230

STAT 514 **Theory of Statistics II** (3) Sufficiency, completeness, likelihood, estimation, testing, decision theory, Bayesian inference, sequential procedures, multivariate distributions and inference, nonparametric inference.
Effective: Summer 1986
Prerequisite: STAT 513

STAT 515 **Stochastic Processes I** (3) Conditional probability and expectation, Markov chains, the exponential distribution and Poisson processes.
Effective: Summer 1986
Prerequisite: MATH 414, STAT 414 orSTAT 513

STAT 517 (MATH 517) **Probability Theory** (3) Measure theoretic foundation of probability, distribution functions and laws, types of convergence, central limit problem, conditional probability, special topics.
Effective: Summer 2000
Prerequisite: MATH 403

STAT 518 (MATH 518) **Probability Theory** (3) Measure theoretic foundation of probability, distribution functions and laws, types of convergence, central limit problem, conditional probability, special topics.
Effective: Fall 1983
Prerequisite: STAT 517

STAT 519 (MATH 519) **Topics in Stochastic Processes** (3) Selected topics in stochastic processes, including Markov and Wiener processes; stochastic integrals, optimization, and control; optimal filtering.
Effective: Fall 1984
Prerequisite: STAT 516, STAT 517

STAT 524 **Ecometrics** (3) Stochastic models and statistical methods in ecological problems; population dynamics, spatial patterns in populations of one, two, or more species.
Effective: Winter 1978
Prerequisite: STAT 414 orSTAT 418

STAT 525 **Survival Analysis I** (3) Location estimation, 2- and K- sample problems, matched pairs, tests for association and covariance analysis when the data are censored.
Effective: Summer 1992
Prerequisite: STAT 512, STAT 514

STAT 526 **Survival Analysis II** (3) Asymptotic theory for Kaplan-Meier estimator, 2- and K- sample rank tests, rank regression, proportional hazards regression.
Effective: Spring 1992
Prerequisite: STAT 525

STAT 527 **Quantitative Ecology** (3) Introduction to quantitative population and community ecology, with emphasis on problems, concepts, and methods using mathematical, statistical, and computational analysis.
Effective: Spring 1988
Prerequisite: STAT 409, BIOL 210

STAT 528 **Statistical Ecology Spectrum** (3) Overview of research and instruction of particular interest to quantitative ecology faculty in the Ecology program.
Effective: Fall 1983
Prerequisite: STAT 527

STAT 540 **Statistical Computing** (3) Computational foundations of statistics; algorithms for linear and nonlinear models,

discrete algorithms in statistics, graphics, missing data, Monte Carlo techniques.
Effective: Fall 1983
Prerequisite: STAT 501 orSTAT 511;STAT 415 ; matrix algebra

STAT 544 **Categorical Data Analysis I** (3) Two-way tables; generalized linear models; logistic and conditional logistic models; loglinear models; fitting strategies; model selection; residual analysis.
Effective: Summer 1992
Prerequisite: STAT 512, STAT 514

STAT 545 **Categorical Data Analysis II** (3) Generalized logit models; symmetry and agreement models; repeated measures; longitudinal data; delta method; asymptotic distributions; ML/WLS; advanced special topics.
Effective: Spring 1992
Prerequisite: STAT 544

STAT 548 **Statistical Distribution Theory** (3) Analytical study of nonnormal models and methods in reliability theory, survival analysis, records evaluation, scale/scale-free analysis, and directional statistics.
Effective: Spring 1984
Prerequisite: MATH 410 orMATH 414 orMATH 416

STAT 551 **Linear Models I** (3) A coordinate-free treatment of the theory of univariate linear models, including multiple regression and analysis of variance models.
Effective: Spring 1987
Prerequisite: MATH 415 orSTAT 415 orSTAT 514;STAT 512;MATH 436 orMATH 441

STAT 552 **Linear Models II** (3) Treatment of other normal models, including generalized linear, repeated measures, random effects, mixed, correlation, and some multivariate models.
Effective: Spring 1987
Prerequisite: STAT 551

STAT 553 **Asymptotic Tools** (3) A rigorous but non-measure-theoretic introduction to statistical large-sample theory for Ph.D. students.
Effective: Summer 2004
Prerequisite: STAT 513 andSTAT 514

STAT 557 (IST 557) **Data Mining I** (3) This course introduces data mining and statistical/machine learning, and their applications in information retrieval, database management, and image analysis.
Effective: Summer 2009
Prerequisite: STAT 318 orSTAT 416 and basic programming skills

STAT 558 (IST 558) **Data Mining II** (3) Advanced data mining techniques: temporal pattern mining, network mining, boosting, discriminative models, generative models, data warehouse, and choosing mining algorithms.
Effective: Summer 2010
Prerequisite: STAT 557 orIST 557

STAT 561 **Statistical Inference I** (3) Classical optimal hypothesis test and confidence regions, Bayesian inference, Bayesian computation, large sample relationship between Bayesian and classical procedures.
Effective: Spring 2003
Prerequisite: STAT 514 Concurrent: STAT 517

STAT 562 **Statistical Inference II** (3) Basic limit theorems; asymptotically efficient estimators and tests; local asymptotic analysis; estimating equations and generalized linear models.
Effective: Spring 2003
Prerequisite: STAT 561

STAT 564 **Theory of Nonparametric Statistics** (3) Estimation and testing based on nonparametric procedures for location and regression models. Distribution theory and asymptotic efficiency.
Effective: Spring 1987
Prerequisite: MATH 415, STAT 415 orSTAT 514

STAT 565 **Multivariate Analysis** (3) Theoretical treatment of methods for analyzing multivariate data, including Hotelling's T2, MANOVA, discrimination, principal components, and canonical analysis.
Effective: Spring 1987
Prerequisite: STAT 505, STAT 551

STAT 572 **Statistical Decision Theory I** (3) Structure of statistical games, optimal strategies, fixed sample-size games.
Effective: Spring 1987
Prerequisite: MATH 415, STAT 415 orSTAT 514

STAT 580 **Statistical Consulting Practicum I** (2) General principles of statistical consulting and statistical consulting experience. Preparation of reports, presentations, and communication aspects of consulting are discussed.
Effective: Spring 2005
Prerequisite: STAT 502;STAT 503, STAT 504, STAT 506

STAT 581 **Statistical Consulting Practicum II** (1 per semester/maximum of 2) Statistical consulting experience including client meetings, development of recommendation reports, and discussion of consulting solutions.
Effective: Summer 2004
Prerequisite: STAT 580

STAT 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

STAT 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

STAT 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1987

STAT 597I **Communication Basic Statistics Concepts** (1) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

STAT 598B (CSE 598B, BIOL 598B) **Bioinformatics I** (3) AR and MA processes, spectrum analysis, regression models, multivariate models.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

STAT 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

STAT 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 1983

STAT 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

STAT 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Fall 1983

STAT 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 2008

STAT 897A **Introduction to Applied Statistics** (3) Descriptive statistics, hypothesis testing, power, estimation, confidence intervals, regression, one- and two-way ANOVA, chi-square tests, diagnostics.
Effective: Summer 2010 Ending: Summer 2010

STAT 897A **Introduction to Applied Statistics** (3) Descriptive statistics, hypothesis testing, power, estimation, confidence intervals, regression, one- and two-way ANOVA, chi-square tests, diagnostics.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Supply Chain Mgmt (SCM)

SCM 400 **Transport Planning** (3) Advanced study of transport systems in supply chain networks.
Effective: Spring 2007
Prerequisite: B A 302 andSCM 404

SCM 404 **Demand Fulfillment** (3) Analysis of demand fulfillment and the role of distribution operations management in the supply chain.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: B A 302

SCM 404 **Demand Fulfillment** (3) Analysis of demand fulfillment and the role of distribution operations management in the supply chain.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: B A 302 orSCM 301

SCM 405 **Manufacturing and Services Strategies** (3) Investigates operations strategy and its relationship to other functions in the supply chain and presents quantitative tools for decision-making.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: B A 302

SCM 405 **Manufacturing and Services Strategies** (3) Investigates manufacturing and services strategies in supply chain networks.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: SCM 301 orB A 302

SCM 406 **Strategic Procurement** (3) Analysis of strategic procurement in the supply chain.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: B A 302 orSCM 301

SCM 406W **Strategic Procurement** (3) Analysis of strategic procurement in the supply chain.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: B A 302

SCM 416 **Warehousing and Terminal Management** (3) Administration of warehouse and terminal functions in logistics systems, with analysis of customer service, forecasting, inventory, investment, design, and operation. Not available to baccalaureate business students in Smeal.
Effective: Spring 2007
Prerequisite: SCM 301

SCM 418 **Logistics Analysis** (3) Design, develop, and use computer decision models for analysis of logistics problems; computer intensive coursework emphasizing spreadsheet applications. Not available to baccalaureate business students in Smeal.
Effective: Spring 2007
Prerequisite: SCM 301, SCM 320 andCMPSC 203

SCM 421 **Supply Chain Modeling and Analysis** (3) Problem solving and modeling methods for analyzing supply chains management.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: SCM 404 orSCM 405 orSCM 406W

SCM 421 **Supply Chain Analytics** (3) Models and Methodologies for supply chain analysis.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: SCM 404 orSCM 405 orSCM 406

SCM 423 **Information Technology in Supply Chains** (3) Appropriate and effective use of information technology in supply chain.
Effective: Spring 2007
Prerequisite: SCM 404 orSCM 405 orSCM 406W

SCM 430 **Transport Problems** (3) Selected problems in transport systems and transport management. Not available to baccalaureate business students in Smeal.
Effective: Spring 2007
Prerequisite: SCM 301 orSCM 320

SCM 432 **Service Supply Chains** (3) Supply chain management in the services sector.
Effective: Spring 2007
Prerequisite: B A 302

SCM 435 **International Logistics** (3) Design and operation of global supply chain networks. Not available to baccalaureate business students in Smeal.
Effective: Spring 2007
Prerequisite: SCM 301 andSCM 320

SCM 445 **Operations Planning and Control** (3) Aggregate production planning procedures, disaggregation methods in hierarchical production planning, master production scheduling, material requirements planning, lot-sizing, and capacity planning. Not available to baccalaureate business students in Smeal.

Effective: Spring 2007
Prerequisite: SCM 310

SCM 450 **Strategic Design and Management of Supply Chains** (3) Strategic design and management of supply chains.
Effective: Spring 2007
Prerequisite: SCM 421

SCM 455 **Logistics Systems Analysis and Design** (3) Customer service, inventory management, transportation, warehousing, purchasing, international logistics, site location planning and analysis, and total cost analysis.
Effective: Spring 2007
Prerequisite: SCM 301 orSCM 310

SCM 456 **Supply Chain Risk Analysis** (3) Business processes are modeled as a network of queues using discrete-event simulation and analyzed model outcomes using statistical methods.
Effective: Spring 2007
Prerequisite: SCM 200 andB A 302

SCM 460 **Purchasing and Materials Management** (3) Purchasing policies, procedures, order specifications and agreements, supplier selection, and the role of purchasing in production planning and inventory management. Not available to baccalaureate business students in Smeal.
Effective: Spring 2007
Prerequisite: SCM 301 orSCM 310

SCM 465 **Electronic Business Management** (3) A problem-based exploration of the various electronic business tools and technologies required to efficiently manage a supply chain. Not available to baccalaureate business students in Smeal.
Effective: Spring 2007
Prerequisite: SCM 301 orSCM 310

SCM 466 **Managerial Forecasting** (3) The use of time series models for business and economic forecasting. Topics include exponential smoothing and Box-Jenkins (ARIMA) models.
Effective: Spring 2007
Prerequisite: B A 302 orSCM 310

SCM 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2007

SCM 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 2008

SCM 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 2007

SCM 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2007

SCM 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2007

SCM 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2007

SCM 530 **Supply Chain Analysis** (3) Methods and tools to support supply chain decision making with emphasis on forecasting, inventory analysis, and demand planning.
Effective: Summer 2007
Prerequisite: SCM 800, SCM 810 andSCM 820

SCM 540 **Transportation in Supply Chains** (2) Strategies and processes for design and implementation of transportation service links in supply chain networks.
Effective: Summer 2002
Prerequisite: B A 510 or permission of program

SCM 546 **Strategic Procurement** (2) Development of procurement and supply management strategies to support synchronized supply chains.
Effective: Summer 2002
Prerequisite: B A 510 or permission of program

SCM 556 **Manufacturing Strategy** (2) Development of service-sensitive manufacturing strategies to support synchronized supply chains.
Effective: Summer 2002
Prerequisite: B A 510 or permission of program

SCM 566 **Demand Fulfillment** (2) Demand fulfillment strategies, operations, and methods in supply chain networks.
Effective: Summer 2002
Prerequisite: B A 510 or permission of program

SCM 570 **Supply Chain Modeling** (2) Explore current modeling methods and software for design, analysis, execution and integration of supply chains.
Effective: Summer 2002
Prerequisite: SCM 556

SCM 576 **Logistics and Supply Chain Leadership** (2) Current issues and best practices for selected supply chain leadership topics.
Effective: Summer 2002
Prerequisite: SCM 546, SCM 556, SCM 566

SCM 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2007

SCM 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2004

SCM 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be tuaght in one year or semester.
Effective: Spring 2002

SCM 800 **Supply Chain Management** (4) Introduction to the strategic framework, issues, and methods for integrating supply and demand management within and across companies.
Effective: Summer 2007

SCM 810 **Transportation and Distribution** (4) Role of transportation and distribution operations in matching supply with demand; principles of transport industry analysis and competitive positioning.
Effective: Summer 2007
Prerequisite: SCM 800

SCM 820 **Strategic Procurement** (4) Strategic planning for the source/buy process, including developing and managing supplier relationships, global issues, and e-procurement.
Effective: Summer 2007
Prerequisite: SCM 800

SCM 830 **Supply Chain Analysis** (2) Methods and tools to support supply chain decision making with emphasis on forecasting, inventory analysis, and demand planning.
Effective: Summer 2007
Prerequisite: SCM 800, SCM 810 andSCM 820

SCM 840 **Supply Chain Project Management** (4) The fundamentals and tools of managing supply chain projects, with special emphasis given to related information technology projects.
Effective: Summer 2007
Prerequisite: SCM 800, SCM 810 andSCM 820

SCM 850 **Supply Chain Design and Strategy** (4) Design and management of supply chain networks, emphasizing the alignment of supply chain networks with corporate competitive strategy.
Effective: Summer 2007
Prerequisite: SCM 800, SCM 810, SCM 820

SCM 860 **Supply Chain Transformation and Innovation** (4) Strategic supply chain transformation and innovation with emphasis on (re)configuration of key capabilities to achieve competitive advantages.
Effective: Summer 2007
Prerequisite: SCM 800, SCM 810, SCM 820, SCM 830, SCM 840 andSCM 850

SCM 894 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2007

SCM 896 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2007

SCM 897 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Summer 2007

SCM 898 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered

infrequently; several different topics may be taught in one year or term.
Effective: Summer 2007

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Surveying (SUR)

SUR 441 **Data Analysis and Project Design** (3) Post least squares adjustment analysis of control networks, statistical testing, blunder detection, network design considerations, and computer optimization techniques.
Effective: Summer 1994
Prerequisite: STAT 401 orSTAT 451, SUR 341

SUR 445 **Numerical Methods in Adjustment Computations** (3) Computer optimization techniques used in adjustment of large, sparse, positive-definite matrices with emphasis on efficient storage and solution routines. Lab.
Effective: Spring 2001
Prerequisite: SUR 341

SUR 455 **Precise Positioning Systems** (3) Stellar coordinate systems; geodetic reference coordinate systems; satellite orbital theory; global positioning systems; pseudo-ranging; GPS vector adjustments.
Effective: Summer 1994
Prerequisite: SUR 351 . Prerequisite or concurrent:SUR 441

SUR 465 **Multipurpose Land Information Systems Applications** (3) Using a GIS as a decision tool; spatial modeling; data structure and management issues; legal issues; case studies; application projects.
Effective: Spring 2001
Prerequisite: SUR 362

SUR 471 **Professional Aspects of Land Surveying** (3) Ethical issues and legal limits of practice; surveyor as an expert witness; surveyor-client relationship; responsibilities to the profession.
Effective: Summer 1994
Prerequisite: SUR 372W

SUR 482 **Land Development Design** (3) The land development process; geometric, environmental, aesthetic aspects of development; local regulatory requirements; preparation of final plat and report.
Effective: Summer 1994
Prerequisite: SUR 313, SUR 471

SUR 485 **Stormwater Management Design** (2) Regulations, design storms, runoff volumes, hydrographs, routing methods, detention, BMPs, innovative design, groudwater recharge.
Effective: Spring 2008
Prerequisite: SUR 285 fifth-semester standing

SUR 490 **Seminar in Surveying** (1) Individual or group work in surveying.
Effective: Summer 1994
Prerequisite: senior standing

SUR 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an indiviudal basis and that fall outside the scope of formal courses.
Effective: Summer 1993

SUR 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1993

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Swahili (SWA)

SWA 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

SWA 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

SWA 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Spring 1995

SWA 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 1992

SWA 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Systems Engineering (SYSEN)

SYSEN 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1999

SYSEN 497A **Wireless Positioning** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

SYSEN 505 **Technical Project Management** (3) Analysis and construction of project plans for the development of complex engineering products taken from a variety of problem domains.
Effective: Fall 2003

SYSEN 507 **Systems Thinking** (3) The theory and practice of systems thinking. General systems theory; system dynamics, emergent properties, structure, feedback and leverage.
Effective: Spring 2009

SYSEN 509 **Biostatistics** (3) Multivariate Statistical methodology arising in the health care and biological sciences.
Effective: Summer 2005
Prerequisite: Students should have completedSTAT 500 or have instructor's permission.

SYSEN 510 **Engineering Analysis I** (3) The course includes applications of advanced engineering mathematics; the study of systems are described by ordinary/partial differential equations and methods of solutions.
Effective: Spring 2001
Prerequisite: students should have completed calculus at the undergraduate level or have instructor's permission

SYSEN 511 **Engineering Analysis II** (3) The course includes applications of advanced engineering mathematics; study numerical solutions, linear algebra, scalar/vector field theory, Fourier methods, and partial differential equations.
Effective: Spring 2001
Prerequisite: SYSEN 510 or instructor's permission

SYSEN 520 **Systems Engineering** (3) Fundamentals of Systems Engineering with focus on System methodology, design, and management; includes life cycle analysis, human factors, maintainability, serviceability/reliability.
Effective: Spring 2001
Prerequisite: SYSEN 510 orSYSEN 511 or instructor's permission

SYSEN 530 **Systems Optimization** (3) Theory/practice of linear programming will be developed including determination of optimum mix of products, levels of staffing, blending, network analysis, multi-period planning.
Effective: Spring 2001
Prerequisite: SYSEN 520 or instructor's permission

SYSEN 531 **Probability Models and Simulation** (3) Provides background in modeling problems containing random components that must be accounted for in a reasonable solution.
Effective: Summer 2007

SYSEN 533 **Deterministic Models and Simulation** (3) Provides a background in simulation and the modeling of problems that contain differential equations as part of the system.
Effective: Summer 2007

SYSEN 535 **Statistical Methods in Research** (3) Multiple Linear Regression methods including logistic regression will be introduced and specialized to include the experimental designs useful in research.
Effective: Summer 2005
Prerequisite: Students should have completedSTAT 500 or have instructor's permission

SYSEN 536 **Decision and Risk Analysis in Engineering** (3) Analysis of engineering decisions under uncertainty; problem identification, formulation, judgment, resolution; mitigation, risk analysis, quantification and management.
Effective: Summer 2008

SYSEN 540 **Intelligent System Applications** (3) Mathematical foundations of intelligent control and systems; linear quadratic self-tuning regulation and model reference adaptive control.
Effective: Summer 2002
Prerequisite: approval of instructor or department

SYSEN 545 **Neural Networks** (3) Artificial neural network architectures; perceptrons including training algorithms; extensive use of applications and simulations.
Effective: Summer 2002
Prerequisite: approval of instructor or department

SYSEN 550 **Creativity and Problem Solving I** (3) Foundations of individual problem solving, including creativity, cognitive

style and level, problem solving processes and techniques, the paradox of structure.
Effective: Spring 2006

SYSEN 552 **Creativity and Problem Solving II** (3) Theory and practical applications of group problem solving, including cognitive gap, coping behavior, agents of change, and managing cognitive diversity.
Effective: Summer 2005
Prerequisite: SYSEN 550

SYSEN 554 **Problem Solving Leadership** (3) Models, processes, and techniques for solving complex problems, managing problem solving diversity, and facilitating change through problem solving in socio-technical systems.
Effective: Summer 2007
Prerequisite: SYSEN 550, SYSEN 552

SYSEN 555 **Invention and Creative Design** (3) This course focuses on the creative design process which leads to the development of new products, processes, and systems (i.e. invention).
Effective: Spring 2001

SYSEN 566 **Advanced Telecommunications** (3) Review of digital communications and in-depth discussions on the latest communication architectures, protocols, and applications.
Effective: Summer 2002
Prerequisite: prior coursework in Data Communications or Introduction to Telecommunications or IT Network Management I and IT Network Management II

SYSEN 590 **Colloquium** (1-3) Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1999

SYSEN 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1999

SYSEN 594A **Masters Research Paper** (3) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 2010 Ending: Summer 2010

SYSEN 594C **Advanced Systems Engineering Studio** (3) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SYSEN 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1999

SYSEN 596A **Exercising Problem Solving Leadership in an Engineering Team** (3) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 2010 Ending: Summer 2010

SYSEN 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Spring 1999

SYSEN 597A **Fundamentals of Continuous Improvement** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 2010 Ending: Summer 2010

SYSEN 597A **Fundamentals of Continuous Improvement** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

SYSEN 597B **Fundamentals of Continuous Improvement II** (3) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

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Telecommunications (TELCM)

No courses for department code **TELCM** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Theatre (THEA)

THEA 400 **Advanced Theatre Projects** (1-6 per semester) Individual and group-directed study of in-depth projects involving reading, discussion, performance, and critical analysis by faculty.
Effective: Spring 1991
Prerequisite: seventh-semester standing or 12 credits in theatre or related areas

THEA 401Y (IL) **Theatre History I: Ancient to 1700** (3) Survey of drama and theatre from primitive rites through the Renaissance.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 402W **Theatre History II: From 1700 to Present** (3) Survey of European drama and theatre from the eighteenth century through the modern period.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 405 (US) **Theatre History: American Theatre** (3) Survey of American drama and theatre from the colonial period to the present.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 406 (IL) **Theatre in Asia** (3) A survey of major theatre forms and traditions in Asia.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 407 (US) (WMNST 407) **Women and Theatre** (3) A study of theatre practice and dramatic literature as informed by issues of gender, race, and ethnic background.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 408 (US) **History of American Musical Theatre** (3) A survey of the history of American musical theatre presented in a social, cultural, and aesthetic prospective.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 410 **Play Analysis** (3) Advanced skills in textual analysis of plays and screenplays.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 412 (US;IL) (AAA S 412) **African American Theatre** (3) Exploration of the development of African American theatre from its roots in Africa through the diaspora, to the present time.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 423 **Musical Theatre Performance III** (2) Studio training in the unique performance skills, repertoire and business of professional musical theatre.
Effective: Spring 2006
Prerequisite: THEA 224 seventh-semester standing in the Musical Theatre Option

THEA 424 **Musical Theatre Performance IV** (2) Studio training in the unique performance skills, repertoire and business of professional musical theatre.
Effective: Spring 2006
Prerequisite: THEA 423

THEA 425A **B.F.A. Acting Studio II** (2) Scene Study
Effective: Summer 2005
Prerequisite: THEA 115, THEA 225A Concurrent: THEA 425C

THEA 425C **B.F.A. Voice/Speech Studio II** (2) Advanced voice and speech training for BFA Musical Theatre students.
Effective: Summer 2005
Prerequisite: THEA 225C Concurrent: THEA 425A

THEA 426 **Children's Theatre** (3) Theories and practice of theatre for children.
Effective: Spring 2001
Prerequisite: THEA 150, THEA 220

THEA 427A **B.F.A. Acting Studio III** (2) Continuation of THEA 425A
Effective: Summer 2005
Prerequisite: THEA 425A Concurrent: THEA 427C

THEA 427C **B.F.A. Voice/Speech Studio III** (2) Stage Dialect Studies
Effective: Summer 2005
Prerequisite: THEA 425C Concurrent: THEA 427A

THEA 428 **Creative Drama** (3) Exercises and techniques for creative growth of children and adults, creative interaction for classroom, recreational, social, or therapeutic environments.
Effective: Spring 1991

Prerequisite: fifth-semester standing

THEA 429 **Theatre Performance Practicum** (1-3 per semester) Supervised experience in rehearsal and performance of significant roles.
Effective: Fall 1983
Prerequisite: admission by audition only

THEA 434 **Introduction to Directing** (3) Introduction to principles and procedures of play direction.
Effective: Spring 2001
Prerequisite: THEA 114 orTHEA 410;THEA 160, THEA 170 orTHEA 180

THEA 436 **Directorial Processes** (3) Preparing a play for production including the scoring of thescript, developing ground plan, casting, and staging projects in American realism.
Effective: Spring 1991
Prerequisite: THEA 434 and approval of instructor prior to registration

THEA 437 **Artistic Staff for Production** (1-6) To provide students with experience in choreography, dramaturgy, combat, staging, voice/speech, musical direction, assisting in direction, for major productions.
Effective: Summer 1989
Prerequisite: approval of the proposed assignment by the instructor prior to registration

THEA 439 **Projects in Directing** (1) Projects in directing for analysis and critique.
Effective: Spring 1991
Prerequisite: THEA 436 and approval of proposed project by instructor prior to registration

THEA 440 **Principles of Playwriting** (3) Structure, dramatic effect, characterization, and dialogue; the writing, reading, and criticism of original one-act plays.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 447 **Make-Up Design for Production** (1-6) Materials, research, preparation, design, execution of make-up for major University Theatre productions.
Effective: Summer 1989
Prerequisite: approval of proposed assignment by the instructor prior to registration

THEA 450 **Advanced Topics in Scene Design** (3 per semester/maximum of 6) Design emphasis on a variety of production techniques, genre, and styles.
Effective: Spring 2006
Prerequisite: THEA 250 or portfolio review

THEA 451 **Drafting, Drawing, and Painting for the Theatre** (1) Drafting, freehand drawing including perspective methods and property development, rendering techniques, and painters' elevations.
Effective: Summer 1993
Prerequisite: THEA 251, THEA 252 and prior approval of instructor; first-year MFA theatre candidacy

THEA 452 **Advanced Presentation Techniques** (1) Advanced drafting, freehand drawing, rendering techniques, model building, and reproduction techniques.
Effective: Summer 1993
Prerequisite: THEA 451

THEA 453 **Advanced Scene Painting** (1 per semester, maximum of 12) Practicum study in painting techniques currently in professional use. Exploration of tools, available paints, and texturing materials.
Effective: Spring 1991
Prerequisite: THEA 253

THEA 454 **Period Research for the Theatre** (3) History of decor, styles, and movements in art and architecture.
Effective: Summer 1993
Prerequisite: BFA theatre arts candidacy or permission of instructor

THEA 455 **Twentieth Century Design** (3) Seminar study of movements, practices, methods, and designers in the modern theatre.
Effective: Summer 1993
Prerequisite: BFA theatre arts candidacy and prior approval of faculty

THEA 456 **Scenic Projects for Production** (1 per semester, maximum of 6) Special projects for production; painting, properties, design assistance.
Effective: Summer 1993
Prerequisite: approval of proposed projects by instructor prior to registration

THEA 457 **Scene Design for Production** (1 per semester/maximum of 6) Design and execution of production projects.
Effective: Fall 1983
Prerequisite: approval of proposed project by instructor prior to registration

THEA 458 **Digital Imaging for the Theatre** (1) Introduction to imaging software and its application in theatrical design and production.
Effective: Summer 2005
Prerequisite: Design or Visual Arts major or permission of program

THEA 459 **Theatre Portfolio & Business Practices** (2) Life as a professional theatre designer. Contracts, taxes, record-keeping, resumes, portfolios, interviewing, job hunting, and legal considerations.
Effective: Spring 2006

Prerequisite: B.F.A. Theatre candidacy

THEA 460 **Advanced Topics in Costume Design** (3 per semester/maximum of 6) Developing and executing a design concept in a variety of the performing arts.
Effective: Spring 2006
Prerequisite: THEA 260, THEA 464

THEA 461 **Advanced Topics in Costume Construction and Technology** (3 per semester/maximum of 6) A specialized course in advanced costume construction techniques and theatrical costume technologies.
Effective: Spring 2006
Prerequisite: THEA 261

THEA 464 **History of Fashion** (3) Survey of dress from Egyptian period to contemporary fashion.
Effective: Spring 2008
Prerequisite: THEA 100 orTHEA 105

THEA 465 **History of Fashion II** (3) Survey of dress from 1800 to contemporary fashion.
Effective: Summer 2004
Prerequisite: THEA 100 orTHEA 105

THEA 466 **Costume Construction for Production** (1 per semester/maximum of 6) Execution of production projects in construction and shop management.
Effective: Fall 1983
Prerequisite: approval of proposed project by instructor prior to registration

THEA 467 **Costume Design for Production** (1 per semester/maximum of 6) Design and execution of production design projects.
Effective: Fall 1983
Prerequisite: approval of proposed project by instructor prior to registration

THEA 470 **Advanced Topics in Lighting Design** (3 per semester/maximum of 6) Advanced Topics in Lighting Design will rotate through opera, dance, non-traditional spaces, architecture, advanced technology, and color theory.
Effective: Spring 2006
Prerequisite: THEA 270

THEA 471 **Stagelighting Design II** (3) Advanced training through lectures and laboratory experience with color, shape, and form as it relates to the specifics of illumination.
Effective: Summer 1993
Prerequisite: THEA 470

THEA 472 **Lighting Technology** (3) An introduction to the basics of electricity, dimmer protocols, lightboard programming, lighting paperwork, and master electrician & assistant lighting design practices.
Effective: Summer 2005
Prerequisite: THEA 270 or equivalent

THEA 473 **The History of Stage Lighting Technology** (3) An exploration of the history of stage lighting from the development of electric light to the present.
Effective: Summer 1993
Prerequisite: THEA 270

THEA 475 **Creative Lighting in the Entertainment Arts** (3) Survey/analysis of the growth of creative lighting in venues other than theatre; advances in design for the entertainment world.
Effective: Summer 1993
Prerequisite: THEA 270 and consent of instructor

THEA 477 **Lighting Design for Production** (1 per semester/maximum of 6) Design and execution of design projects.
Effective: Fall 1983
Prerequisite: approval of proposed project by instructor prior to registration

THEA 480 **Advanced Topics in Technical Direction for the Theatre** (3 per semester/maximum of 6) Advanced study of the methods, materials, equipment, facilities, concepts and processes associated with Technical Direction for the Theatre.
Effective: Summer 2005
Prerequisite: THEA 280

THEA 480A **Technical Production III** (3) Technical draftings; focus on the creation of packages of drawings based on designer elevations from actual productions; drafting intensive.
Effective: Spring 2001
Prerequisite: THEA 150, THEA 251, THEA 381

THEA 480B **Technical Production IV** (3) Discussion of problems of the technical director: personnel management, time management, scheduling, budgeting, purchasing, and the technical drawing of production.
Effective: Spring 1995
Prerequisite: THEA 381

THEA 481 **Stage and Production Management** (3) Production planning, scheduling, assignment of personnel, rehearsal procedures, and budgeting.
Effective: Fall 1983
Prerequisite: THEA 170, THEA 180

THEA 483A **Technical Production V** (3) Calculation for, and specification of advanced wood structures and rigging for theatrical production.

Effective: Summer 1993
Prerequisite: THEA 480A

THEA 483B **Technical Production VI** (3) Tool maintenance necessary in the scene shop and the procedures, tracking, and repair information necessary for the technical director.
Effective: Summer 1993
Prerequisite: THEA 480B

THEA 484 **Sound Recording Techniques** (3) Multi-track audio recording and post production techniques.
Effective: Summer 2005
Prerequisite: INART 258 orTHEA 285

THEA 485 **Sound for Theatre Production** (3) Aesthetics of live and recorded sound; recording and editing techniques for the stage.
Effective: Spring 2001
Prerequisite: THEA 100, THEA 150

THEA 486 **Stage Management for Production** (1-9) Stage manager for University Theatre production.
Effective: Summer 1996
Prerequisite: approval of proposed assignment by instructor prior to registration

THEA 487 **Technical Projects for Production** (1 per semester/maximum of 6) Execution of practical production projects.
Effective: Fall 1983
Prerequisite: approval of proposed project by instructor prior to registration

THEA 489 **Theatre Production Practicum** (1 per semester) Supervised experience in production techniques. For theatre majors only.
Effective: Spring 2001
Prerequisite: THEA 160, THEA 170 orTHEA 180

THEA 495 **Internship Practicum** (1-6 per semester/maximum of 12) Professional field experience in theatre performance, production, and management assignments.
Effective: Fall 1983
Prerequisite: approval of internship by instructor prior to registration

THEA 496 **Independent Studies** (1-18) Creative projects, including research and design, supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1983

THEA 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1983

THEA 497A **Theatre Professional Preparation** (3) Profession Preparation for undergraduate theatre students.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

THEA 497B **Musical Theatre Studio V** (2) Senior Musical Theatre Studio for Musical Theatre Majors.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

THEA 497C **Camera Acting** (3) Acting for the camera techniques.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

THEA 497D **Writer's Room** (3) Writing workshop for theatre productions.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

THEA 497E **Properties Design and Construction** (3) Design and Construction of props for production.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

THEA 497F **Comedy Writing** (3) Comedy writing for performance.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

THEA 497G **The Social History of the Theater** (3) We will explore plays and cultures that reflect and comment upon the ills and triumphs of society over 2,500 years.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

THEA 497H **Honors London Theatre Study** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

THEA 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Summer 1994

THEA 498A **Theatre Capstone Experience** (3) The culminating course for majors concentrating on reflective analyses and a practical laboratory experience in the mounting of a production.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

THEA 499 (IL) **Foreign Studies--Theatre Arts** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005
Prerequisite: approval by department

THEA 500 **Theatre Research: Sources and Procedure** (3) Source materials and techniques as applied to theatre research; the form and content of theses and monographs.
Effective: Winter 1978

THEA 501 **Production Process** (3) Exploration and development of the creative processes which lead to realized production.
Effective: Summer 1993
Prerequisite: MFA theatre design and technology students

THEA 502 **Creative Collaboration** (3) Theory and process of creative collaboration between the theatre artistic and production staffs.
Effective: Summer 1993
Prerequisite: MFA theatre candidate

THEA 503 **Theatre Criticism and Theory I** (3) Examining significant documents of theory/criticism from Greek theatre to Collier. Theory applied to specific plays within that period.
Effective: Summer 1990
Prerequisite: THEA 500

THEA 504 **Theatre Criticism and Theory II** (3) Examining sifnificant documents of theory/criticism from collier controversy to the present. Theory applied to specific plays within that period.
Effective: Summer 1990
Prerequisite: THEA 500

THEA 505 **Masterpieces in Production I** (3) Dramatic structure, theatrical validity, production viability of great plays from Greek to eighteenth-century. Drama as blueprint for production.
Effective: Summer 1990

THEA 506 **Masterpieces in Production II** (3) Dramatic structure, theatrical validity, production viability of masterworks of theatre. Drama as the blueprint for production. Offered in London, England.
Effective: Fall 2004
Prerequisite: THEA 500, THEA 505

THEA 507 **Masterpieces in Production III** (3) Dramatic structure, theatrical validity, production viability of major American plays from Tyler to the present. Drama as blueprint for production.
Effective: Spring 1990

THEA 508 **Experiential Analysis of Italian Design Styles** (3) Applications of Historical and Cultural Perspectives in Dramatic Production. Offered in Italy.
Effective: Fall 2009

THEA 509 **Experiential Analysis of Eastern European Styles** (3) Applications of Historical and Cultural Perspectives in Dramatic Production. Offered in Prague and Budapest.
Effective: Fall 2009

THEA 510 **Experiential Analysis of Period Style** (3) Applications of Visual/Spatial History in Dramatic Production. Offered in London, England.
Effective: Spring 2004

THEA 524 **Acting V** (2) Advanced scene study and class projects; development of individual student repertoires.
Effective: Spring 1996
Prerequisite: THEA 523A

THEA 526 **Acting for the Camera** (2) Development of techniques and skills necessary for media performance: commercials, soap operas, television drama, etc.
Effective: Spring 1996
Prerequisite: THEA 524, THEA 525

THEA 529 **Performance Monograph** (1-2 per semester, maximum of 4) The development and presentation of M.F.A. monographs in acting, design/ production, or directing.
Effective: Spring 1996
Prerequisite: permission of graduate supervisor

THEA 530 (THEA 222) **Rehearsal Methods for the Director** (3) Theory and practice in approaches, procedures, and techniques in mounting a play.
Effective: Fall 1985
Prerequisite: THEA 410, THEA 434, permission of instructor prior to registration

THEA 531 **Directorial Styles and Approaches** (2) Seminar in advanced theory and directorial practice. Designed for the advanced student of directing.
Effective: Fall 1999
Prerequisite: THEA 530

THEA 532 **Directing Seminar** (2) Career orientation: resume preparation, interviewing, unions, survey of directorial opportunities, and review of major contemporary directors and practices.
Effective: Fall 1999
Prerequisite: THEA 531

THEA 536 **Directing for the Camera** (2) Development of techniques and skills necessary for media directing: commercials, soap operas, television drama, etc.
Effective: Summer 1999
Prerequisite: THEA 531, THEA 532

THEA 537 **Artistic Staff for Performance in Production** (1 per semester/maximum of 6) Practical experience in choreography, dramaturgy, combat, special staging, voice/speech work, musical direction, or assisting in stage direction for university theatre productions.
Effective: Spring 1990
Prerequisite: approval of the assignment by the produced (Chair) prior to registration

THEA 539 **Projects in Directing** (1-2) Approved directing projects for the M.F.A. directing student.
Effective: Spring 1990
Prerequisite: THEA 410 ; admission to the M.F.A. directing program

THEA 543 **Projects in Playwriting** (1-9) Preparation of the script for revision during and following production of the student's original play.
Effective: Fall 1983
Prerequisite: production approval

THEA 550 **Scenic Design III** (3 per semester/maximum of 9) Advanced design, concentration on conceptualization, visual communication skills, portfolio production.
Effective: Fall 1983
Prerequisite: THEA 450 portfolio review

THEA 551 **Scenic Design IV** (1-6) Advanced projects in scenic design.
Effective: Fall 1983
Prerequisite: THEA 550 or protfolio review

THEA 552 **Scene Design III** (3) Design and project execution of plays and industrial installations.
Effective: Summer 1994
Prerequisite: THEA 551 MFA theatre design candidacy

THEA 553 **Scene Design IV** (3) Design of plays for proper theatre and mass media.
Effective: Summer 1994
Prerequisite: THEA 552 MFA theatre design candidacy

THEA 554 **Period Research for the Theatre** (3) History of decor, styles, and movements in art and architecture.
Effective: Spring 1994
Prerequisite: MFA candidacy

THEA 555 **Twentieth Century Design** (3) Seminar study of movements, practices, methods, and designers in the modern theatre.
Effective: Spring 1994
Prerequisite: MFA camdidacy or approval of the theatre arts department

THEA 559 **Portfolio Presentation** (1 per semester, maximum of 2) Current practice in portfolio development and presentation to client and employer.
Effective: Spring 1994
Prerequisite: prior approval of faculty

THEA 560 **Costume Design III** (3 per semester/maximum of 9) Advanced costume design with emphasis on total production concept.
Effective: Fall 1983
Prerequisite: THEA 460 or portfolio review

THEA 562 **Costume Design: Rendering Techniques** (3) Exploration and development of various rendering techniques with application to costume design.
Effective: Spring 1994
Prerequisite: MFA candidacy

THEA 564 **History of Costume** (3) Exploration of dress from Egyptian to modern.
Effective: Fall 1983
Prerequisite: permission of instructor prior to registration

THEA 568A **Costume Design for Related Performance Arts** (3) Exploration and development of costume design with

application to the other arts (opera/dance/film).
Effective: Spring 1994
Prerequisite: MFA candidacy

THEA 568B **Costume Design: Production Concepts** (3) Exploration and development of costume design for specific production concepts.
Effective: Spring 1994
Prerequisite: MFA candidacy

THEA 569 **Costume Construction: Crafts** (3) Exploration and development of various crafts techniques with application to costume construction (i.e. masks, jewelry, armor, millinery, footwear, wigs).
Effective: Spring 2010

THEA 570 **Stage Lighting Design III** (3) Advanced techniques in the art of theatrical lighting design.
Effective: Fall 1983
Prerequisite: THEA 470

THEA 571 **Stage Lighting Design IV** (3) Course addresses individual problems in the stage lighting design process concentrating on the development of skills necessary for processional examination.
Effective: Spring 1994
Prerequisite: THEA 570

THEA 580 **Technical Production III** (3) Design consultation and specification of equipment, systems, and movable structures for new theatres; structures and projection devices for production.
Effective: Fall 1983
Prerequisite: THEA 480B

THEA 580A **Technical Production VII** (3) Mechanical design for the theater; calculation for and specification of, DC motors and controls, sprockets, chain drives, gearboxes, gearing, shafts for the movement of scenery.
Effective: Spring 1994
Prerequisite: THEA 480A, THEA 483A

THEA 580B **Technical production VIII** (3) Planning of the theater shop; emphasis on space design, renovation, upgrade, planning, outfitting, and safety; selection of tools and tool support systems.
Effective: Spring 1994
Prerequisite: THEA 480B

THEA 581 **Theatre Administration I** (3) Organizational structure and personnel; contracts; unions; budget preparation and control; administrative styles in theatre, opera, and dance.
Effective: Fall 1983
Prerequisite: THEA 481

THEA 582 **Theatre Administration II** (3) Fund raising; promotion; audience development; audience survey technique; program development and startegies.
Effective: Fall 1983
Prerequisite: THEA 581

THEA 583 **Projects in Theatre Administration, Management, and Operations** (1-6) No description.
Effective: Winter 1978

THEA 585 **Theatre Planning** (3) Processes and problems in planning and designing theatres: performance, audience, and technical requirements.
Effective: Winter 1978

THEA 586 **Stage Management for Production** (1 per semester/maximum of 6) Practical experience in production stage management for mainstage university theatre productions.
Effective: Spring 1990
Prerequisite: approval of the proposed assignment by the instructor prior to registration

THEA 589 **Design/Production Monograph** (1-4) The development and presentation of M.F.A. monographs in design/production.
Effective: Summer 1995

THEA 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1987

THEA 595 **Internship** (1-3) Professional field experience in theatre performance, production, and management assignments.
Effective: Spring 1987
Prerequisite: approval of internship by instructor prior to registration

THEA 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1987

THEA 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1987

THEA 597A **Director/Design Collaboration** (3) Director and Designer Collaboration for MFA students.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: admittance to MFA Program

THEA 597B **Design Collaboration for Directors** (2) Design course for MFA Directing Candidates.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: admittance to MFA in Directing

THEA 600 **Thesis Research** (1-15) No description.
Effective: Fall 1983

THEA 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Teaching of theatre and film classes under senior faculty supervision.
Effective: Fall 1983

THEA 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Fall 1983

THEA 811 **International Studio Intensive** (1-9) The course enhances the ability of the actor to meet the voice and speech demands for the performance of Shakespeare.
Effective: Fall 2007

THEA 811A **International Production Studio Intensive** (1 per semester/maxium of 9) Intensive studio application of processes and procedures within specific theatre disciplines as influenced by the work of international professionals.
Effective: Summer 2009
Prerequisite: THEA 500, THEA 505

THEA 820A **Acting I** (4) Exercises, monologue, and scene study. Principal focus on realism.
Effective: Spring 2009
Prerequisite: admission to the MFA performance acting program

THEA 820B **Movement for Actors I** (2) Techniques and skills in physical expression, awareness, control, and stage movement.
Effective: Fall 2007
Prerequisite: admission to MFA performance acting program

THEA 820C **Voice and Speech I** (2) Vocal techniques for the actor: articulation, voice control, support, and projection.
Effective: Fall 2007
Prerequisite: admission to the MFA performance acting program

THEA 821A **Acting II** (3) A continuation of THEA 520A.
Effective: Fall 2007
Prerequisite: THEA 820A

THEA 821B **Movement for Actors II** (2) A continuation of THEA 520B.
Effective: Fall 2007
Prerequisite: THEA 820B

THEA 821C **Voice and Speech II** (2) A continuation of THEA 520C.
Effective: Fall 2007
Prerequisite: THEA 820C

THEA 822A **Acting III** (3) This course will focus on the research and development of skills necessary to perform the plays of Shakespeare and his contemporaries.
Effective: Fall 2007
Prerequisite: THEA 821A

THEA 822B **Movement for Actors III** (2) Advanced techniques and skills in physical expression.
Effective: Fall 2007
Prerequisite: THEA 821B

THEA 822C **Voice and Speech III** (2) Advanced voice and speech training for the actor: articulation, resonance, and vocal technique related to verse and heightened language drama.
Effective: Fall 2007
Prerequisite: THEA 821C

THEA 823A **Acting IV** (3) Students prepare audition material for their New York Showcase for theatrical agents.
Effective: Fall 2007
Prerequisite: THEA 822A

THEA 823B **Movement for Actors IV** (2) Fundamentals of unarmed and armed stage combat with emphasis on enactment of safe and effective stage fights.

Effective: Fall 2007
Prerequisite: THEA 822B

THEA 823C **Voice and Speech IV** (2) A study of stage dialects.
Effective: Fall 2007
Prerequisite: THEA 822C

THEA 824 **Acting for the Camera** (6) This course introduces the actor to the skills necessary for successful performance in television, film, video and commercial venues.
Effective: Summer 2009
Prerequisite: THEA 823A, THEA 823B, THEA 823C

THEA 825A **Acting Professionally/NYC Showcase** (3) Development of audition repertoire; study of business topics; development, rehearsal and performance of NYC showcase.
Effective: Spring 2009
Prerequisite: THEA 823A, THEA 823B, THEA 823C

THEA 825C **Professional Repertory Performance** (3) Rehearsal and performance of theatre productions at Penn State featuring third year MFA actors and professional guest artists.
Effective: Summer 2007
Prerequisite: THEA 823A, THEA 823B, THEA 823C

THEA 830 **Interdisciplinary Theatrical Design Studio** (3-6 per semester/maximum of 36) Advanced analysis, graphic, and presentation techniques for evolving and communicating design for the stage.
Effective: Fall 2009

THEA 847 **Makeup Design for Production** (1 per semester/maximum of 6) Makeup design and execution for major university theatre production.
Effective: Spring 2010

THEA 857 **Scenic Design for Production** (1 per semester/maximum of 6) Design and execution of production design projects.
Effective: Summer 2010

THEA 861 **Costume Design and Construction** (1-6 per semester/maximum of 18) Advanced special projects for the graduate designer and costumer.
Effective: Spring 2010
Prerequisite: THEA 461 orTHEA 560

THEA 863 **Costume Construction: Draping** (3) Exploration and development of various draping techniques with application to costume construction.
Effective: Spring 2010

THEA 865 **Costume Construction: Period Reconstruction** (3) Exploration and development of reproduction techniques relating to period clothing, and their application to costume construction.
Effective: Spring 2010

THEA 866 **Costume Construction for Production** (1 per semester/maximum of 6) Execution of production in construction and shop management.
Effective: Summer 2010

THEA 867 **Costume Design for Production** (1 per semester/maximum of 6) Design and execution of production design projects.
Effective: Summer 2010

THEA 877 **Lighting Design for Production** (1 per semester/maximum of 6) Design and execution of production design projects.
Effective: Spring 2010

THEA 887 **Technical Projects for Production** (1 per semester/maximum of 6) Execution of assigned technical projects for theatre production.
Effective: Summer 2010

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Tmp Educ Abroad Reg (ED AB)

No courses for department code **ED AB** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Training and Development (TRDEV)

TRDEV 418 **Instructional Methods in Training and Development** (3) Emphasis on teaching techniques and learning principles used by trainers and supervisors in business, health care, and government.
Effective: Spring 1986

TRDEV 421 **Presentation Skills for New Trainers** (3) The effective use of platform skills for training, including the use of voice, audio-visual aids, group facilitation, and personal presence.
Effective: Summer 1993
Prerequisite: admission to M.ED. program in Training and Development

TRDEV 431 **Basic Technology Skills in Training** (3) Introduces basic training technology skills: electronic communications, word processing, spreadsheets, databases; provides skills to create and maintain electronic presentations and programs.
Effective: Spring 1999
Prerequisite: admission to the Training and Development Program Training and Development Certificate Program or permission of the Program

TRDEV 432 **Video Production in Training** (3) Introduces learners to the equipment, design, and production of video instruction for the workplace.
Effective: Spring 2002
Prerequisite: TRDEV 418, TRDEV 431 or permission of program

TRDEV 460 **Foundations in Training and Development** (3) Roles in training and development, relationships between training and development and other organizational structures, and the principles of training design.
Effective: Spring 1986

TRDEV 465 **Performance Analysis** (3) This course involves the systematic analysis of employee performance in organizations to identify performance problems, diagnose causes, and specify solutions.
Effective: Spring 2005
Prerequisite: TRDEV 460, TRDEV 418 or permission of the program

TRDEV 470 **Human Resource Development Tools and Techniques** (3) Examination of contemporary strategies, tools, and techniques for designing human resource functions to promote employee learning and performance within organizations.
Effective: Spring 2005
Prerequisite: TRDEV 460, TRDEV 418 or permission of the program

TRDEV 475 **Career and Succession Management** (3) This course involves the study of a systematic approach for integrating career planning and succession planning programs in organizations.
Effective: Spring 2005
Prerequisite: TRDEV 460, TRDEV 418 or permission of the program

TRDEV 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 1986

TRDEV 505 **Project Management in Training and Development** (3) Introduces skills for managing complex training and development projects, such as developing timelines, creating budgets, and allocating resources.
Effective: Spring 2006
Prerequisite: TRDEV 418, TRDEV 460 or permission of the program

TRDEV 507 **Program Evaluation** (3) Evaluation of educational and other human services programs; preparation and presentation of the evaluation proposal.
Effective: Summer 2002
Prerequisite: TRDEV 418 andTRDEV 460 or permission of program

TRDEV 518 **Systematic Instructional Design in Training** (3) Study of theory and practice of systematic instructional design. Application of instructional design principles to training problems in local organizations.
Effective: Summer 2002
Prerequisite: TRDEV 418 andTRDEV 460 or permission of program

TRDEV 520 **Learning Styles and Learning Theory in Training** (3) Adult learning theory and its application to training and development.
Effective: Spring 2001
Prerequisite: TRDEV 418, TRDEV 460

TRDEV 531 **Technology in Training** (3) Applications of various new instructional technologies to training problems.
Effective: Summer 2002
Prerequisite: TRDEV 431 or permission of the program

TRDEV 532 **Web-Based Training** (3) Introduction to the design and development of websites for computer-based instruction in the workplace.
Effective: Fall 2001

Prerequisite: TRDEV 418, TRDEV 431 or permission of the program

TRDEV 533 **Distance Learning for Trainers** (3) This course will explore a variety of instructional technologies which have direct applications in training adult learners at a distance.
Effective: Summer 2002
Prerequisite: TRDEV 418 andTRDEV 431 or permission of program

TRDEV 565 **Implementing Training and Development Programs** (3) The critical analysis of theories, strategies, and techniques for planning and implementing TRDEV programs to enhance employee learning and performance.
Effective: Spring 2006
Prerequisite: TRDEV 460, TRDEV 465 or permission of the program

TRDEV 583 **Issues in Training** (3) An issue seminar addressing topics such as an unprepared work force, diversity, recession, and issues generated by the class.
Effective: Summer 2002
Prerequisite: TRDEV 418 andTRDEV 460 or permission of the program

TRDEV 587 **Master's Paper** (1-6) The development of an original master's project (paper, production, or practicum) supervised and judged by an appropriate faculty committee.
Effective: Spring 1986

TRDEV 588 **Research Designs Applied in Training** (3) Planning experimental, observation, survey and qualitative research designs for training setting needs such as needs assessments and evaluations.
Effective: Spring 1995
Prerequisite: EDUC 586, TRDEV 418, TRDEV 460

TRDEV 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Fall 2001
Prerequisite: prior approval of proposed assignment by instructor

TRDEV 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1988

TRDEV 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be tuaght in one year or semester.
Effective: Spring 1987

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Turfgrass (TURF)

TURF 425 **Turfgrass Cultural Systems** (3) A study of turfgrass maintenance practices and how their interrelationships can be utilized to develop meanagement systems.
Effective: Fall 2001
Prerequisite: SOILS 101, TURF 235

TURF 434 **Turfgrass Edaphology** (3) Characterization of soil physical properties for the establishment and maintenance of sports turf; includes root-zone construction.
Effective: Fall 2007
Prerequisite: SOILS 101, TURF 235

TURF 435 **Turfgrass Nutrition** (4) Study of turfgrass nutrition and growth; emphasizing constructed and mineral soil fertility, nutrient uptake and function, and fertilizer use efficiency.
Effective: Spring 2004
Prerequisite: SOILS 101, TURF 235

TURF 436W **Turfgrass Management Systems** (3) Case study and discussion considering integrated management of selected turfgrass sites; emphasis on problem analysis, principle application, and decision making.
Effective: Fall 1995
Prerequisite: TURF 235, TURF 236, TURF 425

TURF 489 **Supervised Experience in College Teaching** (1-3) Participate with instructors in teaching and undergraduate turfgrass course. Assist with teaching an evaluation and with development of instructional materials.
Effective: Spring 1998
Prerequisite: TURF 235

TURF 490 **Colloquium** (1) Oral presentations developed by students in consultation with the course instructor.
Effective: Summer 1997
Prerequisite: seventh semester standing

TURF 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Summer 1992
Prerequisite: prior approval of proposed assignment by instructor

TURF 496 **Independent Studies** (1-18) Creative projects, including research and design, that are supervised on an individual basis and that fall outside the scope of formal courses.
Effective: Summer 2000

TURF 850 **Turfgrass Physiology** (3) Lectures, reading assignments, and problems designed to develop student competency in plant physiology as it relates to turfgrass management strategies.
Effective: Summer 2010

TURF 852 **Turfgrass Health Management** (3) Lectures and exercises designed to develop student competency in solving turfgrass pest problems, as well as disease resistance in turfgrass.
Effective: Spring 2010

TURF 853 (PPATH 853) **Interpreting Turfgrass Science Literature** (3) Introduction to turfgrass research publications, interpretation of the data, and discussion of the significance of the results.
Effective: Summer 2010

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Ukrainian (UKR)

UKR 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Summer 1994

UKR 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small group basis.
Effective: Fall 2007

UKR 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

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Vet & Biomed Sci (VB SC)

VB SC 402W (ENT 402) **Biology of Animal Parasites** (3) An intorduction to animal parasitology. Emphasis placed on host/parasite interactions, parasites of zoonotic importance, control programs and taxonomy.
Effective: Spring 2010
Prerequisite: BIOL 110

VB SC 405 **Laboratory Animal Science** (3) Principles involved in maintaining laboratory animals. Emphasis is on management, preventive medicine, and surgical considerations used in laboratory animal colonies.
Effective: Spring 2009
Prerequisite: AN SC 201, AN SC 301, BIOL 110

VB SC 407 **Dairy Herd Health Programs** (2) A discussion of health programs for dairy herds to assist in the control of infectious and metabolic diseases of dairy animals.
Effective: Fall 2007
Prerequisite: AN SC 301, AN SC 310, AN SC 427, AN SC 431W

VB SC 418 **Bacterial Pathogenesis** (2) Study of molecular interactions between bacterial pathogens and their hosts.
Effective: Fall 2007
Prerequisite: MICRB 201, MICRB 410

VB SC 420 **General Animal Pathology** (3) Nature and mechanisms of the disease process including degenerations, growth disturbances, inflammation, host-parasite relationships and neoplasia.
Effective: Fall 2007
Prerequisite: AN SC 423 orBIOL 472, MICRB 201, AN SC 301

VB SC 421 (BIOL 421) **Comparative Anatomy of Vertebrates** (4) The comparative anatomy of representative vertebrate animals, discussed from a descriptive and an evolutionary viewpoint.
Effective: Spring 2008
Prerequisite: BIOL 240W

VB SC 423W **Pathology of Nutritional and Metabolic Diseases** (3) Overview of nutritional and metabolic diseases of animals integrating concepts from biochemical and physiologic abberrations to clinical applications.
Effective: Spring 2008
Prerequisite: B M B 211 orB M B 401, AN SC 301 or equivalent nutrition course

VB SC 425 (AN SC 425) **Principles of Avian Diseases** (3) Principles of pathogenesis and control of diseases in poultry and other avian populations. Case material used where appropriate.
Effective: Spring 2009
Prerequisite: AN SC 201, BIOL 110, MICRB 201

VB SC 430 **Principles of Toxicology** (3) Introduction to the biomedical aspects of toxicology with emphasis on the mechanisms and fate of chemical interaction with biological systems.
Effective: Fall 2007
Prerequisite: BIOL 110, BIOL 240W;B M B 211 orB M B 401

VB SC 431 (E R M 431) **Environmental Toxicology** (3) Effects of pollutants on animal health at the chemical, physical, and cellular level.
Effective: Spring 2011 Future: Spring 2011
Prerequisite: BIOL 110, CHEM 110, CHEM 112

VB SC 432 (MICRB 432, B M B 432) **Advanced Immunology: Signaling in the Immune System** (3) The study of signaling pathways that regulate the immune response.
Effective: Fall 2007
Prerequisite: B M B 400, MICRB 410

VB SC 433 (B M B 433) **Molecular and Cellular Toxicology** (3) In-depth coverage of processes by which drugs/chemicals interact with biological systems and the experimental approaches used to study these interactions.
Effective: Fall 2007
Prerequisite: B M B 401

VB SC 435 (B M B 435, MICRB 435) **Viral Pathogensis** (2) A study of the molecular, immunological, and pathological aspects of viral diseases as well as laboratory methods of diagnosis.
Effective: Fall 2007
Prerequisite: MICRB 201;B M B 251 andB M B 252 orBIOL 110 andBIOL 230W

VB SC 444 **Epidemiology of Infectious Diseases** (3) An introduction to epidemiology of infectious diseases with emphasis on unders tanding epidemiologic concepts for identifying, preventing and controlling infectious diseases.
Effective: Fall 2007
Prerequisite: BIOL 220, STAT 200 orSTAT 250

VB SC 445 **Molecular Epidemiology of Infectious Diseases** (3) A discussion and practicum of the molecular laboratory techniques used to study molecular epidemiology of infectious diseases.
Effective: Fall 2007
Prerequisite: BIOL 220, STAT 200 orSTAT 250 andVB SC 444

VB SC 448W **Current Topics in Immunology** (3) Study of current approaches and questions driving research in

immunology and infectious diseases.
Effective: Fall 2007
Prerequisite: MICRB 410, B M B 400

VB SC 451 **Immunotoxicology of Drugs and Chemicals** (3) An in depth discussion of the effect of xenobiotics and drugs on host immune mechanisms.
Effective: Spring 2008
Prerequisite: VB SC 433 andMICRB 410

VB SC 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2007

VB SC 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Fall 2007

VB SC 511 (BMMB 511, IBIOS 511) **Molecular Immunology** (2) The study of molecular and biochemical events that influence immune responses and define current questions in immunology.
Effective: Spring 2008
Prerequisite: B M B 400, MICRB 410

VB SC 514 (NUTRN 514) **Prostaglandins and Leukotrienes** (3) Biochemical, physiological, and nutritional aspects of arachidonic acid and related essential fatty acid metabolism. Structure-activity relationships of prostaglandins, prostacyclins, thromboxanes, and leukotrienes.
Effective: Fall 2009
Prerequisite: BIOCH 402 orBIOCH 437

VB SC 515 (BMMB 515) **Macrophage Biology** (2) The role of macrophages at the interface between innate and adaptive immunity.
Effective: Spring 2008
Prerequisite: B M B 400, MICRB 410, VB SC 432

VB SC 516 (BMMB 516) **Viral Evasion of Immune Responses** (2) An in-depth study of the interaction of viruses and cells and mechanisms that permit viruses to escape immunity.
Effective: Spring 2008
Prerequisite: B M B 400, MICRB 410

VB SC 518 (BMMB 518) **T Cell Recognition and Development** (2) An in-depth analysis of the mechanisms of T cell recognition, activation and development, and the acquired immune response.
Effective: Spring 2008
Prerequisite: B M B 400, MICRB 410, VB SC 432

VB SC 519 (BMMB 519) **Development of the Hematopoietic/Vascular System** (2) An in-depth analysis of current research in the development of the hematopoietic and vascular system during embryogenesis and fetal development.
Effective: Spring 2008
Prerequisite: B M B 400, MICRB 410, VB SC 432

VB SC 520 **Pathobiology** (3) The course deals with the mechanism of disease. Topics are: homeostasis, vascular injury, inflammation, neoplasia, genetic disorders, and biochemical toxicology.
Effective: Fall 2009
Prerequisite: V SC 420;BIOCH 401 orBIOCH 437

VB SC 530 (IBIOS 530) **Regulation of Gene Expression by Xenobiotics** (3) The mechanisms by which foreign chemicals alter gene expression and the techniques used to examine this effect are examined.
Effective: Spring 2008
Prerequisite: B M B 401 or equivalent vb sc 433/b m b 433 recommended

VB SC 532 (IBIOS 532) **Developmental and Reproductive Toxicology** (3) Effects of environmental chemicals, nutrients and drugs on embryo/fetal development and maternal/paternal toxicity.
Effective: Spring 2008
Prerequisite: B M B 402

VB SC 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2007

VB SC 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2007

VB SC 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject whihc may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2008

VB SC 600 **Thesis Research** (1-15) No description.

Effective: Fall 2007

VB SC 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Fall 2007

VB SC 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Experience in preparing and conducting lectures/laboratories and assembling materials for laboratories.
Effective: Fall 2007

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Veterinary Science (V SC)

V SC 489 (BIOTC 489) **Animal Cell Culture Methods** (3) AN OVERVIEW OF ANIMAL CELL CULTURE METHODOLOGY, AND ITS PRACTICAL APPLICATION IN BIOPROCESS TECHNOLOGY.
Effective: Spring 1996
Prerequisite: MICRB 201, MICRB 202;BIOL 230W ORB M B 251

V SC 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Summer 1995

V SC 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 1992

V SC 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Spring 1992

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Wildlife (WILDL)

No courses for department code **WILDL** were found. It's possible that the code has changed, there aren't any listed courses, or that the URL you're using has become mangled.

Wildlife and Fisheries Science (W F S)

W F S 406 **Ornithology Laboratory** (1) Laboratory and field identification of Pennsylvania birds, avian ecology and behavior, field survey techniques.
Effective: Fall 2006
Prerequisite: or concurrent:W F S 209, W F S 407

W F S 407 **Ornithology** (3) Introduction to the biology, ecology, adaptations, and conservation of birds.
Effective: Fall 1996
Prerequisite: BIOL 110, W F S 209

W F S 408 **Mammalogy** (3) Identification, systematics, characteristics, adaptations, ecology, behavior, natural history and conservation, and socio-economic aspects of mammals.
Effective: Spring 1995
Prerequisite: BIOL 110

W F S 409 **Mammalogy Laboratory** (1) Laboratory and field identification of mammals, ecology and behavior of mammals, field survey techniques.
Effective: Fall 2006
Prerequisite: or concurrent:W F S 209, W F S 408

W F S 410 **General Fishery Science** (3) Introduction to the study, management, and uses of fish populations; methods of investigation, culture, and harvest of fishes.
Effective: Fall 2001
Prerequisite: BIOL 210 orW F S 209

W F S 422 **Ecology of Fishes** (3) Role of fishes in aquatic communities and general ecosystems. Environmental factors influencing fish as individuals, populations, and communities.
Effective: Spring 1995
Prerequisite: BIOL 220W orW F S 209

W F S 424 **Aquaculture** (2) Scientific basis of aquaculture. Fundamental management skills for hatchery managers.
Effective: Summer 1988
Prerequisite: one course in biology

W F S 430 (FOR 430) **Conservation Biology** (3) The application of biological principles to issues in the conservation of biodiversity.
Effective: Spring 1995
Prerequisite: BIOL 220W orFOR 308

W F S 435 (E R M 435) **Limnology** (3) Biogeochemistry and natural history of freshwater ecosystems.
Effective: Summer 2007
Prerequisite: BIOL 110, BIOL 220W, CHEM 110

W F S 436 (E R M 436) **Limnological Methods** (3) Application of current methodologies to evaluate the biological, chemical, and physical characteristics of aquatic ecosystems.
Effective: Spring 2010
Prerequisite: BIOL 110 andCHEM 110

W F S 440 **Natural Resources Public Relations** (3) The course prepares students to integrate public relations concepts with principles of natural resources management at the community level.
Effective: Fall 2001
Prerequisite: SPCOM 100 seventh-semester standing and 6 credits of W F S FOR or R P M

W F S 446 **Wildlife and Fisheries Population Dynamics** (3) Concepts and estimation of mammalian, avian, and fish populations; processes of mortality, natality, growth, and regulation.
Effective: Summer 1994
Prerequisite: W F S 209

W F S 447W **Wildlife Management** (3) Management of renewable wildlife resources by applying ecological concepts, habitat evaluation, and decision-making; writing and editing reports are emphasized.
Effective: Fall 2001
Prerequisite: W F S 209 orW F S 309

W F S 450 (E R M 450) **Wetland Conservation** (3) Wetland types, classification, functions and values; hydrology, soils, and plants; introduction to wetland identification and delineation; wetland regulations.
Effective: Fall 2001
Prerequisite: E R M 300 orW F S 209

W F S 452 **Ichthyology** (2) Study of the structure, taxonomy, systematics, and natural history of freshwater and marine fishes.
Effective: Spring 1995
Prerequisite: BIOL 110, BIOL 240W

W F S 453 **Ichthyology Laboratory** (2) Identification of fishes, major fish families, use of keys.
Effective: Spring 2001
Prerequisite: BIOL 110, BIOL 240W . Prerequisite or concurrent:W F S 452

W F S 460 **Wildlife Behavior** (3) Scholarly discussion and critique of history, concepts, and application of wildlife behavioral concepts to conservation issues.
Effective: Spring 2007
Prerequisite: at least 6 credits in general wildlife or biology

W F S 462 **Amphibians and Reptiles** (3) Critique of global evolution and conservation of amphibians and reptiles, focusing on Northeastern U.S. natural history and ecology.
Effective: Spring 2009
Prerequisite: 5th semester standing or higher and 6 credits of general biology

W F S 463W **Fishery Management** (3) Management of sport and commercial fisheries, including biological, political, social, and economic factors; regulations and other management techniques.
Effective: Spring 2001
Prerequisite: W F S 209, W F S 300, W F S 301, W F S 310

W F S 495 **Wildlife/Fisheries Internship** (1-6) Supervised field experience related to the student's major.
Effective: Spring 1994
Prerequisite: approval of proposed assignment by instructor prior to registration

W F S 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 1989

W F S 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 1989

W F S 497A **Field Ichthyology** (3) One-week field course at Tom Ridge Environmental Center in Eric, Pennsylvania. Field collection techniques, identification and behavior of Pennsylvania fishes.
Effective: Summer 2010 Ending: Summer 2010

W F S 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

W F S 500 **Professionalism in Natural Resources** (3) Scholarly discussion and critique of skills important to professionalism of students in natural resources, wood products, and related science-based disciplines.
Effective: Summer 2005
Prerequisite: graduate student standing or permission of program

W F S 525 **Communications in Natural Resources** (3) Communications of research results through manuscripts for peer reviewed journals, presentations at professional meetings, and articles for the general public.
Effective: Summer 2003
Prerequisite: graduate-level research experience (M.S. or Ph.D. enrollment) or permission of program

W F S 529 **Fish Population Dynamics** (3) Methods for analyzing fish population dynamics and their application to fisheries management.
Effective: Spring 1989
Prerequisite: A calculus course

W F S 530 **Conservation Ecology** (3) Discussion of the application of ecological principles to conservation and management of biological diversity, landscapes, and ecosystems.
Effective: Spring 2005
Prerequisite: Graduate Student standing

W F S 536 **Freshwater Field Ecology** (3) Organisms and physical/chemical factors that affect them in the aquatic environment; basic water chemistry; identification of aquatic organisms.
Effective: Spring 1989
Prerequisite: BIOL 435

W F S 542 (BIOL 542, ENT 542) **Systematics** (3) Principles and methods of classification, phylogeny, and speciation; taxonomic techniques; analysis of species; causal interpretation of animal diversity.
Effective: Summer 1990

W F S 550 **Wetland Ecology and Management** (3) Discussions of the ecological, hydrologic, and cultural functions and values of freshwater and coastal wetlands.
Effective: Spring 1989
Prerequisite: 3 credits in ecological or hydrologic sciences

W F S 551 **Wildlife Biometrics and Population Analysis** (3) Application of biometrics and mathematics to concepts and problems in wildlife ecology with emphasis on population analysis.
Effective: Spring 1989
Prerequisite: 3 credits in animal ecology and 6 credits in biometrics or statistics

W F S 552 **Systematics and Evolution of Fishes** (3) Detailed study of the systematics, evolution, identification, and natural history of fishes.
Effective: Spring 1989

Prerequisite: BIOL 421, WILDL 452

W F S 560 **Estimation of Fish and Wildlife Population Parameters** (4) Application of statistical models to estimate population parameters such as survival rates and population size.
Effective: Spring 2003
Prerequisite: MATH 141, STAT 501, STAT 502 or permission of program

W F S 590 (FOR 590) **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Fall 2007

W F S 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1989

W F S 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1989

W F S 597B **Design of Ecological Field Studies** (2) Application of the scientific method and general principles of designing ecological field studies through discussion and critique of the primary literature.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010
Prerequisite: one course in statistics that covers ANOVA

W F S 600 **Thesis Research** (1-15) No description.
Effective: Spring 1989

W F S 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1988

W F S 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Provides an opportunity for supervised and graded teaching experience in wildlife courses.
Effective: Spring 1989

W F S 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Spring 1989

W F S 611 **Ph.D. Dissertation Part-Time** (0) No Description.
Effective: Summer 1988

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Women's Studies (WMNST)

WMNST 400 (US;IL) **Feminist Theory** (3) Consideration of feminist theories of women's experience in transforming understanding, reconceptualizing old problems, raising new ones, and expanding traditional disciplines.
Effective: Summer 2005
Prerequisite: WMNST 301

WMNST 401 **Feminist Perspectives on Research and Teaching** (3) Feminist approaches to methodological issues in research and teaching in the social sciences and the humanities.
Effective: Fall 2009
Prerequisite: WMNST 001 orWMNST 003 orWMNST 301

WMNST 407 (US) (THEA 407) **Women and Theatre** (3) A study of theatre practice and dramatic literature as informed by issues of gender, race, and ethnic background.
Effective: Summer 2005
Prerequisite: THEA 100

WMNST 410 (AAA S 410) **Spirit, Space, Survival: Contemporary Black Women** (3) How recent Black women have used spirit and space to survive.
Effective: Spring 1995
Prerequisite: WMNST 101

WMNST 412 (EDTHP 412) **Education and the Status of Women** (3) An examination of the relationship of education to the status of women in American society.
Effective: Spring 2005

WMNST 416 (US;IL) (AAA S 416, S T S 416) **Race, Gender and Science** (3) The class will focus on race and gender as products of science, and how societal values shape scientific activity.
Effective: Summer 2008
Prerequisite: 6 credits in S T S WMNST or AAA S

WMNST 419 (US;IL) (HIST 419) **The History of Feminist Thought** (3) A critical analysis of European and United States feminist thought from the Renaissance to the present.
Effective: Spring 2006
Prerequisite: WMNST 001, WMNST 003, WMNST 116 orWMNST 117

WMNST 420 (US;IL) (CED 420, R SOC 420) **Women in Developing Countries** (3) Analysis of women's work, experiences, and development policies and practices in Africa, Asia, and Latin America.
Effective: Fall 2009

WMNST 421 (IL) (HIST 421) **The History of European Women** (3) European women's lives from the Middle Ages to the present.
Effective: Spring 2006
Prerequisite: WMNST 001, WMNST 003, WMNST 116 orWMNST 117

WMNST 423 (US) (CRIMJ 423, CRIM 423) **Sexual and Domestic Violence** (3) Legal, sociological, and psychological perspectives of sexual and domestic violence.
Effective: Spring 2008
Prerequisite: CRIM 100

WMNST 424 (US) (KINES 424) **Women and Sport** (3) An interdisciplinary approach to contemporary issues related to women and sport from historical, physiological, psychological, and sociological perspectives.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 231, PSYCH 479, SOC 001 orWMNST 001

WMNST 426Y (US;IL) (GEOG 426Y) **Gender and Geography** (3) Description and explanation of the links between gender relations and spatial structures; gender and work, social services, and neighborhood activism.
Effective: Spring 2007
Prerequisite: GEOG 020, GEOG 126, GEOG 120, WMNST 001 orWMNST 187

WMNST 428 (US;IL) (PL SC 428) **Gender and Politics** (3) Gender in politics in the United States and around the world; major areas of women and politics research.
Effective: Fall 2007
Prerequisite: 3 credits in political science or women's studies

WMNST 430 (US) (AM ST 430) **Women in American Society** (3) A historical study of women's roles and experiences in the United States.
Effective: Spring 2008
Prerequisite: 6 credits of American Studies Sociology or Women's Studies

WMNST 432 (US) **Women in Politics in the U.S.** (3) Course examines the U.S. women's movements, the participation of women in politics, and selected areas of public policy.
Effective: Spring 2008
Prerequisite: 3 credits in political science or women's studies

WMNST 438 (PHIL 438) **Feminist Philosophy** (3) Examines the central currents of feminist philosophy, selected problems and concepts regarding difference, gender and sex, identity, and political culture.
Effective: Fall 2007
Prerequisite: 9 credits of philosophy including 6 credits of philosophy of the 200-level or 5th semester standing

WMNST 452 (BB H 452, NURS 452) **Women's Health Issues** (3) Exploration of major health issues concerning women today, with an emphasis on social, cultural, and medical influences.
Effective: Spring 2007
Prerequisite: BIOL 141 orPSYCH 100

WMNST 453 (US) (CRIMJ 453, CRIM 453) **Women and the Criminal Justice System** (3) This course focuses on the experiences of women as offenders, victims, and professionals in the criminal justice system.
Effective: Spring 2008
Prerequisite: CRIMJ 100 orWMNST 001

WMNST 455 (US) (CAS 455) **Gender Roles in Communication** (3) Explores the literature on gender research in the discipline of human communication.
Effective: Summer 2005
Prerequisite: CAS 202

WMNST 456 (SOC 456) **Gender, Occupations, and Professions** (3) The role of gender in shaping contemporary North American patterns of employment, occupational roles, and statuses.
Effective: Spring 1991
Prerequisite: WMNST 001 or 3 credits in Sociology

WMNST 457 (US;IL) (HIST 457, S T S 457) **The History of Women in Science** (3) Critical analysis of the roles women, gender, and minorities have played in the natural sciences.
Effective: Spring 2006
Prerequisite: WMNST 001, WMNST 003, WMNST 005, WMNST 116 orWMNST 117

WMNST 458 (BB H 458) **Critical Issues in Reproduction** (3) Examination and analysis of the new reproductive technologies from the standpoint of medical ethics, feminism, and sociocultural influences.
Effective: Spring 2007
Prerequisite: BIOL 141 orPSYCH 100

WMNST 462 (US) (ENGL 462) **Reading Black, Reading Feminist** (3) Female identity and its construction in textual representations of gender, class, color, and cultural difference in English-language literatures.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

WMNST 464 (US) (BE SC 464) **Feminine/Masculine** (3) Study of sex role learning; investigating feminine/masculine labeling; implications for contemporary society.
Effective: Spring 2008
Prerequisite: general psychology or general sociology

WMNST 466 (US;IL) (HIST 466) **Lesbian and Gay History** (3) Critical exploration of the history of sexuality, focusing especially on the emergence of modern lesbian and gay identities.
Effective: Summer 2005
Prerequisite: WMNST 001, WMNST 117

WMNST 471 (US) (PSYCH 479) **The Psychology of Gender** (3) Theories and research on gender differences and gender roles. Emphasis on women's and men's current positions in society.
Effective: Spring 2007
Prerequisite: PSYCH 100, PSYCH 221

WMNST 472 (LER 472) **Work-Life Practices and Policies** (3) Explore the causes and consequences of conflicts between work, family, and other life commitments, and how these may be resolved.
Effective: Spring 2008
Prerequisite: 3 credits of LER

WMNST 476W (ANTH 476W) **Anthropology of Gender** (3) Cross-cultural construction of gender and sex roles; theories of gender construction; case studies and practical effects.
Effective: Spring 2001
Prerequisite: 3 credits in women's studies or anthropology

WMNST 489 (ENGL 489) **British Women Writers** (3) A study of selected British women writers.
Effective: Spring 2008
Prerequisite: 6 credits of ENGL

WMNST 490 (US;IL) (ENGL 490) **Women Writers and Their Worlds** (3) American and British literature written from the perspective of women.
Effective: Summer 2005
Prerequisite: ENGL 015 orENGL 030

WMNST 491 (AM ST 476, ENGL 492) **American Women Writers** (3) A study of selected American women writers.
Effective: Spring 2008
Prerequisite: 6 credits of ENGL

WMNST 492W **Current Feminist Issues** (3) Critical analysis of major contemporary feminist research and writing in the arts, humanities, social and natural sciences.
Effective: Spring 2002

Prerequisite: WMNST 301, WMNST 302

WMNST 494 **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Summer 1994

WMNST 494H **Research Project** (1-12) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Fall 2007

WMNST 495 **Internship** (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
Effective: Spring 1998
Prerequisite: prior approval of proposed assignment by instructor

WMNST 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside scope of formal courses.
Effective: Fall 1983

WMNST 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1984

WMNST 497D (CRIMJ 497D, PSYCH 497D, SOC 497D) **Family and Justice** (3) Examination of the relationship between the family and the criminal justice system in which the family operates.
Effective: Summer 2010 Ending: Summer 2010

WMNST 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

WMNST 501 **Feminist Perspectives on Research and Teaching Across the Disciplines** (3) Feminist approaches to methodological issues in research and teaching in the social sciences, humanities, and natural sciences.
Effective: Spring 2002

WMNST 502 **Global Perspectives on Feminism** (3) Exploration of feminist issues in a global perspective, including debates in history, ethics, and political feminism.
Effective: Fall 2001

WMNST 507 **Feminist Theory** (3) Development of feminist theory and its relationship to history in terms of critique of family, sexuality, and gender stratification.
Effective: Spring 2002

WMNST 515 (GEOG 515) **Gender and Geography** (3) Explanations of links between gender relations and spatial structures.
Effective: Summer 1994

WMNST 516 (HIST 516) **Topics in Gender History** (3) A critical analysis of gender and theories of gender in selected historical contexts.
Effective: Summer 1992

WMNST 520 **Gender and Nationalism** (3) Impact of Western nationalism and colonialism on the organization of gender roles from the 18th century to the present.
Effective: Fall 2001

WMNST 538 (PHIL 538) **Feminist Philosophy Seminar** (3) Critically examines feminist approaches to ethics, epistemology, philosophy of science, metaphysics, social/political philosophy, and the history of philosophy.
Effective: Summer 2005

WMNST 541 (ADTED 541) **Women and Minorities in Adult Education** (3) Seminar on women and minority adults as learners and leaders in various contexts of adult education.
Effective: Spring 1998
Prerequisite: ADTED 460

WMNST 565 (ANTH 565) **Women and Development** (3) Interaction of women and development.
Effective: Spring 1994

WMNST 572 (PSY 572) **Psychology of Gender** (3) Theory and research on the psychology of gender, emphasizing gender in social interaction and in individual identity.

Effective: Spring 2002
Prerequisite: graduate standing in psychology women's studies or allied field

WMNST 594 **Research Topics** (1-15) Supervised student activities on research projects identified on an individual or small-group basis.
Effective: Spring 1998

WMNST 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 1998

WMNST 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1987

WMNST 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently.
Effective: Spring 1992

WMNST 597A **Girls and Popular Culture: From Nancy Drew to Webkinz** (3) Explores girls and popular culture from books, media, and toys through a historical approach and theories of feminist cultural studies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

WMNST 602 **Supervised Experience in College Teaching** (1-3 per semester, maximum of 6) Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.
Effective: Fall 1996

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Wood Products (W P)

W P 400 **Properties of Wood** (2) Chemical Structure and Mechanical Properties of Wood Composites.
Effective: Summer 2003
Prerequisite: W P 200W

W P 411 **Wood-Environmental Relationships** (4) Material composition and structure; basic and derived physical properties; moisture movement in wood; methods and techniques of drying wood.
Effective: Spring 2001
Prerequisite: or concurrent:W P 200W, W P 203

W P 412 **Wood in Structures** (3) Behavior and design of solid, laminated, and plywood wood beams, trusses, columns, and foundations. Wood construction details.
Effective: Summer 1997
Prerequisite: W P 200W, W P 203

W P 413 **The Chemistry of Wood** (3) Chemical composition, reactions, and properties in relation to products and the uses of wood.
Effective: Summer 1997
Prerequisite: W P 200W, W P 203

W P 416 **Wood Industries Management Development** (3) Managerial concepts and issues important to forest products organizations will help prepare students to assume management-level positions.
Effective: Spring 2004
Prerequisite: W P 200W

W P 417 **Wood Products Manufacturing Systems and Processes** (4) Description of systems and processes used in the manufacture of wood products.
Effective: Summer 1997
Prerequisite: W P 200W, W P 203 and sixth-semester standing

W P 418 **Chemical Processing of Wood** (4) Principles and practices of basic operations in converting wood and wood waste into useful chemicals and modified cellulose products.
Effective: Summer 1997
Prerequisite: W P 200W, W P 203

W P 423 **Deterioration and Protection of Wood Products** (2) Timber and wood deterioration from fungi, insects, fire; treatment of wood products for protection.
Effective: Fall 1996
Prerequisite: W P 203

W P 435 **Wood Products Production and Sales Management** (3) Wood products production management with emphasis on investment decision- making, personal selling, and sales management.
Effective: Fall 1996
Prerequisite: W P 200W

W P 437W **Wood Industries Marketing Management** (4) Examination of major international wood products market segments in terms of products, distribution, industry structure, and strategic management issues.
Effective: Summer 1997
Prerequisite: W P 200W, W P 203

W P 438 **Business Concepts for Wood Manufacturing** (4) The course will cover manufacturing strategies and related financial measures in a wood production environment.
Effective: Summer 2003
Prerequisite: W P 200W

W P 460 **Wood Products Industrial Environmental Control** (3) Wood products industrial environmental control technologies and strategies for pollution abatement.
Effective: Summer 1995
Prerequisite: fifth semester standing

W P 490 **Wood Products Colloquium** (1) Presentations and discussions of solutions to problems within the forest products industry.
Effective: Spring 1993
Prerequisite: seventh-semester standing

W P 495 **Wood Products Internship** (1-6) Supervised field experience related to the student's major.
Effective: Spring 1993
Prerequisite: approval of proposed assignment by instructor prior to registration.

W P 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1993

W P 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

Effective: Spring 1993

W P 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005

W P 502 **Wood Fibers** (3) Identification and measurement of physical and chemical characteristics of wood fibers used in paper or dissolving pulps.
Effective: Spring 1993

W P 511 **Physical Properties of Wood and Fibers** (3) Theories of moisture, diffusion, permeability, and heat transport; ultrastructure and thermal properties of wood and fibers.
Effective: Spring 1993
Prerequisite: W P 411

W P 513 **Wood Chemistry** (3) Treatment of the chemical components of wood, their distribution and reactions.
Effective: Spring 1993
Prerequisite: W P 413

W P 515 **Wood Composite Processing Parameters** (3) Wood composite manufacture in theory and practice including various synthesis parameters in relation to physical and mechanical properties.
Effective: Fall 1993
Prerequisite: F P 415

W P 530 **Case Studies in Forest Products** (3) Manufacturing, marketing, and management issue analysis from a global perspective in the forest products industries.
Effective: Spring 1997

W P 531 **Mechanical Behavior of Wood** (3) Time-dependent properties, theory of failure, rheologic properties, and theory of the mechanical behavior of wood and structural composites.
Effective: Spring 1993

W P 532 **Theory of Adhesion** (3) Theory of adhesion as it pertains to bonding of wood, paper-based laminates, fibers, and bonding of wood to dissimilar materials.
Effective: Spring 1993

W P 537 **International Wood Products Marketing and Trade** (3) Strategic analysis, environmental scanning, international trade policy implications, determinants of competitive strategy for firms, industries, and nations.
Effective: Spring 1993
Prerequisite: W P 437W

W P 560 **Wood Products Industrial Environmental Control** (3) Legislation, impacts, and management of air, water, and solid waste pollution in the wood products industry.
Effective: Summer 2002
Prerequisite: W P 401

W P 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 1993

W P 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 1993

W P 596A **Wood Composite Processing Parameters** (3) Wood composite manufacture in theory and practice including various synthesis parameters in relation to physical and mechanical properties.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

W P 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.
Effective: Spring 1993

W P 600 **Thesis Research** (1-15) No description.
Effective: Spring 1993

W P 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) Provides an opportunity for supervised and graded teaching experience in forest products courses.
Effective: Spring 1993

W P 610 **Thesis Research Off Campus** (1-15) No description.

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Effective: Spring 1993

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Workforce Education and Development (WF ED)

WF ED 402 **Supervision of Vocational Education** (3) For administrators, supervisors, and teachers responsible for improvement of instruction through supervision or for students preparing for supervisory work.
Effective: Fall 2001

WF ED 413 **Vocational Education for Special-Needs Learners** (3) Introduction to program modifications, supplementary services, and resources required for special-needs learners in vocational and practical arts education programs.
Effective: Fall 2001

WF ED 422 **Integrating Communication Skills into the Vocational Classroom** (3) Students completing this course will demonstrate their ability to integrate oral, written, visual communication skills into their occupational classroom.
Effective: Summer 1996

WF ED 441 **Conceptual and Legal Bases for Cooperative Vocational Education** (2) History, conceptual and legal bases for a cooperative vocational education program.
Effective: Summer 1996
Prerequisite: WF ED 445

WF ED 442 **Operating Cooperative Vocational Education Programs** (2) Student and training station selection, training plan and related subject development, records and reporting systems, school-industry coordination.
Effective: Summer 1996
Prerequisite: WF ED 441

WF ED 445 **Vocational Guidance** (3) Problems and possibilities of vocational guidance; the field of guidance and guidance literature; methods of field work; school guidance techniques.
Effective: Summer 1996
Prerequisite: WF ED 105 ; fourth-semester standing

WF ED 450 (US;IL) **Cultural Diversity in the Workplace** (3) Provides opportunities for students to explore different cultures and mores that are changing the dynamics of the workplace.
Effective: Fall 2006

WF ED 471 **Training in Industry and Business** (3) Appraisal of training functions and development of competencies in work analysis, design, development, delivery, and evaluation of training.
Effective: Spring 2001
Prerequisite: seventh-semester standing or higher

WF ED 495 **Internship** (1-6) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Summer 1996
Prerequisite: prior approval of proposed assignment by instructor

WF ED 495A **Cooperative Education Practicum** (2) Validation of competencies learned in prerequisite courses during interaction with professional staff while functioning under the supervision of a certified cooperative coordinator.
Effective: Summer 1996
Prerequisite: WF ED 445

WF ED 495C **Student Teaching** (10) Supervised observation and practice teaching in approved vocational industrial schools/health occupations education settings.
Effective: Spring 1997
Prerequisite: successfull completion of occupational competency evaluation. PA Act 34 clearance required. In addition non-Pennsylvania residents must provide evidence of an FBI background information check. (Forms: 228 Chambers)

WF ED 495D **Instructional Internship in Industrial Training** (5) Supervised internship in industrial training. Interns will be expected to perform instructional duties in industrial environments.
Effective: Summer 1996
Prerequisite: WF ED 105, WF ED 106, WF ED 207W, WF ED 270, WF ED 471 ; successful completion of occupational competency examination

WF ED 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

WF ED 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1996

WF ED 497A **The Science and Art of Healing: Sustaining Healthy Living** (3) Critically and scientifically evaluate complementary and alternative healing therapies, current research, and prospects for revised health care policies.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

WF ED 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 1996

WF ED 498A **Project Management for Professionals** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

WF ED 498A **Project Management for Professionals** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

WF ED 498A (CN ED 498A) **Facilitating Career Development** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

WF ED 498B **Child Development** (3) Teaching the Family & Consumer Sciences Academic Standards: Child Development and Balancing Family, Work and Community Responsibility.
Effective: Summer 2010 Ending: Summer 2010

WF ED 498B (CN ED 498A) **Facilitating Career Development** (3) Students acquire relevant competencies to assist others in planning and managing careers. Upon successful completion, students may aply for the GCDF certification.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

WF ED 498C **Mastering Supervision** (3) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Summer 2010 Ending: Summer 2010

WF ED 498D (CN ED 498A) **Facilitating Career Development** (3) Students acquire relevant competencies to assist others in planning and managing careers. Upon successful completion, students may apply for the GCDF certification.
Effective: Summer 2010 Ending: Summer 2010

WF ED 501 **Seminar in Workforce Education** (1-3) Conferences, colloquiums, discussions, and investigations of various topics and issues related to workforce education in the public and private sector.
Effective: Summer 1996

WF ED 508 **Workforce Education Management** (3) Introduction to theories and concepts of managing workforce education programs in the public and private sector.
Effective: Summer 1996

WF ED 518 **Curriculum and Instructional Leadership for Workforce Education** (3) Study of topics related to curriculum and instructional leadership in workforce education in the public and private sectors.
Effective: Summer 1996
Prerequisite: 3 years of professional experience in vocational education

WF ED 528 **Fiscal and Facilities Management for Vocational Administrators** (3) Sources of revenue, budget preparation, purchasing, and the management of physical facilities in vocational education.
Effective: Summer 1996
Prerequisite: 3 years of professional experience in vocational education

WF ED 530 **College Teaching for Workforce Education** (3) Structure and organization of collegiate programs in workforce education including faculty requirements, curricula, funded projects and program evaluation.
Effective: Summer 1996
Prerequisite: acceptance as a graduate student in vocational industrial education

WF ED 538 **Administering Personnel Services in Vocational Education** (3) Planning and implementing staff development activities, student guidance services, admissions, student organizations, and placement.
Effective: Summer 1996
Prerequisite: 3 years of professional experience in vocational education

WF ED 540 **Data Analysis in Workforce Education and Development** (3) Provides opportunities to acquire and practice skills in descriptive and inferential statistics.
Effective: Spring 1996

WF ED 541 **Program Evaluation in Workforce Education** (3) Exploring positivistic and constructionist approaches to program evaluation, with emphasis on planning and management, accreditation, certification, licensure, criteria and standards.
Effective: Summer 1996

WF ED 542 **Social and Economic Foundations of Workforce Education and Development** (3) Review of labor force, demographic and economic concepts, measures, and models.
Effective: Summer 1996

WF ED 543 **Evaluation of Investments in Workforce Education and Development** (3) Use of labor supply models to evaluate investments in workforce education and development.
Effective: Summer 1996 Ending: Fall 2010
Prerequisite: I ED 540, WF ED 542, WF ED 550

WF ED 543 **Evaluation of Investments in Workforce Education and Development** (3) Use of labor supply models to evaluate investments in workforce education and development.
Effective: Spring 2011 Future: Spring 2011

WF ED 544 **Analysis of Policies for Workforce Education and Development** (3) Explores models and methods for analyzing policies for workforce education.
Effective: Summer 1996
Prerequisite: I ED 540, WF ED 550

WF ED 545 **Economic and Demographic Modeling of Policies for Workforce Education and Development** (3) Use of economic and demographic models to plan and evaluate workforce education and development.
Effective: Summer 1996
Prerequisite: I ED 540, WF ED 542, WF ED 550

WF ED 546 **Work Based Education** (3) Discussion of legislation and educational requirements for education based at the worksite including cooperative education, youth apprenticeship, and apprenticeship programs.
Effective: Summer 1996
Prerequisite: WF ED 441

WF ED 550 **Research in Workforce Education** (3) Research techniques in workforce education.
Effective: Summer 1996

WF ED 557 **Present-Day Local, Personnel, and Curriculum Problems** (2-3) Various plans, techniques, and practices.
Effective: Summer 1996

WF ED 559 **Managing Technical Education** (2-3) Concepts and issues pertinent to the effective administration and supervision of technical education at the secondary and post secondary level.
Effective: Summer 1996
Prerequisite: 6 credits in industrial education valid director's certificate or equivalent training and experience

WF ED 560 **Historical and Philosophical Foundations of Workforce Education** (3) An investigation of historical, philosophical, and professional foundations of workforce education.
Effective: Summer 1996

WF ED 572 **Organization Development For Industrial Trainers** (3) An introduction to major concepts, skills and techniques required by industrial trainers to support and facilitate organization change.
Effective: Summer 1996
Prerequisite: WF ED 471

WF ED 573 **Needs Assessment for Industrial Trainers** (3) Acquire skills to identify training and development needs, distinguish problems with management versus training solutions, develop and evaluate training solutions.
Effective: Fall 2001

WF ED 574 **Strategic Planning For Education For Work** (3) Study of human capital as a component of education, industrial and business training strategic planning at economy, and organizational levels.
Effective: Summer 1996
Prerequisite: WF ED 471, WF ED 572, WF ED 573

WF ED 575 **Current Policy and Practices in Industrial Training** (3) Analysis of training and development practices and their articulation with business practices.
Effective: Summer 1996
Prerequisite: WF ED 471, WF ED 572

WF ED 576 **International, Multicultural, and Diversity Training** (3) Study of concepts, models, and techniques of multicultural and diversity training for industrial trainers.
Effective: Summer 1996
Prerequisite: WF ED 471, WF ED 572, WF ED 574

WF ED 590 **Industrial Training Professional Seminars** (1) Study of special topics relating to problems, practices, methodologies and special competency needs in industrial training.
Effective: Fall 2001

WF ED 595A **Field Based Project in Industrial Training** (2-5) Students identify a training and/or organization

development problem in industry and/or business and carry out contract problem analysis and resolutions.
Effective: Fall 2001

WF ED 595B **Workforce Education Administrative Internship** (2-15) Supervised study with an administrator or researcher at a cooperating school, state governmental agency, or research institution.
Effective: Summer 1996

WF ED 595C **Internship in Cooperative Vocational Education** (1-10) Validation of teaching and co-op coordinator competencies learned in prerequisite courses during interaction with professional staff while functioning under the supervision of a certified cooperative coordinator.
Effective: Fall 1997
Prerequisite: WF ED 441, WF ED 442

WF ED 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Summer 1996

WF ED 597 **Special Topics** (1-9) Formal courses given on a topic or special interest subject which may be offered infrequently.
Effective: Summer 1996

WF ED 597A **Scholarly Inquiry** (3) Exploration of personal research and career interests to stimulate thinking about work in the field of practice of workforce education and development.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

WF ED 597A **Organization Leadership in the Public and Private Sectors** (3) Provides opportunities for students to explore different styles of leadership that are changing the dynamics of the workplace.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

WF ED 597B **Process Consultation** (3) Focuses on interpersonal relationships, that is, how consultants and trainers watch groups and help group members work together more effectively.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

WF ED 597B **Ethics in Workforce Education** (3) Ethics in Workforce Education will explore decision making in workforce education contexts and how leaders solve ethical dilemmas.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

WF ED 597C **Integrated Instructions** (3) Occupational analysis for instructional planning; emphasis on instructional methods to deliver a competency based program in an integrated learning environment.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

WF ED 597C **Develop and Delivering Training Programs** (3) Each student develops a half-day training program and presents one module from the program to the class.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

WF ED 597D **Working Close Apart** (3) Technology for Communication & Collaboration in WF ED (3) Asynchronous communications; RSS feeds; social networks, and media; calendaring; voice- and video-over-IP; Creative Commons licensing; web-based surveys; webinars; technology mash-ups.
Effective: Fall 2010 Ending: Fall 2010 Future: Fall 2010

WF ED 597E **Appreciative Inquiry** (3) Students will build practical competencies necessary to carry out various Appreciative Inquiry interventions based on the theories and techniques of organization development and change management.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

WF ED 597F **Marketing Organization Development and Consulting for Trainers** (3) Familiarize students with approaches to marketing organization development 572. Helps students to develop the specialized competencies essential to market OD both internally and externally.
Effective: Spring 2011 Ending: Spring 2011 Future: Spring 2011

WF ED 598 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.
Effective: Fall 2001

WF ED 600 **Thesis Research** (1-15) No description.
Effective: Summer 1996

WF ED 601 **Ph.D. Dissertation Full-Time** (0) No description.
Effective: Summer 1996

WF ED 602 **Supervised Experience in College Teaching** (1-3 per semester/maximum of 6) An opportunity for graduate students to teach a college level course under the supervision of an experience professor.
Effective: Summer 1996

WF ED 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 1996

WF ED 611 **Ph.D. Dissertation Part-Time** (0) No description.
Effective: Summer 1996

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World Languages Education (WL ED)

WL ED 400 **Foundations of Language in Second Language Teaching** (3) Critical understanding of basic concepts and principles in second language acquisition and teaching.
Effective: Summer 2004
Prerequisite: PA Instructional I or II teaching certificate

WL ED 411 **Methods of Teaching World Languages in Grades 1-5** (3) Exploration of the complexity of teaching World Languages and development of curricular designs for teaching in grades 1-5 schools.
Effective: Summer 2004
Prerequisite: EDPSY 014, EDTHP 115, WL ED 295A, WL ED 300 Concurrent: WL ED 495B

WL ED 412W **Methods of Teaching World Languages in Grades 6-12** (3) Exploring the complexity of teaching World Languages and development of curricular designs for teaching World Languages in grades 6-12.
Effective: Spring 2010
Prerequisite: WL ED 411, WL ED 495B Concurrent: WL ED 495C

WL ED 414 **Methods of Teaching in Bilingual Education** (3) Methods, techniques, materials, and language laboratory in dual-language instruction.
Effective: Spring 2005
Prerequisite: EDPSY 014, EDTHP 115, WL ED 295A, WL ED 300 Concurrent: WL ED 495B or WL ED 495C

WL ED 422 **Issues in Bilingual Education** (3) Contemporary issues in foreign language and bilingual education for prospective and practicing teachers of foreign languages and bilingual education.
Effective: Fall 2004
Prerequisite: 12 credits or 12-credit level proficiency in the target languageEDPSY 014, EDTHP 115, WL ED 295A, WL ED 300

WL ED 444 (CI ED 444) **Language, Culture and the Classroom: Issues for Practitioners** (3) Critical understanding of cultural linguistic diversity to facilitate the inclusion of English Language Learners in a globalized classroom.
Effective: Fall 2007
Prerequisite: WL ED 300 orWL ED 400

WL ED 483 **Evaluating Schools Performances and Programs with English Language Learners (ELLs)** (3) Using/adapting multiple techniques to asses English Language Learners (ELLs) language and other school subjects.
Effective: Summer 2004
Prerequisite: WL ED 300 orWL ED 400

WL ED 495B **Field Experience for World Languages Teacher Preparation in Grades 1-5** (3) Practicum. Prospective World Language teachers demonstrate knowledge on second language learning/teaching and educational theories (Grades 1-5).
Effective: Spring 2009
Prerequisite: EDPSY 014, EDTHP 115, WL ED 295A, WL ED 300 ; PA Act 34 and Act 151 Clearances required; FBI background information check; and Professional Liability insurance. Concurrent: WL ED 411

WL ED 495C **Field Experience for World Languages Teacher Preparation in Grades 6-12** (3) Practicum. Prospective World Language teachers demonstrate knowledge on second language learning/teaching and educational theories (Grades 6-12).
Effective: Spring 2009
Prerequisite: WL ED 411;WL ED 495B ; PA Act 34 and Act 151 Clearances required; FBI background information check; and Professional Liability insurance. Concurrent: WL ED 412

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Youth and Family Education (YFE)

YFE 438 (US) **Living in an Increasingly Diverse Society** (1-3) Students in this course will explore selected dimensions of diversity through lecture, discussion, speakers, active participation, and experiential learning.
Effective: Summer 2005 Ending: Fall 2010

YFE 439 **Contemporary Youth Issues** (3) This course focuses on empirically-supported interventions that promote resiliency and reduce risk for problem behaviors among youth in community settings.
Effective: Summer 2000 Ending: Fall 2010
Prerequisite: a minimum of six credits in courses that focus on youth and/or families

YFE 455 **Extension Youth Development Programs and Volunteer Management** (3) A study of 4-H/Extension youth programs and the variety of roles played by volunteer leaders.
Effective: Summer 1999 Ending: Fall 2010
Prerequisite: 6 credits of social or behavioral sciences

YFE 470 **Consumer and Financial Skills** (3) Consumer and financial issues formal and non formal educators need to be informed about to function in today's society.
Effective: Spring 2008 Ending: Fall 2010
Prerequisite: Six credits of social and behavioral sciences and six credits of quantification (math)

YFE 495 **Internship in Youth and Family Education Programs** (6-18) Supervised off-campus, nongroup instruction including field experiences, practicums, or internships.
Effective: Summer 1999 Ending: Fall 2010
Prerequisite: prior approval of proposed assignment by instructor

YFE 496 **Independent Studies** (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Spring 2000 Ending: Fall 2010

YFE 497 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.
Effective: Spring 2000 Ending: Fall 2010

YFE 498 **Special Topics** (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject that may be topical or of special interest.
Effective: Spring 2000 Ending: Fall 2010

YFE 499 (IL) **Foreign Studies** (1-12) Courses offered in foreign countries by individual or group instruction.
Effective: Summer 2005 Ending: Fall 2010

YFE 535 **Youth Civic Development** (3) This course critically examines processes enabling youth to become members of local communities and "citizens" of nations and global societies.
Effective: Spring 2001 Ending: Fall 2010

YFE 550 **Program Development and Evaluation in Youth, Families and Communities** (3) Examination of concepts, theories, models, and procedures relative to program development and evaluation in youth, families and communities.
Effective: Spring 2004 Ending: Fall 2010
Prerequisite: AEE 450;AEE 520

YFE 555 **Volunteer Program Management** (3) The study and application of concepts and principles of volunteerism and administration relevant to volunteer program management.
Effective: Fall 2001 Ending: Fall 2010

YFE 590 **Colloquium** (1-3) Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.
Effective: Spring 2001 Ending: Fall 2010

YFE 595 **Internship** (1-18) Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.
Effective: Spring 2007 Ending: Fall 2010
Prerequisite: prior approval of proposed assignment by instructor

YFE 596 **Individual Studies** (1-9) Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.
Effective: Fall 2000 Ending: Fall 2010

YFE 597 **Special Topics** (1-9) Formal courses given on a topical or special interest subject which may be offered

infrequently.
Effective: Spring 2001 Ending: Fall 2010

YFE 597B **Theory to Practice** (1) Applying course content to personal and professional life, including personal financial information, identity theft, nutrition, and food safety.
Effective: Summer 2010 Ending: Summer 2010

YFE 600 **Thesis Research** (1-15) No description.
Effective: Summer 2002 Ending: Fall 2010

YFE 610 **Thesis Research Off Campus** (1-15) No description.
Effective: Summer 2002 Ending: Fall 2010

YFE 840 **Applied Youth Development** (3) Background and current issues related to youth development programs in their application to actual youth programs in community settings.
Effective: Fall 2008 Ending: Fall 2010

YFE 845 **Intergenerational Programs and Practices** (3) Background, intervention strategies, and issues related to developing intergenerational programs and practices aimed at addressing vital social and community issues.
Effective: Summer 2009 Ending: Fall 2010

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GRADUATE PROGRAMS, FACULTY, AND COURSES

A course abbreviation, a number, and a title designate each course. Course designations and official abbreviations are listed above the first course in each group. The figures in parentheses following the course title show the number of credits that may be granted for that course. In the case of courses with variable credits, the number of credits that may be earned in a single semester is determined by the department or program offering the course.

A department or major program may schedule an entire section of a course below the 400 level for fewer credits than the maximum authorized. In 400-level courses, a student may schedule fewer credits than the maximum number but in no case more than the maximum number authorized. No 600-level courses (supervised college teaching; on- and off-campus research; and full- and part-time dissertation work) are listed with individual programs. All courses listed under graduate majors may not be required in the particular major.

COMMON COURSE NUMBERS

The following courses for which students may register have been set up for common use by major programs to encourage innovation and provide flexibility in designing graduate programs. For courses 594, 595, 596, 597, 598, and 599, special titles may be requested by a graduate program for a given semester, through the Senate Curriculum Coordinator, 101 Kern Building, University Park campus.

590. COLLOQUIUM--Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.

594. RESEARCH TOPICS--Supervised student activities on research projects identified on an individual or small-group basis. A specific title may be used in each instance and will be entered on the student's transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.

595. INTERNSHIP--Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required. A specific title may be used in each instance and will be entered on the student's transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc. Prerequisite: prior approval of proposed assignment by instructor.

596. INDIVIDUAL STUDIES--Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses. A specific title may be used in each instance and will be entered on the student's transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.

597, 598. SPECIAL TOPICS--Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester. A specific title may be used in each instance and will be entered on the student's transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.

599. FOREIGN STUDIES (1-2 per semester, maximum of 4) Courses offered in foreign countries by individual or group instruction. A specific title may be used in each instance and will be entered on the student's transcript. Multiple offerings may be accommodated by the use of suffixes A, B, etc.

600, 610. THESIS RESEARCH--In registering for thesis research a student uses the appropriate number (600, 610) preceded by the abbreviation designating the major field. The numbers 600 (on campus) and 610 (off campus) are available for credit in thesis research in all graduate major programs. The bursar assesses charges for these courses at the current rate of tuition, according to the student's status at the time of registration.

601, 611. THESIS PREPARATION--The numbers 601 and 611, with associated special fees, are available to Ph.D. degree candidates who have passed the comprehensive examination and met the two-semester residence requirement. They may be used for thesis preparation work during its later stages, when the academic activity of the candidate consists partly (611) or solely (601) of work on the completion of research and writing of the dissertation.

SUBJ 601 and SUBJ 611 do not carry academic credit. They are entered on the academic transcript to indicate the registration and the nature of the candidate's academic activity. A candidate registered for SUBJ 601 is classified as a full-time student, while one registered for SUBJ 611 is classified as a part-time student. Students may take 601 plus up to 3 additional credits of course work for audit by paying only the dissertation fee. Students wishing to take up to 3 additional credits of course work for credit, i.e., 590, 602, etc., with 601 may do so by paying the dissertation fee and an additional flat fee. Enrolling for 3 credits for either audit or credit will be the maximum a student may take with SUBJ 601 without special approval by the Graduate School. (NOTE: Registration for additional credits above this will incur an additional charge at the appropriate tuition per-credit rate [in-state or out-of-state].) Students wishing to take more than 3 additional credits of course work must register for 600 or 611 (i.e., not for 601, which is full-time thesis preparation). (See also Thesis Preparation, in the General Information section of this bulletin.)

The numbers 600, 601, 610, and 611 may not appear in the *Schedule of Courses* for each semester.

602. SUPERVISED EXPERIENCE IN COLLEGE TEACHING--May be offered by any graduate program in a department that also offers undergraduate courses. A graduate program with no counterpart undergraduate program may offer SUBJ 602 when cooperative arrangements are made with an admin-istrative unit that does not offer graduate degrees but that uses graduate assistants in its teaching. SUBJ 602 may be offered in any semester and is subject to the following restrictions:

1. SUBJ 602 will not be counted in fulfilling any specific credit requirement for an advanced degree.
2. SUBJ 602 will be graded (A, B, C, D, F). The grade will appear on the student's transcript.
3. SUBJ 602 will not be used in calculating grade-point averages.
4. SUBJ 602 shall be offered only in those graduate programs that want to provide opportunity for supervised and

graded teaching experience. Enrollment will be restricted to students for whom the major program is prepared to provide such experience.

5. SUBJ 602 will be counted as a part of the student's credit load unless the program specifies otherwise.

SUBJ 603. FOREIGN ACADEMIC EXPERIENCE (1-12)--Foreign study and/or research approved by the graduate program for students enrolled in a foreign university constituting progress toward the degree.

1/13/05

Accounting (ACCTG)

Program Home Page

PAUL E. FISCHER, *Chair*
Department of Accounting, Smeal College of Business
354 Business Building
814-865-0041
pef5@psu.edu

Degrees Conferred:

Master of Accounting in Accounting (M.Acc.)
Integrated B.S. in Accounting and Master of Accounting in Accounting Program

The Graduate Faculty

Orie E, Barron, Ph.D. (University of Oregon) Professor of Accounting
Robert P. Crum, D.B.A. (Kentucky) Associate Professor of Accounting
Mark W. Dirsmith, Ph.D. (Northwestern) Deloitte & Touche Professor of Accounting
Charles R. Enis, D.B.A. (Maryland) Associate Professor of Accounting
Paul E. Fischer, Ph.D., (Rochester) Professor of Accounting
Dan Givoly, Ph.D. (NYU) Ernst & Young Professor of Accounting
Guojin Gong, Ph.D. (Iowa) Assistant Professor of Accounting
Steven J. Huddart, Ph.D. (Yale) Professor of Accounting
Bin Ke, Ph.D. (Michigan State) Associate Professor of Accounting
J. Edward Ketz, Ph.D. (Virginian Tech) Associate Professor of Accounting
Michelle Liu, Ph.D. (MIT Sloan) Assistant Professor of Accounting
Henock Louis, Ph.D. (Ohio State)Associate Professor of Accounting
Jmaes McKeown, Ph.D. (Michigan State) Mary Jean and Frank P. Smeal Professor of Accounting
Karl Muller, Ph.D. (Illinois) Associate Professor of Accounting
Charles H. Smith, Ph.D. (Penn State) KPMG Professor Emeritus of Accounting
Amy Xue Sun, Ph.D. (Carnegie Mellon) Assistant Professor of Accounting

The Department of Accounting offers a Master of Accounting that is designed to allow students to complete the educational requirements for becoming a certified public accountant in Pennsylvania as well as most other states. Certified public accountants conduct independent audits and provide accounting, tax, and management advisory services. The program prepares students to enter into careers in public accounting, corporate accounting, management accounting, governmental accounting, financial analysis, and law enforcement.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements state in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Entry to the program is competitive and subject to available space. Criteria for evaluating applicants include: professional and academic accomplishments, GMAT scores, personal Data from application forms and, possibly, interviews or examinations. Work on the M.Acc. degree generally begins in the fall semester.

Typically, student who meet the admissions requirements can complete the program in one full year.

Students who apply to the program should have an undergraduate educational background equivalent to a Bachelor Science degree from the Penn State University Smeal College of Business. Students who apply to the program should have completed the equivalent of the following Penn State University accounting courses: ACCTG 211, ACCTG 403W, ACCTG 404, ACCTG 405, ACCTG 471, and ACCTG 472. Applicants to the program from outside Penn State may be required to take an entry exam to demonstrate mastery of the material covered in theses courses prior to beginning coursework in the master's program.

Although the program has no fixed minimum grade-point requirement, an applicant is generally expected to have maintained a junior-senior grade-point average of at least 3.00 on Penn State's grading scale of A (4.00) to D (1.00). In addition, an applicant is expected to have maintained a grade-point average of 3.00 for the required accounting courses.

Applicant to the program are generally required to take the Graduate Management Admission Test (GMAT). For dates, locations, and other information about the test, write for the Bulletin of Information, Graduate Management Admission Test, Educational Testing Services, Princeton, NJ 08540; www.gmat.org; 800-982-6740.

Applicants whose first language is not English or who have received a baccalaureate or master's degree from an institution in which the language of instruction is not English must take either the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) module and submit the results of that test with the application for admission. The TOEFL test is offered in different formats depending on location. A score of at least 600 on the paper-based TOEFL or 250 on the computer-based TOEFL must be attained. A minimum total score of 100, along with a minimum score of 23 on the speaking portion, is required for the Internet-based test (iBT). Information about the TOEFL can be obtained by writing to the Educational Testing Service, Box 6155, Princeton, NJ 08541-6155 or visiting their Web site at www.toefl.org. Alternatively, a minimum composite score of 7.0 on the IELTS test is required for admission. Information about the IELTS can be obtained by contacting IELTS International, 100 E Corson St, Suite 200, Pasadena, CA 91103 or by visiting its Web site at www.ielts.org.

Additionally, the program requires: (1) a completed Smeal College of Business application for graduate study including Graduate School application fee, and (2) official transcripts from all completed graduate and undergraduate course work.

Degree Requirements

Students must complete a minimum of 30 credit hours of graduate instruction. All of the 30 credit hours must be earned in 400-level,

500-level, or 800-level courses. At least 18 of the 30 credit hours must be earned in 500-level and 800-level courses, and at least 6 of the 30 credit hours must be earned in 500-level courses.

Students must complete the following required courses as part of the 30 credit hours of graduate instruction:

ACCOUNTING (ACCTG)

- 432. Accounting Information Systems (3)
- 440. Advanced Managerial Accounting (3)
- 803. Forensic Accounting (3)
- 806. Advanced Topics in Taxation (3)
- 873. Advanced Topics in Financial Reporting (3)
- 881. Financial Statement Analysis (3)

BUSINESS ADMINISTRATION (B A)

- 517. Leadership Communications (3)

BUSINESS LAW (B LAW)

- 444. Advanced UCC and Commercial Transactions (3)

FINANCE

- 531. Financial Management (3)

ACCTG 803 will be the capstone course for the program, with the final project integrating material learned in the other program courses. Student must also take an additional 3 credit (elective) course selected in consultation with their adviser.

Integrated B.S. in Accounting and Master of Accounting in Accounting Program

The Department of Accounting offers an integrated program allowing students to receive a B.S. in Accounting and Master of Accounting (M.Acc.) degrees within a five-year period. Students typically are admitted into the integrated program in the spring of the second year of the undergraduate program and the program is completed in the subsequent three years. The program is designed to meet the educational requirements for becoming a certified public accountant in Pennsylvania as well as most other states. Certified public accountants conduct independent audits and provide accounting, tax, and management advisory services. The program prepares students to enter into careers in public accounting, corporate accounting, management accounting, governmental accounting, financial analysis, and law enforcement. In addition, the program is appropriate for students having an interest in entering law school and graduate programs in business, such as M.B.A. programs or doctoral programs.

Admission Requirements

Students will generally apply for the program in the spring of their second year of undergraduate study. To apply for the program students must:

(1) be enrolled in the Smeal College of Business or Division of Undergraduate Studies and intend to complete the entrance-to-major requirements by the end of the spring semester in which they apply

and

(2) complete a Graduate School application for graduate study.

Although the program has no fixed minimum grade-point requirement, an applicant is generally expected to have grade-point average of at least 3.20 on Penn State's grading scale of A (4.00) to D (1.00).

In addition, the Department may request an interview with an applicant, or require a GMAT exam or other exam. Admissions decisions will be based upon the student's application, undergraduate record, SAT scores and, if applicable, interviews and examination results.

Admitted students must have completed ACCTG 211 with superior performance by the end of the spring semester in which they apply for admission to the program. A student who has not satisfied this requirement by the admissions deadline may be provisionally admitted pending completion of ACCTG 211 with a superior performance.

Degree Requirements

Students must complete the requirements for a B.S. in accounting with the following alterations:

Some of prescribed courses for the B.S. must be taken in sections that are available only to students enrolled in the program. These prescribed courses, which all count toward the undergraduate degree in accounting, are: ACCTG 403W, ACCTG 404, ACCTG 405, ACCTG 471, and ACCTG 472.

The student need not satisfy the requirement that 6 credit hours be completed from the following list of courses: ACCTG 406, ACCTG 432, ACCTG 473, and ACCTG 481.

The following courses cannot be used to satisfy the degree requirements of the integrated program: ACCTG 406, ACCTG 410, ACCTG 411, ACCTG 422, ACCTG 450, ACCTG 473, and ACCTG 481.

Students must complete the Master of Accounting Requirements, which total 30 credit hours of graduate instruction, in addition to completing 120 credit hours of undergraduate instruction.

The following courses, totaling 9 credits hours, will double-count towards both the B.S. and Master of Accounting degrees: B LAW 444(3), FIN 531(3), and ACCTG 881(3).

Courses

Graduate courses carry numbers from 500 to 599 or 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may

be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Last Revised by the Department: Spring Semester 2010

Blue Sheet Item #: 38-06-037; Integrated 38-06-038

Review Date: 04/13/2010

Last updated by Publications: 1/22/10 (link check)

Acoustics (ACS)

Program Home Page

VICTOR W. SPARROW, *Interim Head of the Graduate Program in Acoustics*
217A ARL Building
814-865-6364; Fax—814-865-3119

Degrees Conferred:

Ph.D., M.S., M.Eng.

The Graduate Faculty

- Anthony A. Atchley, Ph.D. (U of Mississippi) Professor of Acoustics; Program Head
- Ingrid M. Blood, Ph.D. (Bowling Green) Professor of Communication Sciences and Disorders
- David L. Bradley, Ph.D. (Penn State) Senior Scientist; Professor of Acoustics
- Kenneth Brentner, Ph.D. (Cambridge) Professor of Aerospace Engineering
- Timothy Brungart, Ph.D. (Penn State) Senior Research Associate; Associate Professor of Acoustics
- Russell C. Burkhardt, Ph.D. (Penn State) Research Associate; Assistant Professor of Acoustics
- Dean Capone, Ph.D. (Penn State) Research Associate; Assistant Professor of Acoustics
- R. Lee Culver, Ph.D. (California, San Diego) Assistant Professor of Acoustics
- John Fahnline, Ph.D. (Penn State) Research Associate; Assistant Professor of Acoustics
- Thomas A. Frank, Ph.D. (Wisconsin) Professor of Communication Sciences and Disorders
- Thomas B. Gabrielson, Ph.D. (Penn State) Senior Research Associate; Associate Professor of Acoustics
- Steven L. Garrett, Ph.D. (UCLA) United Technologies Professor of Acoustics
- Stephen A. Hambric, D.Sc. (George Washington) Senior Research Associate; Associate Professor of Acoustics
- W. Jack Hughes, Ph.D. (Penn State) Senior Scientist; Professor of Acoustics
- Yu-Fan Hwang, Ph.D. (Penn State) Senior Research Associate; Associate Professor of Acoustics
- Robert M. Keolian, Ph.D. (U of California) Senior Research Associate; Associate Professor of Acoustics
- Gary H. Koopmann, Ph.D. (Catholic) Distinguished Professor of Mechanical Engineering
- John S. Lamancusa, Ph.D. (Wisconsin, Madison) Professor of Mechanical Engineering
- Gerald C. Lauchle, Ph.D. (Penn State) Professor of Acoustics
- George Lesieutre, Ph.D. (California, Los Angeles) Professor of Aerospace Engineering
- Lyle Long, Ph.D. (George Washington) Professor of Aerospace Engineering
- Anthony Lyons, Ph.D. (Texas A&M) Senior Research Associate; Associate Professor of Acoustics
- William Mark, Ph.D. (MIT) Senior Scientist; Professor of Acoustics
- Julian D. Maynard, Ph.D. (Princeton) Professor of Physics
- Timothy McDevitt, Ph.D. Senior Research Associate; Associate Professor of Acoustics
- Dennis K. McLaughlin, Ph.D. (MIT) Professor of Aerospace Engineering
- Philip J. Morris, Ph.D. (Southampton) Boeing Professor of Aerospace Engineering
- John Reeves, Ph.D. (Western Washington State) Senior Research Associate; Associate Professor of Acoustics
- Karl M. Reichard, Ph.D. (Virginia Polytech) Research Associate; Assistant Professor of Acoustics
- Michael Roan, Ph.D. (Penn State) Research Associate; Assistant Professor of Acoustics
- Victor W. Sparrow, Ph.D. (Illinois, Urbana-Champaign) Professor of Acoustics
- Richard Stern, Ph.D. (UCLA) Associate Director, ARL; Professor of Engineering Science and Mechanics
- David C. Swanson, Ph.D. (Penn State) Senior Research Associate; Associate Professor of Acoustics
- Dennis W. Thomson, Ph.D. (Wisconsin) Professor of Meteorology
- Bernhard R. Tittmann, Ph.D. (UCLA) Schell Professor of Engineering Science and Mechanics
- Martin W. Trethewey, Ph.D. (Michigan Tech) Professor of Mechanical Engineering
- Richard Tutweiler, Ph.D. (Penn State) Senior Research Associate; Associate Professor of Acoustics
- Lora G. Weiss, Ph.D. (Penn State) Senior Research Associate; Associate Professor of Acoustics

The aim of this program is to enable the student interested in acoustics to obtain an integrated program covering acoustical science and engineering applications of acoustics.

Student curricula are individually tailored and integrated through a selection of core and elective courses in areas such as basic acoustics, physical acoustics, underwater acoustics, signal processing, optics, architectural acoustics, medical ultrasonics, aeroacoustics, vibrations, wave propagation, speech, physiological acoustics, psychoacoustics, thermoacoustics, hydroacoustics, and computational acoustics. The courses are offered by the Graduate Program in Acoustics and by other participating University departments, including Aerospace Engineering, Architectural Engineering, Bioengineering, Electrical Engineering, Engineering Science and Mechanics, Mechanical Engineering, Meteorology, Geosciences, Physics, Speech Communication, and Communication Disorders.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Entering students should hold a bachelor's degree in physics, engineering, mathematics, or a closely related field that would provide substantial preparation in mathematics (a minimum of two semesters of calculus-based physics and mathematics to include complex variables and differential equations). In addition, an undergraduate knowledge of statics and dynamics, linear algebra, and electronic circuit analysis, and the ability to use mathematical analysis software is expected. Students with a 3.00 junior/senior average (on a 4.00 scale), appropriate course backgrounds, and a B+ or better average in mathematics, physical science, and engineering courses will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. An individual with nontechnical background may also apply, but acceptance into the program will depend significantly on the applicant's undergraduate background and motives to pursue advanced study in acoustics. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds and abilities.

Scores from the Graduate Record Examinations (GRE) are required. For applicants required by the Office of Graduate Enrollment to take the TOEFL, minimum require TOEFL scores are 237 (computer-based test) or 580 (paper-based test).

Other Relevant Information

In addition to the acoustics courses listed here, the following courses on acoustics and closely related areas are available: AERSP 511, 524, 525; A E 458, 520; BIOE 506, 516; CMPEN 485; E E 460, 530, 557, 560, 561, 562; E SC 536, 537; E MCH 412, 516, 521, 524A,B,C, 525, 527, 528, 560, 562, 570; GEOSC 504, 507A,B; 551; M E 471, 554; PHYS 443, 533. This list may change as other departments continue to add new courses relevant to acoustics.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ACOUSTICS (ACS) course list

Last updated by Publications: 4/7/10

UCA Revision #2: 7/30/07

Adult Education (ADTED)

Program Home Page

GARY W. KUHNE, *Co-Professor in Charge of Graduate Programs in Adult Education*
FRED M. SCHIED, *Co-Professor in Charge of Graduate Programs in Adult Education*
314 Keller Building
814-863-3781
cgw2@psu.edu

EDWARD W. TAYLOR, *Coordinator of Doctoral Program in Adult Education, Penn State Harrisburg*
717-948-6640; ewt1@psu.edu; Program Home Page

Degrees Conferred:

Ph.D., D.Ed., M.Ed.

The Graduate Faculty

- William Anderson, D.Ed. (Penn State) *Adjunct Assistant Professor*
- Eunice N. Askov, Ph.D. (Wisconsin) *Distinguished Professor Emerita of Education*
- Irene Baird, D.Ed. (Penn State) *Affiliate Assistant Professor of Education*
- Rebecca Beatty, D.Ed. (Penn State) *Affiliate Assistant Professor of Education*
- Thomas Bettinger, D.Ed. (Penn State) *Adjunct Assistant Professor*
- Felicia Brown-Hayward, D.Ed. (Penn State) *Affiliate Assistant Professor of Education*
- Ian Baptiste, Ed.D. (Northern Illinois) *Associate Professor of Education*
- Patricia Cranton, Ph.D. (Toronto) *Visiting Professor of Education*
- Daniele Flannery, Ph.D. (Wisconsin) *Associate Professor Emerita of Education*
- Barbara Frey, D.Ed. (Penn State) *Adjunct Assistant Professor*
- Modupe (Dupe) Irele, D.Ed. (Penn State) *Adjunct Assistant Professor*
- Ilhan Kucukaydin, D.Ed. (Penn State) *Affiliate Assistant Professor of Education*
- Gary W. Kuhne, D.Ed. (Penn State) *Associate Professor of Education*
- Frederick Milacci, D.Ed. (Penn State) *Adjunct Assistant Professor*
- Gary E. Miller, D.Ed. (Penn State) *Affiliate Associate Professor of Education*
- Michael G. Moore, Ph.D. (Wisconsin) *Professor of Education*
- Naomie Nyanungo, D.Ed. (Penn State) *Adjunct Assistant Professor*
- Esther S. Prins, Ph.D. (Cornell) *Assistant Professor of Education*
- Benjamin Allan Quigley, Ed.D. (Northern Illinois) *Adjunct Assistant Professor*
- Jeffrey Ritchey, D.Ed. (Penn State) *Adjunct Assistant Professor of Education*
- Ladislaus (Ladi) M. Semali, Ph.D. (California) *Associate Professor of Education*
- Fred M. Schied, Ed.D. (Northern Illinois) *Associate Professor of Education*
- Kay Shattuck, D.Ed. (Penn State) *Adjunct Assistant Professor*
- Heather Stuckey, D.Ed. (Penn State) *Affiiate Assistant Professor of Education*
- Edward W. Taylor, Ed.D. (Georgia) *Professor of Adult Education*
- Melody M. Thompson, D.Ed. (Penn State) *Assistant Professor of Education*
- Patricia Thompson, D.Ed. (Penn State) *Affiliate Assistant Professor of Education*
- Joan S. Thomson, Ph.D. (Wisconsin) *Professor of Agricultural Communications; Affiliate Professor of Education*
- Elizabeth J. Tisdell, Ed.D. (Georgia) *Professor of Education*

Adult Education extends through the life span from late adolescence to advanced age and takes place in a rich diversity of organizational as well as informal settings. The purpose of the Adult Education program is to increase the knowledge and competence of those who work with adult learners. Coursework, reading assignments, research projects, internships, informal discussions, and the dissertation all provide opportunities for in-depth and challenging learning experiences. The programs are interdisciplinary, and students are advised to seek learning in supporting fields within the University.

The Ph.D., D.Ed., and M.Ed. degrees are offered only at University Park. The M.Ed. is also offered through the World Campus. Harrisburg offers the D.Ed. degree.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from the Miller Analogies Test (MAT), are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in the program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Applicants with a total Verbal and Quantitative score above 1100 on the GRE, a junior/senior average of 3.00 (on a 4.00 scale), and a graduate average of 3.50 are usually admitted to the Ph.D. or D.Ed. program. Applicants with a junior/senior average of 2.70, a graduate average of 3.20, and a GRE total score of 1000 but with special backgrounds, abilities, and interests also may be admitted to the doctoral programs with only the baccalaureate degree, but they will earn the master's degree en route. The Miller Analogies Test may be accepted in place of the GRE for admission to the graduate program in Adult Education. A sample of student writing and a "career letter" in which applicants explain how the proposed studies in adult education relate to their careers are required for each degree. A proctored writing sample is required of doctoral students. Three letters of reference (at least two from faculty members for Ph.D. applicants) that evaluate the candidate's aptitude for graduate study are required.

Applicants who exhibit exceptional qualities without meeting all of the stated requirements for admission may be considered for provisional admission while removing identified deficiencies. Deficiencies must be rectified within the first two semesters in the program; courses taken to remove deficiencies are considered to be prerequisites and do not earn credit toward the doctoral degree.

Master's Degree Requirements

M.Ed. students are required to write a master's paper, in lieu of a thesis, as part of the required 33 credits of course work. A minimum of 18 credits out of the 33 must be taken at the 500 level and a minimum of 18 credits must be in ADTED prefix courses.

Doctoral Degree Requirements

Ph.D. students are required to take 12 core credits in Adult Education, 12 credits in an emphasis area that is composed of Adult Education and supporting courses outside Adult Education, and 18 research credits, in addition to the residency requirement, candidacy and comprehensive examinations, and continuous registration during the dissertation research. All students are required to be computer literate as determined by their doctoral committee and will be assessed for communication skills during core adult education courses. Students with a knowledge of a second language (as demonstrated by having lived in a foreign country for at least one year, speaking a native language other than English, or having studied another language in post-secondary education for at least two years) will be given preference in admission to the Ph.D. program.

D.Ed. students who do not have previous experience in adult education are expected to acquire the equivalent of one year of experience in one or more fields of adult education practice prior to receiving their D.Ed. degree. A candidacy examination is administered after students complete 9-15 credits. During the comprehensive examination, in addition to being examined in their area of specialization, all D.Ed. students will be examined in the core adult education areas. A minimum of 24 credits in coursework must be taken in Adult Education. A minimum of 15 credits must be taken outside Adult Education as a minor or General Studies option. A minimum of 6 research credits is required.

Students in the Ph.D. program focus on research in Globalization and Lifelong Learning selecting one emphasis area (Distance Education, Literacy for Culturally and Linguistically Diverse Populations, Comparative Lifelong Learning, or Learning in Work and Communities). Research credits develop the background knowledge and tools to enable them to engage in original research. D.Ed. students conduct applied research with the goal of improving practice in the general adult education field.

Prerequisites for the Ph.D. Program: ADTED 460, Introduction to Adult Education, and ADTED 507, Research and Evaluation in Adult Education, or their equivalents, are prerequisites to admission to the Ph.D. program. Another prerequisite is a basic statistics course, such as EDPSY 400 or AEE 521, required as part of the Penn State master's degree program in Adult Education. As prerequisites they do not count toward the requirements of the Ph.D. program although they may be completed while taking required Ph.D. courses.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ADULT EDUCATION (ADTED) course list

Last Revised by the Department: Fall Semester 2004

Blue Sheet Item #: 32-07-017

Review Date: 6/15/04

Last updated by Publications: 7/16/10

Aerospace Engineering (AERSP)

Program Home Page (Opens New Window)

GEORGE A. LESIEUTRE, Head of the Department
229 Hammond Building
814-865-2569; Fax: 814-865-7092; gradaero@engr.psu.edu

Degrees Conferred:

Ph.D., M.S., M.Eng.

The Graduate Faculty

- Sven G. Bilén, Ph.D. (Michigan) Associate Professor of Engineering Design and Electrical Engineering, and Aerospace Engineering
- Kenneth S. Brentner, Ph.D. (Cambridge) Professor of Aerospace Engineering
- Cengiz Camci, Ph.D. (Von Karman Institute) Professor of Aerospace Engineering
- Stephen C. Conlon, Ph.D. (Penn State) Research Associate; Assistant Professor of Aerospace Engineering
- Farhan S. Gandhi, Ph.D. (Maryland) Professor of Aerospace Engineering
- Joseph F. Horn, Ph.D. (Georgia Tech) Associate Professor of Aerospace Engineering
- Robert F. Kunz, Ph.D. (Penn State) Senior Research Associate; Associate Professor of Aerospace Engineering
- Jack W. Langelaan, Ph.D. (Stanford) Assistant Professor of Aerospace Engineering
- George A. Lesieutre, Ph.D. (California, Los Angeles) Professor of Aerospace Engineering
- Deborah A. Levin, Ph.D. (Caltech) Professor of Aerospace Engineering
- Lyle N. Long, D.Sc. (George Washington) Distinguished Professor of Aerospace Engineering and Mathematics
- Mark D. Maughmer, Ph.D. (Illinois) Professor of Aerospace Engineering
- Dennis K. McLaughlin, Ph.D. (MIT) Professor of Aerospace Engineering
- Robert G. Melton, Ph.D. (Virginia) Professor of Aerospace Engineering
- Michael M. Micci, Ph.D. (Princeton) Professor of Aerospace Engineering; Director of Graduate Studies
- Philip J. Morris, Ph.D. (Southampton) Boeing/A. D. Welliver Professor of Aerospace Engineering
- Edward C. Smith, Ph.D. (Maryland) Professor of Aerospace Engineering
- David B. Spencer, Ph.D. (Colorado) Associate Professor of Aerospace Engineering

Opportunities for graduate study are available in the following areas: low-speed aerodynamics, airplane and helicopter aerodynamics; V/STOL aircraft, turbulence, astrodynamics, turbomachinery, air breathing propulsion, aeroacoustics, gas dynamics, stability and control of aerospace vehicles, aerospace structures, structural dynamics, aeroelasticity, rotorcraft engineering, computational fluid dynamics, experimental fluid dynamics, space propulsion, space vehicle dynamics, and high-performance computing.

Admission Requirements

Applicants must submit official scores from the Graduate Record Examinations (GRE) for admission to the graduate program and consideration for financial assistance. In addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin, the department poses a number of specific requirements. The entering M.Eng. or M.S. student must hold a bachelor's degree in engineering, physical science, or mathematics, and may be required to complete (without degree credit) undergraduate course work in fluid and solid mechanics and intermediate mathematical analysis, if not already completed. The department will consider students with a 3.0 junior/senior grade-point average (GPA) on a 4.0 scale; students with special backgrounds, abilities, or interests may request a waiver to this GPA requirement. The best-qualified applicants will be accepted up to the number of spaces that are available. Admission to the Ph.D. program requires satisfactory completion of a master's program in engineering, physical science, or mathematics. Admission to the Ph.D. program prior to completion of a master's degree may be considered upon the student passing the Ph.D. candidacy exam. A student must have completed at least 18 course credits beyond the baccalaureate degree in order to take the Ph.D. candidacy exam, and is not granted official status as a doctoral candidate until the master's degree is complete and the candidacy exam has been passed. Application materials are available at: www.aero.psu.edu.

M.Eng., M.S., and Ph.D. Core Requirements

1. Basic field theories. Complete two courses for 6 credits, one from a prescribed list in each of two of the following categories: fluid mechanics, solid mechanics, or system dynamics.
2. Numerical/computational methods. Complete one 3-credit course that addresses the numerical analysis of differential equations, from a prescribed list.
3. Applied mathematics. Complete one 3-credit, 500-level course from a prescribed list.
4. Teaching assistants and teaching aides who have classroom or laboratory instructional responsibilities must satisfactorily complete ENGR 588. Those with responsibilities limited to grading, holding office hours, and offering problem sessions must take ENGR 588 or a grading seminar.

Master of Engineering Degree Requirements

The M.Eng. degree is a nonthesis professional master's degree. A total of 30 credits is required, including courses in the core requirements. Twenty-one credits must be in Aerospace Engineering courses with at least 18 credits at the 500 level. A student may count a maximum of 6 credits of 400-level course work toward the degree. Each student must complete a scholarly paper (for 2 credits of AERSP 596), which includes a literature review and some additional experiment or analysis, and must complete the graduate colloquium (for 1 credit of AERSP 590).

Master of Science Degree Requirements

A total of 30 credits is required, including courses in the core requirements. Twelve credits must be in Aerospace Engineering courses with at least 6 credits at the 500 level. A student may count a maximum of 6 credits of 400-level course work toward the degree. Six credits of thesis research are also required. A completed M.S. thesis and its public presentation are required for graduation.

Doctoral Degree Requirements

There is no foreign language requirement for the Ph.D. degree; however, students must demonstrate proficiency in reading, writing, and speaking English through an examination administered by the department. This must be completed to satisfy the Graduate School's requirement before taking the comprehensive exam. The candidate's doctoral committee decides which, if any, courses are required in addition to those specified in the core requirements; this typically involves 24 course credits beyond the M.S. degree. Ph.D. candidates must also demonstrate evidence of experimental experience.

Over the course of a Ph.D. program, the department and doctoral committee administer three examinations: The candidacy examination is given as a preliminary aptitude test before the end of the second semester following admission to the program. A comprehensive examination, which covers the major and minor fields of study, is administered after the candidate has substantially completed the required course work. The final oral examination, which is related mainly to the dissertation, is given after the candidate has satisfied all other degree requirements. All Ph.D. students must maintain continuous registration until the thesis is approved. A completed Ph.D. dissertation and its public defense are required for graduation.

Student Aid

Graduate assistantships and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

AEROSPACE ENGINEERING (AERSP) course list

Last updated by Publications: 1/14/09

Agricultural and Biological Engineering (A B E)

Program Home Page

PAUL H. HEINEMANN, *Head of the Department of Agricultural and Biological Engineering*
250 Agricultural Engineering Building
814-865-7792

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Dennis E. Buffington, Ph.D. (Minnesota), P.E. Professor of Agricultural Engineering
- Jeff Catchmark, Ph.D. (Lehigh) Assistant Professor of Agricultural Engineering
- Ali Demirci, Ph.D. (Iowa State) Associate Professor of Agricultural Engineering
- Herschel A. Elliott, Ph.D. (Delaware) P.E. Professor of Agricultural Engineering
- Robert E. Graves, Ph.D. (Massachusetts) P.E. Professor of Agricultural Engineering
- James M. Hamlett, Ph.D. (Iowa State) P.E. Associate Professor of Agricultural Engineering
- Paul H. Heinemann, Ph.D. (Florida) Professor of Agricultural Engineering
- James W. Hilton, Ph.D. (Iowa State) Associate Professor of Agricultural Engineering
- Joseph Irudayaraj, Ph.D. (Purdue) Associate Professor of Agricultural Engineering
- Albert R. Jarrett, Ph.D. (Penn State) P.E. Professor of Agricultural Engineering
- Jude Liu, Ph.D. (Manitoba, Canada) Assistant Professor of Agricultural Engineering
- Kenneth M. Lomax, Ph.D. (Maryland) Adjunct Associate Professor of Agricultural Engineering
- Harvey B. Manbeck, Ph.D. (Oklahoma State) P.E. Distinguished Professor Emeritus of Agricultural Engineering
- Dennis J. Murphy, Ph.D. (Penn State) C.S.P. Distinguished Professor of Agricultural Engineering
- Virendra M. Puri, Ph.D. (Delaware) Distinguished Professor of Agricultural Engineering
- Thomas L. Richard, Ph.D. (Cornell) Associate Professor of Agricultural Engineering
- Robert D. Shannon, Ph.D. (Indiana) Associate Professor of Agricultural Engineering
- Paul N. Walker, Ph.D. (Massachusetts) P.E. Professor of Agricultural Engineering
- Eileen F. Wheeler, Ph.D. (Cornell) Professor of Agricultural Engineering
- Roy E. Young, Ph.D. (N Carolina State) P.E. Professor of Agricultural Engineering

Agricultural and Biological Engineering offers students the opportunity to gain expertise in areas of engineering for biological/agricultural systems corresponding to their professional interests. Graduate students select research projects (and supporting course work) from a wide range of interest areas that match faculty research expertise. Research projects are available in physical properties of biological materials, plant and animal production systems, food engineering, wood engineering, agricultural structures, agricultural safety, food safety, bulk solids handling and storage, agricultural systems engineering, agricultural by-product utilization, forage processing and handling systems, electronics instrumentation, online computer control systems, erosion and sedimentation control, waste management, water quality, and natural resources management and conservation.

Excellent facilities, including equipment and instrumentation, are available for research in the designated areas. Among the special facilities are field plot areas; a full-scale sedimentation basin test facility; hydraulic flumes; sedigraph; gas and ion chromatography units; atomic absorption unit; rainfall simulators; food properties lab; food equipment and processing lab; microbiological engineering lab; computer vision systems; hydraulic and pneumatic test stands; fabrication shop; electronics instrumentation; microcomputer laboratory; controlled environment chambers; wood structures lab; and wood mechanics lab. Collaborative arrangements allow access to a large variety of other resources: Penn State Institutes of the Environment; Particulate Materials Center; Housing Research Center; Center for Food Manufacturing; USDA Pasture Systems and Watershed Management Research Lab; a mushroom research and demonstration facility and a 1,500-acre agricultural research center for cooperative work with agronomic and horticultural production systems as well as animal production systems.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin.*

An undergraduate major in engineering is normally a prerequisite to work in the major. Students without an undergraduate engineering degree will be considered for admission on a provisional basis pending the completion of a number of additional credits to be specified on an individual basis.

All students must submit scores from the General Aptitude Test of the Graduate Record Examinations (GRE) prior to admission (except those who have an ABET-accredited engineering degree). There is no minimum GRE score required for admission, as this is only one of several qualifications considered in the admission review process. However, financial assistance is often influenced by the degree of success exhibited by GRE scores and grade-point averages (GPAs) from previous engineering programs. International applicants must submit OFFICIAL transcripts, degree, and diploma certificates in both English and the native language.

Photocopies will not be accepted. All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test or a score of 213 on the computer-based test is required for admission. The TOEFL exam must be taken within three years of the application date.

All applicants must provide the department with official transcripts of all their previous course work (in duplicate), a statement of purpose written by the applicant, and at least three letters of recommendation. Admission into the A B E Graduate Program is based upon a thorough review of all applicant qualifications, and the best-qualified applicants will be accepted up to the number of students for which department resources are available.

Entrance to Master of Science Program

Completion of an undergraduate degree in agricultural or biological engineering or in another related engineering discipline is required

for direct admission to the A B E graduate program. Students need at least a 2.50 (4.00 base) junior/senior grade-point average to be considered for admission.

A student with an undergraduate degree in a non-engineering field can be admitted to the M.S. program on a provisional basis, which continues until completing the engineering undergraduate requirements in mathematics, physics, engineering sciences (thermodynamics, statics, dynamics, strength of materials, fluid-mechanics and electrical circuitry), and 6 credits of 400-level Agricultural and Biological Engineering courses. Upon completion of these preparatory courses with a minimum grade-point average of 2.75, the student will be admitted to the graduate program.

Entrance to Doctor of Philosophy Program

The requirement for direct acceptance is an M.S. degree with a research thesis in an engineering or science discipline and a B.S. degree from an engineering program. Only very highly qualified students will be accepted into the Ph.D. program directly from a B.S. engineering program.

A student with an undergraduate degree in a non-engineering field can be admitted to the Ph.D. program on a provisional basis, which continues until completing the engineering undergraduate requirements in mathematics, physics, engineering sciences (thermodynamics, statics, dynamics, strength of materials, fluid mechanics and electrical circuitry), and 6 credits of 400-level Agricultural and Biological Engineering courses.

Master's Degree Requirements

All candidates for the M.S. degree must prepare a thesis, complete a minimum of 30 graduate credits (including a minimum of 6 credits of research), and obtain a minimum grade-point average of 3.00. Only grades of C or better are accepted for graduate credit. Each program should include at least one course each from the areas of agricultural and biological engineering, agricultural/biological science, mathematics or statistics, and A B E 500 Research Methods. A total of at least 12 credits of course work must be at the 500 level. All courses must be approved by the student's advisory committee as having significance and value for the degree program. All requirements for a master of science degree, whether satisfied at Penn State or elsewhere, must be met within five years from the first semester of graduate study.

Additional program details are contained in a graduate syllabus, available from the department.

Doctoral Degree Requirements

Official entrance into a Ph.D. program occurs upon successful completion of the Ph.D. Candidacy Exam. Ph.D. degree requirements include successful completion of the following: approved graduate course work, Ph.D. language and communication requirements, a comprehensive examination, and defense and approval of a dissertation.

No specified number of courses completed or credits earned are required by the department. However, the candidate must complete at least 9 credits of Agricultural and Biological Engineering (A B E) course work beyond the baccalaureate degree. Six credits must be 500-level A B E courses (excluding A B E 500, 590, 594, 595, 596); the remaining 3 credits must be in any A B E 460 course or higher. Unless previously taken, all Ph.D. students must complete A B E 500. The student's doctoral advisory committee will recommend the minimum requirements in such supporting areas as mathematics, engineering, agricultural/biological sciences, and physical sciences. The candidate is expected to develop a program of study and submit it to the appointed doctoral advisory committee for consideration and approval. All Ph.D. students are required to participate in resident education or extension teaching activities for the equivalent of at least one semester during their graduate program. A typical plan of study consists of about 90 credits beyond the baccalaureate degree with about 30 of the total credits for research. All requirements for a Ph.D. degree, whether satisfied on this campus or elsewhere, must be completed within seven years after passing the candidacy examination.

PH.D. LANGUAGE AND COMMUNICATION REQUIREMENT--The purpose of the communication requirement is to strengthen the student's professional communication skills. The candidate must take a minimum of two courses (a minimum total of 5 credits) and receive a grade of B or better in each course taken. Course selections must be approved by the academic adviser prior to registration. Courses used to satisfy this requirement must include the substantial practice of writing and/or speaking.

Other Relevant Information

Continuous fall and spring registration is required for all graduate students until the thesis is approved.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Last updated by Publications: 7/16/10

Agricultural and Extension Education (AEE)

Program Home Page (Opens New Window)

TRACY S. HOOVER, *Head of the Department*
323 Agricultural Administration Building
814-865-1688

Degrees Conferred:

Ph.D., M.S., M.Ed.

The Graduate Faculty

- Connie D. Baggett, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- Blannie E. Bowen, Ph.D. (Ohio State) Professor of Agricultural and Extension Education
- Cathy F. Bowen, Ph.D. (Ohio State) Associate Professor of Agricultural and Extension Education
- Jacklyn A. Bruce, Ph.D. (Texas A&M) Assistant Professor of Agricultural and Extension Education
- Thomas H. Bruening, Ph.D. (Iowa State) Associate Professor of Agricultural and Extension Education
- Ann H. Dodd, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- John C. Ewing, Ph.D. (Ohio State) Assistant Professor of Agricultural and Extension Education
- Constance A. Flanagan, Ph.D. (Michigan) Professor of Agricultural and Extension Education
- James W. Hilton, Ph.D. (Iowa State) Associate Professor of Agricultural and Extension Education
- Tracy S. Hoover, Ph.D. (Penn State) Associate Professor of Agricultural and Extention Education
- Patreese D. Ingram, Ed.D. (Western Michigan) Associate Professor of Agricultural and Extension Education
- Matthew S. Kaplan, Ph.D. (CUNY) Associate Professor of Agricultural and Extension Education
- Claudia C. Mincemoyer, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- James H. Mortensen, Ph.D. (Penn State) Professor of Agricultural Education
- Daniel F. Perkins, Ph.D. (Michigan State) Professor of Agricultural and Extension Education
- Rama B. Radhakrishna, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- Kristina G. Ricketts, Ph.D. (Florida) Assistant Professor of Agricultural and Extension Education
- Dennis C. Scanlon, Ph.D. (Ohio State) Professor of Agricultural and Extension Education
- Jan F. Scholl, Ph.D. (Iowa State) Associate Professor of Agricultural and Extension Education
- Tena L. St. Pierre, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- Joan S. Thomson, Ph.D. (Wisconsin-Madison) Professor of Agricultural Communications
- Barbara K. Wade, Ph.D. (Penn State) Affiliate Assistant Professor of Agricultural and Extension Education
- Nicole S. Webster, Ph.D. (Michigan State) Assistant Professor of Agricultural and Extension Education
- Edgar P. Yoder, Ph.D. (Ohio State) Professor of Agricultural and Extension Education

Graduate programs emphasize agricultural or extension education (including preparation for employment in college or university programs), youth and family programming, state-level administration, local-level administration, private industry and international education. A minor may be taken in an area of the student's choice or in general studies. Programs may include courses needed for certification in other fields of education.

Admission Requirements

All applicants must submit a letter of application, two or three typewritten pages in length, describing their professional experience, education, career goals, and reasons for pursuing the degree. Applicants must ensure that three departmental recommendation and evaluation forms from individuals knowledgeable about the applicant are forwarded to the department. Only the most qualified applicants will be admitted to the graduate program. The graduate program may provisionally admit selected applicants pending resolution of the requirements listed here or applicants with special skills and experiences. Requirements listed here are in addition to the general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Master's Degrees

Prerequisite for admission to a master's program is a demonstrated professional interest in agricultural and extension education and/or applied youth and family education. Applicants whose junior-senior grade-point average (GPA) is under 3.00 on a 4.00 scale for their baccalaureate degree are required to submit Graduate Record Examinations (GRE) scores.

Master of science: This program is intended for those who are interested in defining, developing, or evaluating educational programs, both formal or nonformal, through public and private agencies and organizations serving youth, families or the agriculture community.

Master of education: Prerequisite for admission to this program is a minimum of 18 credits in professional education courses (including educational psychology and teaching and/or professional internship) or certification as a teacher of agriculture, or equivalent professional experience, including extension.

Doctoral Degree

An applicant should have a minimum average of 3.40 on a 4.00 scale on all previous graduate work or a minimum combined score of 1000 on the verbal and quantitative sections of the GRE. Two years of appropriate professional experience is required either prior to admission or before the degree is awarded. An interview with the graduate faculty is recommended of all applicants prior to admission into a doctoral program. Applicants to the doctoral program must submit evidence of ability to write a scholarly paper or thesis and demonstrate a teaching-level competence of English.

Master's Degree Requirements

A program of study agreement between adviser and student, including planned course work (approved by the student's committee) and time frame, should be completed before beginning the second semester of study. Successful performance on a four-hour written essay exam, plus a one-hour oral exam, is required of all M.S. and M.Ed. candidates near the completion of their course work for the degree. The master's candidate is required to successfully complete an oral defense of a paper or thesis.

Doctoral Degree Requirements

Two years of appropriate professional experience is required either prior to admission or before the doctoral degree is completed.

Other Relevant Information

Selection and appointment of a thesis adviser and doctoral committee follows admission to candidacy. The candidate consults the department head or graduate officer in selecting an adviser. The candidate, in cooperation with an adviser, selects the doctoral committee. The chair of the committee is not necessarily the thesis adviser, but the thesis adviser is a member of the committee.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

AGRICULTURAL AND EXTENSION EDUCATION (AEE) course list

Last Revised by the Department: Spring Semester 2007

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Last updated by Publications: 10/25/06

Agricultural, Environmental, and Regional Economics (AEREC)

Program Home Page (Opens New Window)

STEPHEN M. SMITH, Head of the Department of Agricultural Economics and Rural Sociology
103 Armsby Building
814-865-5461

Degrees Conferred:

Ph.D., M.S.

The graduate program emphasizes economic theory and quantitative methods as applied to the food and agricultural system, natural resources and the environment, and regional economics and economic development.

Graduate Option in Watershed Stewardship

M.S. students in this program may elect the Graduate Option in Watershed Stewardship. This option provides enhanced educational opportunities for students with an interest in water resources management. The Watershed Stewardship Option attracts students from several graduate programs and educates them to facilitate team-oriented, community-based watershed management planning directed at water resource problems. The Watershed Stewardship Option is coordinated with similar options in other graduate programs through the Center for Watershed Stewardship. The Graduate Option in Watershed Stewardship requires 18 credits of graduate course work when taken with the M.S. degree in Agricultural, Environmental and Regional Economics: 6 credits of breadth courses, 3 credits of environmental economics, 1 credit of Watershed Stewardship Seminar (AEREC 591), and 8 credits of Watershed Stewardship Practicum I and II (AEREC 570 and AEREC 571). Breadth courses consist of 3 credits of graduate course work from water resources science and 3 credits from either humanities or communications/design. For M.S. students, the 3 credits in environmental economics consist of Resource and Environmental Economics I (AEREC 519). In the watershed stewardship practicum courses, students work in multidisciplinary teams with community, government and business leaders to analyze and understand natural resource problems and creatively synthesize appropriate solutions in a written watershed management plan.

Lists of acceptable water resources science, humanities, and communication/design courses are maintained by the Center for Watershed Stewardship. Students may petition the Agricultural, Environmental and Regional Economics Graduate Program Committee and the Center for Watershed Stewardship to substitute higher level or equivalent courses to suit their specific backgrounds and goals. Courses taken for the Graduate Option in Watershed Stewardship may be used to satisfy other equivalent (400- or 500-level) degree requirements in the Agricultural, Environmental and Regional Economics graduate program with the concurrence of their adviser and the Agricultural, Environmental and Regional Economics Graduate Program Committee. The graduate committee for a student enrolled in the Option in Watershed Stewardship must include a faculty representative from the Center for Watershed Stewardship.

Admission Requirements

Scores from the Graduate Record examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Students entering the master's program should have a total of 9 credits in agricultural economics and/or economics. Students entering the doctoral program should have successfully completed courses in intermediate micro- and macroeconomic theory, in differential and integral calculus and linear algebra, and in intermediate statistics. Students are permitted to enter the master's and doctoral programs with deficiencies but must pass courses to eliminate deficiencies as soon as possible.

Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Doctoral Degree Requirements

There is no foreign language requirement for the Ph.D. degree; rather, the student must satisfactorily complete courses in economic theory and quantitative methods.

Other Relevant Information

Students in this program may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees.

Students may qualify for admission to the dual-title degree program option in Demography consisting of interdisciplinary course work, with special emphasis on the economic, social, and geographic issues arising from the dynamics of population change.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

AGRICULTURAL ECONOMICS (AG EC) course list

Graduate Bulletin Archive - July 2010

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Agronomy (AGRO)

Program Home Page (Opens New Window)

D. M. SYLVIA, *Head of the Department of Crop and Soil Sciences*
116 Agricultural Sciences and Industries Building
814-865-2025D. P. KNIEVEL, *Chair of the Graduate Program in Agronomy*
254 Agricultural Sciences and Industries Building
814-865-1547

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Douglas B. Beegle, Ph.D. (Penn State) Professor of Agronomy
- Surinder Chopra, Ph.D. (Vrije U of Brussels) Assistant Professor of Maize Genetics
- William S. Curran, Ph.D. (Illinois) Professor of Weed Science
- Marvin H. Hall, Ph.D. (Minnesota) Professor of Forage Management
- David R. Huff, Ph.D. (California, Davis) Professor of Turfgrass Breeding
- Heather D. Karsten, Ph.D. (Cornell) Associate Professor of Crop Production/Ecology
- Daniel P. Knievel, Ph.D. (Wisconsin) Associate Professor of Crop Physiology
- Peter J. Landschoot, Ph.D. (Rhode Island) Professor of Turfgrass Science
- Andrew S. McNitt, Ph.D. (Penn State) Assistant Professor of Soil Science
- David A. Mortensen, Ph.D. (North Carolina State) Professor of Weed Ecology/Biology
- Barbara Pennypacker, Ph.D. (Penn State) Senior Scientist; Professor of Agronomy; Assistant Dean of the Graduate School
- Gregory W. Roth, Ph.D. (Penn State) Professor of Agronomy
- Matt A. Sanderson, Ph.D. (Iowa State) Adjunct Associate Professor of Agronomy
- Robert H. Skinner, Ph.D. (Missouri) Adjunct Assistant Professor of Agronomy
- A. J. Turgeon, Ph.D. (Michigan State) Professor of Turfgrass Management
- Thomas L. Watschke, Ph.D. (Virginia Tech) Professor of Turfgrass Science

Agronomy graduate programs emphasize research that increases the efficiency of production of agronomic crops, improves the quality of food, feed, and fiber available for humans and animals, assists in the use and development of land resources, develops an understanding of the basic soil-plant-animal climate complex of which humans are a part, and improves the overall quality of the human environment. Within this framework, students may specialize in soil science, crop science, or soil and crop management, including turfgrass management. Areas of specialization in soil science include chemistry, fertility, genesis and morphology, microbiology, mineralogy, and physics. Crop science specialties include breeding and genetics, ecology and management, physiology, and weed science.

Research facilities include a 340-acre experimental farm with irrigation facilities, a 22-acre turfgrass research center, and 18-acre landscape management research center, greenhouses, service areas, and a number of well-equipped experimental laboratories. The department enjoys close collaboration with the USDA Pasture Systems and Watershed Management Research Laboratory, which adds substantial strength to the research and graduate education capabilities of the department.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination, are required for admission. At the discretion of the graduate standards committee, a student may be admitted provisionally for graduate study in the program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin.*

Prerequisites for major work in agronomy vary with the area of specialization and the degree sought, but courses in chemistry, mathematics, physics, geology, basic and applied biological sciences, and English communication skills are required. A baccalaureate degree in basic or applied natural sciences is preferred for M.S. degree applicants.

A minimum junior/senior grade-point average 3.00 (on a 4.00 scale) is required in all courses in the biological and physical sciences regardless of when taken. Exceptions to these requirements may be made for students with special backgrounds, abilities, and interests.

For admission to the Ph.D. program, an M.S. or equivalent degree with an emphasis on basic and applied natural sciences is preferred. Applicants for the Ph.D. program will be evaluated on the quality of work completed in all previous degree programs.

Students who lack some of the prerequisite courses may be admitted but are required to take these courses without degree credit. The best-qualified applicants will be accepted up to the number of spaces available for new students.

Master's Degree Requirements

In addition to the general requirements for the M.S. degree as defined by the Graduate School, the department requires 6 credits of 400- or 500-level formal courses in a minor or general studies area. Participation in at least one Agronomy seminar course each semester is required, and students must register for at least 1 credit of AGRO 602 Teaching Experience. An advisory committee will be appointed for each student, and additional courses and requirements may be determined by this advisory committee.

A thesis based on field and/or laboratory research is required for the M.S. degree.

Both M.S. and M.Agr. candidates must pass a final examination.

Doctoral Degree Requirements

Beyond the general requirements for the Ph.D. defined by the Graduate School, the department has a number of specific requirements regarding course level and distribution that are defined in the departmental publication "Graduate Degrees in Agronomy." While a minimum number of courses for the degree is not specified, the doctoral advisory committee has the responsibility of specifying courses and credits essential for the education and development of the candidate. Students are expected to be educated in depth in a specific

subfield of agronomy and to have a perspective of the general field. Normally, 55 to 60 credits in formal course work beyond the B.S. degree are required. Doctoral candidates are required to participate regularly in a departmental seminar and to register for at least 2 credits of the seminar during the Ph.D. program. A teaching experience, consisting of two separate semesters, is also required of all Ph.D. students.

The communication and foreign language requirement for the Ph.D. degree may be met either by demonstrating a knowledge of at least one foreign language or by completing at least 6 credits of course work in an area of English communications approved by the student's advisory committee.

Other Relevant Information

Every student has a close professional relationship with his or her faculty adviser. While research that is done for the thesis will be on subjects that fall within the ongoing research program of the adviser, students are encouraged to propose research projects that are of interest to them. For the most part, all costs relative to the research program will be covered by the department. The department encourages professional development of students through participation in meetings of relevant professional societies and organizations.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

AGRONOMY (AGRO) course list *See also* Soil Science (Opens New Window).

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Last updated by Publications: 6/30/05

American Studies (AMSTD)

Program Home Page (Opens New Window)

SIMON J. BRONNER, *Director*
Penn State Harrisburg
777 W. Harrisburg Pike
Middletown, PA 17057-4898
Phone: 717-948-6201
Email: amstd@psu.edu

Degrees Conferred:

M.A., Ph.D.

The Graduate Faculty

- Michael L. Barton, Ph.D. (Pennsylvania) Professor of American Studies and Social Science
- Simon J. Bronner, Ph.D. (Indiana) Distinguished Professor of American Studies and Folklore
- John R. Haddad, Ph.D. (Texas) Associate Professor of American Studies and Literature
- Charles Kupfer, Ph.D. (Texas) Associate Professor of American Studies and History
- Yvonne D. Sims, Ph.D. (Bowling Green) Assistant Professor of American Studies and Ethnic Studies

The M.A. Degree Program

The M.A. degree program, offered at Penn State Harrisburg, emphasizes the interdisciplinary study of American society and culture. It serves students who want to investigate the American experience and apply their studies in a variety of professions, including education, government, communications, and museums. It is the distinguishing characteristic of the program that the large majority of its course offerings are taught by faculty trained in the discipline of American Studies and bearing the "American Studies" title. The program offers a number of concentrations including folklore, cultural history (politics, popular culture, media studies), international American Studies, material and visual culture (art, architecture, craft, landscape, food, clothing, medicine), public heritage (museums, historic preservation, archiving, cultural resource management), race and ethnicity, and regional studies.

The campus is located in a rich cultural region, surrounded by Amish Farmlands, Gettysburg, Hershey, Steelton, Ephrata, Carlisle, York, and Harrisburg. Additionally, proximity to the major cities of Philadelphia, Pittsburgh, Baltimore, Washington, D.C., and New York offer a host of research options for students. Strong ties with local educational and cultural institutions, including the Pennsylvania Historical and Museum Commission, State Museum of Pennsylvania, Pennsylvania Farm Museum of Landis Valley, Hershey Museum, National Civil War Museum, and the Dauphin County Historical Society, Cumberland County Historical Society, and other Public Heritage resources provide excellent learning opportunities for students.

The M.A. degree can be earned by full- or part-time study. Most 500-level courses are offered in the evening as the program strives to meet students' needs.

Admission Requirements

The M.A. degree program in American Studies accepts students from a wide array of disciplines--particularly art, history, English, sociology, and anthropology--but recommends educational preparation related to the interdisciplinary study of American culture. This program accepts baccalaureate degrees earned from accredited institutions. Conditions of the degree must be equivalent to the conditions required for a degree from Penn State. All applicants must submit: a completed application form with the application fee; two official transcripts of all colleges and universities attended (minimum of 2.75 junior/senior grade-point average on a 4.00 scale); two letters of recommendation from individuals who can attest to the student's ability to handle graduate study; a statement of intent (approximately 500 to 1,000 words outlining their preparation for study, proposed fields of study, and career goals; and a sample of written work (seminar paper or equivalent research paper) as evidence of their American research and writing skills.

An application is available on the Web at www.hbg.psu.edu or by calling 717-948-6250. Submit materials for fall admission before February 15 and for spring admission before October 15. Students applying for scholarships and assistantships are requested to submit general examination scores of the Graduate Record Examination (GRE) taken within five years previous to the date of application. The GRE is recommended, but not required, for admission.

All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language: www.toefl.org) or the IELTS (International English Language Testing System) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test, a score of 213 on the computer-based test, or 80 points on the new Internet-based test with a minimum of 23 points on the new speaking portion is required for admission; or an International English Language Testing System (IELTS) minimum composite score of 6.5. The IELTS exam tests four mandatory skill areas: listening, reading, writing, and speaking.

Completed international application material must be submitted by the following deadlines. Applications received after the deadlines will be processed for the following semester: fall semester, February 15; spring semester, October 15. Applications received after these deadlines will be processed for the following semester.

Degree Requirements

The student is required to take a minimum of 30 credits in American Studies, including at least 18 credits in the 500 series; AM ST 500, 591, and AM ST 580 or 600 are required. AM ST 500 should be taken within the first two semesters of study; AM ST 591 should be taken in the last two semesters of study. Usually in the last semester of study, students are required to complete their program with a major paper by taking AM ST 580 or thesis, in which case AM ST 600 is taken. The choice of AM ST 580 to fulfill graduation requirements is for an original scholarly master's paper or project. One to 6 credits in AM ST 580 can be earned; the typical number of credits for the culminating project is 3. The choice of AM ST 600 is for a thesis and is taken for 6 credits. The thesis must follow the guidelines established by the Thesis Office of the Graduate School (see http://www.gradsch.psu.edu/current/thesis.html).

Advanced undergraduate courses (400-level) that have not counted toward a student's undergraduate degree may be considered for

transfer into the graduate student's requirement of 30 credits of American Studies with permission of the program and approval of the Graduate School. At least 20 of the 30 credits must be earned at the Harrisburg location where the program is offered. Courses not having an American Studies designation but which are relevant to American Studies may be considered for inclusion in the student's requirement of 30 credits of American Studies with permission of the program.

The Ph.D. Program

The Doctor of Philosophy Program in American Studies represents the study of the United States as an academic field with its own developed theories, methods, and applications. Taking advantage of its location in a capital region with internationally known heritage sites and American Studies resources such as the Gettysburg Battlefield, Three-Mile Island, Hershey, Steelton, Anthracite Coal Region, and Amish Country, it emphasizes critical cultural inquiry and the application of American Studies to public heritage, public policy, and cultural resource management--including governmental work, museums, cultural agencies, education, archives and records management, public policy, and communications. A foundation for this application is an understanding of the American experience developed within the intellectual legacy of American Studies.

Graduates of the program are typically oriented toward public practice as well as scholarship in American Studies--integrating perspectives on United States history, culture, and society. Students have opportunities for internships and field experiences outside the classroom. In addition to preparation for academic teaching and writing, the program is distinctively concerned among other doctoral departments of American Studies with the production of public scholars and leadership careers outside of academe. The program strives to cover America broadly in its national and international contexts, work with local resources and institutions, and to develop a focus on cultural expression and identity, including areas of material and visual culture; folk and popular culture; race, ethnicity, and gender; and literature, performance, and media.

The program requires enrollment as a full-time student for at least two consecutive semesters--9 credits per semester (summer sessions not included). A doctoral student is required to complete the program, including defense and acceptance of the doctoral thesis, within eight years after admission to candidacy.

Admission Requirements

Students may apply for admission only in the fall semester. All materials should be submitted before January 15.

Applicants for the Doctor of Philosophy in American Studies must hold a master's degree in American Studies, or a related field emphasizing American cultural scholarship and public heritage work such as history, English, sociology, political science, folklore, cultural studies, performance studies, ethnic studies, gender studies, communications, art history, museum and library studies, education, and cultural resource management.

Students are required to submit the following:

- a completed online application with the application fee;
- two transcripts of all undergraduate and graduate course work;
- scores from the Graduate Record Examination (GRE);
- three letters of reference attesting to both academic and professional capabilities. (At least two of these letters should be from academic sources, such as professors or academic advisers);
- a letter of 500 to 1000 words outlining significant scholarly and applied experience, career goals, commitment to American Studies as a field, and academic objectives;
- a recent personal vita;
- a paper from a graduate course taken previously or publication demonstrating research and compositional skills.

Admission is highly competitive and the best-qualified students will be admitted subject to space availability and compatibility of the student with the program's research mission. Successful applicants with an M.A. typically have a GPA of 3.5 or above (on a 4.0 scale) in their graduate work.

International Students

International applicants must hold the equivalent of an American master's degree. They must submit official or attested university records, with certified translations if the records are not in English. Notarized copies are not sufficient. The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the Internet-based test. Applicants with iBT speaking scores between 15 and 19 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States and Wales.

Information about the TOEFL can be obtained by writing to the Educational Testing Service, Box 6155 , Princeton , NJ 08541-6155 or visiting their Web site at www.toefl.org (Opens New Window). Local administration at University Park campus of the TOEFL is handled by the IECP. Information about the IELTS can be obtained by contacting IELTS International, 100 East Corson Street, Suite 200 , Pasadena , CA 91103 or visiting its Web site at www.ielts.org(Opens New Window) .

Residency

Over some twelve-month period during the interval between admission to the Ph.D. program and completion of the Ph.D. program, the candidate must spend at least two semesters (summer sessions are not included) as a registered full-time student (9 credits per semester) engaged in academic work at Penn State Harrisburg.

The Curriculum

Students progress through the following phases and take courses designated by their doctoral committee as part of their study for the Ph.D.

Candidacy

In this initial phase, the student must (1) make up any deficiencies in graduate courses in American Studies noted in the letter of acceptance, and (2) complete with a grade of B or better the following courses--AM ST 500 (Theory and Method), AM ST 502 (Problems in American Studies), AM ST 591 (Seminar), and at least one course from the subfield seminars (AM ST 510 to 570)--and (3) pass a candidacy examination. Admitted students who have met all course prerequisites begin the core courses with AM ST 500 (Theory and Method). Students who have already taken AM ST 500 within three years of admission may begin their program of study with the AM ST 502 (Problems in American Studies).

The candidacy examination is administered by a special committee appointed by the director of the doctoral program. After the exam is passed, a student is advanced to doctoral candidacy. General guidance of a doctoral candidate is the responsibility of a doctoral committee consisting of four or more active members of the Graduate Faculty, which includes at least two faculty members in the major field, and one outside member. The primary responsibilities of the outside member are (1) to maintain the academic standards of the Graduate School and (2) to assure that all procedures are carried out fairly. The outside member represents the Graduate School ; and, as such, the outside member shall be a member of the Graduate Faculty but need not have direct expertise in the research area of the candidate. The outside member may contribute technical expertise, but this role is subordinate to the aforementioned primary responsibilities . The dissertation adviser must be a member of the doctoral committee and usually (but is not required to) serves as chair. If the candidate has a minor, that field must be represented on the committee. This committee is appointed by the graduate dean through the Office of Graduate Enrollment Services, upon recommendation of the head of the major program, soon after the student is admitted to candidacy. A person not affiliated with Penn State who has particular expertise in the candidate's research area may be added as a special member, upon recommendation by the head of the program and approval of the graduate dean (via the Office of Graduate Enrollment Services). A special member is expected to participate fully in the functions of the doctoral committee. If the special member is asked only to read and approve the doctoral dissertation, that person is designated a special signatory of the thesis. Occasionally, special signatories may be drawn from within the Penn State faculty in particular situations.

The Comprehensive Examination

Students must be registered as a full-time or part-time degree student for the semester (excluding summer session) in which the comprehensive examination is taken. The examination consists of three parts and is administered by the student's doctoral committee. One is in the area of Theory and Method and an additional two subfields of study from a list of five areas covered in the program. The five subfields of specialization are:

1. Public Heritage, Cultural Resource Management, and Museum Studies;
2. Folk and Popular Culture (material and visual culture, literature and media, language, performance, media, and music);
3. Interdisciplinary History and Politics (history of ideas, philosophy, and politics; biography and oral history; everyday life and socioeconomic studies; government, public policy, and diplomacy);
4. Society and Ethnography (race, ethnicity, class, gender, age; religion and belief; comparative culture and transnationalism);
5. Regional, Environmental, Urban, and Local Studies.

Additional subfields of study within American Studies may be selected with the approval of the student's doctoral committee.

Although the exact number of courses required in each subfield may vary among students, typically four per subfield are required. Doctoral committees meet with students at least once each academic year. Written and oral comprehensive examinations in the three areas are given at the end of the study period.

The Dissertation

Under guidance from the doctoral committee, the candidate prepares a detailed research proposal that serves as the basis for the written dissertation covering an aspect of American Studies. The dissertation should represent a significant contribution to knowledge, show familiarity with the intellectual heritage of American Studies, be presented in a scholarly manner, reveal an ability on the part of the candidate to do independent research of high quality, and indicate considerable experience in using a variety of research techniques and forms of primary evidence. The contents and conclusions of the dissertation must be defended at the time of the final oral examination. Once approved, the student can enroll in AM ST 600 Thesis for on-campus work or AM ST 610 Ph.D. Dissertation Research Off-Campus. The writing and defense of this original contribution to the theory and practice of American Studies is the capstone to the Ph.D. program. A student must be registered continuously for each Fall and Spring semester, beginning with the first semester after the comprehensive examination requirement and residency requirement have been met, until the dissertation is accepted and approved by the dissertation committee. To maintain continuous registration, candidates may register for noncredit AM ST 601 or 611, with payment of the special thesis preparation fee; students who want to combine course work with thesis preparation must register for AM ST 600 or 611 (not 601 which is full-time thesis preparation) plus course registration at the regular per-credit fee. For more information on academic procedures, see http://bulletins.psu.edu/bulletins/whitebook/academic_procedures.cfm

The final examination of the doctoral candidate is an oral examination (defense) administered and evaluated by the entire doctoral committee. This oral defense is open to the public and related in large part to the dissertation, but it may cover the candidate's whole program of study. The Committee may restrict part of the defense to its members and the candidate. The candidate must be registered as a full-time or part-time degree student for the semester in which the oral defense is held.

Grade-Point Average and Time Limit

A minimum grade-point average of 3.0 (on a 4.0 scale) for work done in the American Studies doctoral program at the University is required for doctoral candidacy, for admission to the comprehensive examination, the final oral examination, and for graduation.

A doctoral student is required to complete the program, including acceptance of the doctoral thesis, within eight years from the date of successful completion of the candidacy examination. Extensions may be granted by the Director of Graduate Enrollment Services in appropriate circumstances.

Financial Aid

A limited number of scholarships, loans, and grants are available from the University. In many cases, employers have a tuition-reimbursement plan paying for partial or full tuition. To find available options from the University, contact the Financial Aid Office at 717-948-6307. For more information, see php.scripts.psu.edu/dept/iit/hbg/academics/gradaid.php

Graduate School Funding Programs

Full-time incoming doctoral students starting in the fall semester with a record of scholarly excellence may qualify for a University Graduate Fellowship, Bunton-Waller Graduate Scholar Awards, and other programs. Interested students should contact the program director, who is responsible for nominating students. For more information, see www.gradsch.psu.edu/prospective/funding/programs.html

Capital College Funding Programs

Full-time incoming graduate students may qualify for a Capital College Assistantship and other programs. Students must be nominated for an assistantship by the program director. For more information, see php.scripts.psu.edu/dept/iit/hbg/academics/gradaid.php

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

AMERICAN STUDIES (AM ST) course list

Date last updated by Publications: 08/07/09

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-07-006

Review Date: 6/17/08

Anatomy (ANAT)

Program Home Page

PATRICIA J. McLAUGHLIN, Director, Anatomy Graduate Program
College of Medicine
Penn State Milton S. Hershey Medical Center
Hershey, PA 17033
717-531-6414

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- David A. Antonetti, Ph.D. (Penn State) Associate Professor of Cellular and Molecular Physiology
- Alistair J. Barber, Ph.D. Assistant Professor of Ophthalmology
- Colin J. Barnstable, D.Phil., Professor and Chair of Neural and Behavioral Sciences
- Cheston M. Berlin, M.D. (Harvard) Professor of Pediatrics
- James R. Connor, Ph.D. (California, Berkeley) Professor and Vice Chair of Neurosurgery
- Henry J. Donahue, Ph.D., (California, Santa Barbara), Professor of Orthopaedics and Rehabilitation, and Vice Chair of Basic Science Research
- H. Paul Ehrlich, Ph.D. Professor of Surgery
- Loren A. Evey, Ph.D. Assistant Professor of Neural and Behavioral Sciences
- Ronald R. Gomes Jr., Ph.D., Assistant Professor of Orthopaedics and Rehabilitation
- Charles H. Lang, Ph.D., (Hahneman) Professor and Vice Chair of Cell and Molecular Physiology
- Alphonse E. Leure-duPree, Ph.D. (London) Professor of Neural and Behavioral Sciences
- David X. Liu, Ph.D. (CUNY) Assistant Professor of Neural and Behavioral Sciences
- Patricia McLaughlin, D.Ed. (Penn State) Professor of Neural and Behavioral Sciences
- Christopher Niyibizi, Ph.D. (McGill, Montreal) Associate Professor of Orthopaedics and Rehabilitation
- David S. Phelps, Ph.D. (Temple) Professor of Pediatrics
- Joseph W. Sassani, M.D. (Thomas Jefferson) Professor of Ophthalmology
- Joyce Tombran-Tink, Ph.D., Professor of Neual and Behavioral Sciences
- Thomas C. Vary, Ph.D. (Penn State) Distinguished Professor of Cell and Moleular Physiology
- Ian S. Zagon, Ph.D. (Colorado) Distinguished Professor of Neural and Behavioral Sciences
- Shaomin Zhang, M.D., Ph.D. (Tokyo) Assistant Professor of Neural and Behavioral Sciences

The graduate program emphasizes the general areas of gross anatomy, history, histology/cytology, neuroanatomy/neurophysiology, or appropriate combinations of these areas. Approaches offered include morphological (descriptive, comparative, developmental), functional (physiological, chemical), and experimental.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin.*

A bachelor's degree reflecting a reasonable background in zoology, biology, mathematics, or chemistry is required. Students with a 3.00 junior/senior average and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Applicants must provide complete transcripts and three letters of recommendation. A personal interview is desirable.

Doctoral Degree Requirements

Students must earn a total of at least 35 didactic credits; there are ten required courses, including ANAT 503, ANAT 505, ANAT 506, ANAT 512, ANAT 590, ANAT 602, BMS 501, BMS 502, HES 515 (or equivalent course), IBIOS 591, NEURO 511, and NEURO 530 plus an additional 6 credits in elective courses. Course work must be completed with an overall grade-point average of 3.0 or better. A grade of B(-) or better is required in ANAT 503, ANAT 505, ANAT 506, ANAT 512, and NEURO 511. Each student also must serve as a teaching assistant in SBMP 715 for one semester. In addition, a student must satisfactorily complete the following: (a) candidacy examination, (b) comprehensive examination, and (c) written and oral defense of thesis. Students must demonstrate competency in the English language. Attendance and participation in college-wide seminars, colloquium, and/or journal clubs is highly recommended.

Other Relevant Information

This program is offered only through the College of Medicine at the Penn State Milton S. Hershey Medical Center.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ANATOMY (ANAT) course list

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-425

Review Date: 6/12/07

Date last updated by Publications: 07/27/09

Animal Science (AN SC)

Program Home Page (Opens New Window)

Terry D. Etherton, *Head of the Department of Dairy and Animal Science*
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Daniel R. Hagen, *Graduate Officer*
drh@psu.edu

324 Henning Building
814-863-3665

Degrees Conferred:

Ph.D., M.S., M.P.S.

The Graduate Faculty

- Paul A. Bartell, Ph.D. (Virginia) Assistant Professor of Avian Biology
- Craig R. Baumrucker, Ph.D. (Purdue) Professor of Animal Nutrition/Physiology
- John W. Comerford, Ph.D. (Georgia) Associate Professor of Dairy and Animal Science
- Chad Dechow, Ph.D. (Tennessee) Assistant Professor of Dairy Genetics
- Francisco J. Diaz, Ph.D. (Wisconsin-Madison) Assistant Professor of Reproductive Biology
- Robert G. Elkin, Ph.D. (Purdue) Professor of Poultry Nutritional Biochemistry
- Terry D. Etherton, Ph.D. (Minnesota) Distinguished Professor of Animal Nutrition
- Daniel R. Hagen, Ph.D. (Illinois) Professor of Animal Science
- Harold W. Harpster, Ph.D. (Michigan State) Associate Professor of Animal Nutrition
- Kevin J. Harvatine, Ph.D. (Cornell) Assistant Professor of Nutritional Physiology
- Arlyn J. Heinrichs, Ph.D. (Ohio State) Professor of Dairy and Animal Science
- Lisa A. Holden, Ph.D. (Penn State) Associate Professor of Dairy and Animal Science
- R. Michael Hulet, Ph.D. (Texas A&M) Associate Professor of Poultry Science
- Kenneth B. Kephart, Ph.D. (Penn State) Professor of Animal Science
- Daniel M. Kniffen, Ph.D. (West Virginia) Assistant Professor of Dairy and Animal Science
- Wansheng Liu, Ph.D. (Northwestern A&F) Associate Professor of Genomics
- Edward W. Mills, Ph.D. (Purdue) Associate Professor of Dairy and Animal Science
- Michael L. O'Connor, Ph.D. (Virginia Tech) Professor of Dairy Science
- Jon M. Oatley, Ph.D. (Washington State) Assistant Professor of Reproductive Physiology
- Troy Ott, Ph.D., PAS (Florida) Associate Professor of Reproductive Physiology
- Joy L. Pate, Ph.D. (New Hampshire) Professor of Reproductive Physiology; C. Lee Rumberger and Family Chair in Agricultural Sciences
- Paul H. Patterson, Ph.D. (Wisconsin) Associate Professor of Poultry Science
- Christopher R. Raines, Ph.D. (Kansas State) Assistant Professor of Meat Science and Technology
- Ramesh Ramachandran, Ph.D. (Maryland) Assistant Professor of Avian Biology
- Cooduvalli S. Shashikant, Ph.D. (Osmania) Associate Professor of Molecular and Developmental Biology
- W. Burton Staniar, Ph.D. (Virginia Tech) Assistant Professor of Equine Science
- Ann W. Swinker, Ph.D. (West Virginia) Associate Professor of Equine Science
- Gabriella A. Varga, Ph.D. (Maryland) Distinguished Professor of Animal Science
- Regina Vasilatos-Younken, Ph.D. (Penn State) Professor of Poultry Science

Students may specialize in animal care and management, breeding and genetics, growth and development, lactational biology, nutrition, or reproductive biology. Well-equipped research laboratories and various agricultural animals, as well as small-animal models and wildlife species, are available.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin.* Prerequisite to graduate work is the completion of an undergraduate major in animal science, dairy science, poultry science, or a related biological science.

Scores from the Graduate Record Examinations (GRE) are required for admission (average percentile at least 50 percent in verbal, quantitative, and analytical components). The quantitative reasoning component is recommended, but the program will accept scores from the mathematical reasoning component. Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission on a competitive basis.

Exceptions to admission requirements may be made for students with special backgrounds, abilities, and interests.

Degree Requirements

The M.P.S. is a professional program designed to prepare individuals for specialist and management positions in county agricultural extension, government, or industry and does not require a thesis. The academic M.S. and Ph.D. programs require a thesis and are designed for those primarily interested in education and research. The requirements of these programs are detailed in the departmental publication "Graduate Student Handbook in Animal Science." The communication or foreign language requirement for the Ph.D. degree may be satisfied by competence in either one foreign language or communication skills.

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ANIMAL SCIENCE (AN SC) course list

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-04-063/063A

Date last updated by Publications: 8/11/09

Review Date: 1/15/08

Anthropology (ANTH)

Program Home Page (Opens New Window)

Nina G. Jablonski, *Head*
Department of Anthropology
409 Carpenter Building
814-865-2509
814-863-1474 (fax)
anthropology@psu.edu

Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- Stephen J. Beckerman, Ph.D. (New Mexico) Associate Professor of Anthropology
- Anne Buchanan, Ph.D. (Texas) Research Associate for Biological Anthropology
- Nathan Craig, Ph.D. (California, Santa Barbara) Assistant Professor of Anthropology
- E. Paul Durrenberger, Ph.D. (Illinois, Urbana-Champaign) Professor of Anthropology
- Kenneth G. Hirth, Ph.D. (Wisconsin-Milwaukee) Professor of Archaeological Anthropology
- Carrie Hritz, Ph.D. (Chicago) Assistant Professor of Anthropology
- Nina G. Jablonski, Ph.D. (Washington) Professor and Head of Department of Anthropology
- Patricia L. Johnson, Ph.D. (Michigan) Associate Professor of Anthropology, Demography, and Women's Studies
- Jeffrey A. Kurland, Ph.D. (Harvard) Associate Professor Emeritus of Anthropology and Human Development
- Stephen A. Matthews, Ph.D. (U Wales, College of Cardiff) Associate Professor of Sociology and Anthropology
- Joseph W. Michels, Ph.D. (California, Los Angeles) Professor Emeritus of Anthropology
- George R. Milner, Ph.D. (Northwestern) Professor of Anthropology
- Warren T. Morrill, Ph.D. (Chicago) Professor Emeritus of Anthropology
- Lee A. Newsom, Ph.D. (Florida) Associate Professor of Anthropology
- David Puts, Ph.D. (Pittsburgh) Assistant Professor of Anthropology
- Joan T. Richtsmeier, Ph.D. (Northwestern) Professor of Biological Anthropology
- Timothy M. Ryan, Ph.D. (Texas, Austin) Assistant Professor of Anthropology, Geosciences, and Information Sciences and Technology
- Pat Shipman, Ph.D. (NYU) Adjunct Professor of Anthropology
- Mark D. Shriver, Ph.D. (Texas) Associate Professor of Anthropology
- Dean R. Snow, Ph.D. (Oregon) Professor of Anthropology
- Alan Walker, Ph.D. (U London) Evan Pugh Professor of Anthropology and Biology
- David L. Webster, Ph.D. (Minnesota) Professor of Anthropology
- Kenneth M. Weiss, Ph.D. (Michigan) Evan Pugh Professor of Anthropology
- James W. Wood, Ph.D. (Michigan) Professor of Anthropology and Demography

The master's program is designed to train students in general anthropology. The doctoral program is structured to train students in the following areas of specialization: ethnology (with subspecialization in social anthropology, demographic anthropology, cultural evolution, and ecology); archaeology (with subspecialization in cultural ecology, analytical approaches, technological methods, and culture areas); biological anthropology (with subspecialization in human adaptability, genetics, biological demography, human evolution, and the behavioral biology of human and non-human primates).

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Undergraduate preparation must include 12 credits in anthropology and archaeology or their equivalent. A student with an excellent record but who does not meet these requirements may be admitted provided course deficiencies are made up without graduate credit. Students with a 3.00 or higher junior/senior average (on a 4.00 scale) and with appropriate course backgrounds who have research interests directly related to the special anthropological competencies within the department will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Master's Degree Requirements

M.A. candidates may submit either a thesis or a term paper. If the latter is chosen, 6 credits in 500-level courses in the major field must be scheduled in lieu of thesis credits. The M.A. degree may be bypassed by exceptional candidates for the Ph.D. degree.

Doctoral Degree Requirements

The communication and foreign language requirement for the Ph.D. degree includes a reading knowledge of a foreign language plus an option from among additional foreign languages, field languages, linguistics, or statistics.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following award typically has been available to post-comprehensive graduate students in this program:

HILL FELLOWSHIPS FOR STUDY IN ANTHROPOLOGY

Details available from Professor Nina G. Jablonski, Department of Anthropology, 409 Carpenter Building, University Park campus.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ANTHROPOLOGY (ANTH) course list

Last updated by Publications: 08/20/09

Applied Behavior Analysis (ABA)

KIMBERLY A. SCHRECK, *Coordinator*
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kas24@psu.edu
www.hbg.psu.edu

Degree Conferred:

M.A.

The Graduate Faculty

Richard M. Foxx, Ph.D. (Southern Illinois) *Professor of Psychology*
Kimberly A. Schreck, Ph.D. (Ohio State) *Associate Professor of Psychology*

The program, offered at Penn State Harrisburg, helps master's level graduates prepare to function in community settings as applied behavior analysts, and to provide the academic training necessary for graduates to apply for national board certification in behavior analysis. The overall model emphasizes the core areas of the discipline including the scientific basis of behavior analysis, as well as how biological, social, and individual differences affect human behavior. Training will emphasize the development of both assessment and intervention skills.

The program helps prepare graduates to work in hospitals, medical schools, mental health centers, health maintenance organizations, a wide variety of educational settings, forensic settings, research facilities, and in center- and home-based programs for individuals with autism and developmental disabilities.

The program is intended for both part- and full-time students. Courses will be scheduled for fall and spring semesters. Admission is in the fall and spring semesters only.

Admission Requirements

Students will be admitted on a competitive basis and must submit the following:

- a completed application form
- two official transcripts of all colleges and universities attended
- three letters of recommendation
- a brief (two-page) interest statement

The applicant must have a bachelor's degree from a regionally accredited academic institution, with at least 18 credits in education, psychology, or related disciplines with a cumulative grade-point average of 3.0 or above in the last 60 credits. Scores from the Graduate Record Examinations are required in the verbal, quantitative, and analytic portions.

The language of instruction at Penn State is English. All international applicants who have not received a baccalaureate or masters degree from a college/university/institution in a country where English is both the language of instruction and the only official or native language must take the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System) and submit the results of that test with the application for admission. a TOEFL score of 550 on the paper test, a score of 213 on the computer-based test, or 80 points on the new Internet-based test with a minimum of 23 points on the speaking portion is required for admission; or a minimum composite score of 6.5 on the IELTS test is required for admission.

A personal interview may be required.

Transfer Credits

Subject to the limitations given below, a maximum of 10 credits of high-quality graduate work done at a regionally accredited institution may be applied toward the requirements for the master's degree. Transferred academic work must have been completed within five years prior to the date of the first degree registration at the Graduate School of Penn State, must be of at least B quality (grades of B- are not transferable), and must appear on an official graduate transcript of a regionally accredited university. Pass-fail grades are not transferable to an advanced degree program unless the "Pass" can be substantiated by the former institution as having at least B quality.

Degree Requirements

Requirements for the M.A. in Applied Behavior Analysis include 27 credits in required course work, including the master's project paper, supervised internship experience, and 6 elective credits for a total of 33 credits.

ABA Core Courses (to be offered annually) are required for all students in the program.

APPLIED BEHAVIOR ANALYSIS (ABA)
500. Experimental Analysis of Behavior (3)
511. Behavior Modification (3)
522. Single Subject Research (3)
533. Applied Analysis of Behavior (3)
588. Ethics and Legal issues in ABA (3)
594A. A Research Project (3)
595. Internship (9)

Elective Courses (6 credits)

APPLIED BEHAVIOR ANALYSIS (ABA)
555. Behavioral Interventions in Autism (3)
566. Behavioral Pediatrics (3)
577. Behavioral Assessment & Treatment (3)
597. Special Topics (1-3)

PSYCHOLOGY-CI (PSYC)
592. Current Topics (3)

PSYCHOLOGY (PSYCH)
443. Treatment and Education in Developmental Disabilities (3)
476. Child Behavior Disorders (3)

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

APPLIED BEHAVIOR ANALYSIS (ABA) course list

PSYCHOLOGY (PSYC) course list

PSYCHOLOGY (PSYCH) course list

Last Revised by the Department: Summer Session 2009

Blue Sheet Item #: 37-05-052

Last updated by Publications: 11/21/06

Review Date: 2/24/09

UCA Revision #1: 11/8/06

Applied Clinical Psychology (ACPSY)

THOMAS G. BOWERS, *Graduate Program Coordinator*
Penn State Harrisburg
W-311 Olmsted Building
777 West Harrisburg Pike
Middletown, PA 17057
717-948-6063
dvo@psu.edu
www.hbg.psu.edu

Degree Conferred:

M.A.

The Graduate Faculty

- John Steven Backels, Ph.D. (Ball State) Affiliate Assistant Professor of Psychology
- Michael A. Becker, Ph.D. (SUNY, Albany) Associate Professor of Psychology
- Thomas G. Bowers, Ph.D. (Virginia Tech) Associate Professor of Psychology
- Gina M. Breisford, Ph.D. (Bowling Green) Assistant Professor of Psychology
- Barbara A. Bremer, Ph.D. (Bryn Mawr) Associate Professor of Psychology
- Richard Fiene, Ph.D. (Newport) Associate Professor of Human Development and Family Studies
- Marissa Harrison, Ph.D. (SUNY, Albany) Assistant Professor of Psychology
- Senel Poyrazli, Ph.D. (Houston) Assistant Professor of Counseling Psychology
- Maria A. Turkson, Ph.D. (Maryland) Assistant Professor of Psychology
- Xu Xu, Ph.D. (Northern Illinois) Assistant Professor of Psychology

The Master of Arts in Applied Clinical Psychology program helps students prepare to work as mental health professionals in a variety of settings and is intended to provide a broad training program in empirically validated clinical psychology which, when accompanied by an additional 12 credits in advanced graduate studies in psychology and/or counseling, can provide the academic training necessary for graduates to apply for master's level licensing as a professional counselor in the Commonwealth of Pennsylvania. The M.A. program requires 48 credits of course work. An optional 12-credit certificate program is available in the area of clinical health psychology through the School of Behavioral Sciences and Education for students seeking licensure.

The overall model emphasizes the scientific bases of behavior, including biological, social, and individual difference factors. The training model is health-oriented rather than pathology-oriented and emphasizes the development of helping skills, including both assessment and intervention.

The degree program is intended for both part-time and full-time students. Admission is possible for the fall or spring semesters. The deadline for fall admission is May 1 and the deadline for spring admission is November 1.

Admission Requirements

Students will be admitted on a competitive basis and must submit the following:

- completed application form with the application fee
- two official transcripts of all colleges and universities attended
- three professional letters of recommendation
- a brief (two-page) interest statement
- verbal, quantitative, and analytical scores on the Graduate Record Examinations

The applicant must have a bachelor's degree from a regionally accredited academic institution or the equivalent, must have completed at least 18 credits in psychology, and must have a cumulative grade-point average of 3.0 or above in the last 60 credits of course work. The undergraduate work must include a statistics course and a psychology research methods course with grades of B or higher. A personal interview is required.

International Students

All applicants whose first language is not English or who have not received a baccalaureate degree from an institution in which the language of instruction is English must take the Test of English as a Foreign Language (TOEFL), www.toefl.org. The test must be passed with a score of 550 (paper-based test) or 213 (computer-based test) or higher.

All students with international credentials must submit transcripts to Educational Credential Evaluators, Inc. (ECE) for a "Course by Course" academic evaluation of transcripts and degree. An ECE application can be obtained on the Web at www.ece.org.

Transfer Credits

Penn State allows for the approval of up to 10 transfer credits to graduate programs.

Grade-Point Average

Students must have a 3.00 grade-point average to graduate from the program.

Financial Aid

There is a limited number of scholarships and research grants available, as well as graduate assistantships. Many students work full-time and take classes part-time. In many cases, employers have a tuition-reimbursement plan paying for partial or full tuition. To find other options available to you, contact the Financial Aid Office at 717-948-6307.

Degree Requirements

The M.A. in Applied Clinical Psychology requires 48 credits of coursework. Included in the core courses are 100 hours of clinical practicum, 600 hours of supervised internship experience, and a master's research paper.

Psychology Core Courses (23 credits) provide a foundation in professional ethics, individual differences and cultural diversity, the scientific bases of behavior, and scientific research skills. These courses are intended to facilitate the development of an awareness of the context in which clients live and in which interventions must work.

PSYCHOLOGY (PSYC)

- 500. Ethics and Professional Practice in Psychology and Counseling (3)
- 501. Cultural Competency in Psychology (3)
- 502. Applied Social Psychology (3)
- 520. Research Methods (4)
- 521. Statistics (4)
- 524. Biological Basis of Behavior (3)
- 530. Research Paper (3)

Clinical Core Courses (25 credits) provide a general background in clinical diagnosis, assessment, and interventions with appropriate supervised experience to allow students to develop the clinical skills appropriate for master's level practitioners.

PSYCHOLOGY (PSYC)

- 510. Human Growth and Development (3)
- 517. Psychopathology (3)
- 518. Interviewing and Counseling (3)
- 519. Theories and Models of Psychotherapy (3)
- 540. Group Interventions (3)
- 571. Tests and Measurement (3)
- 595A. Clinical Practicum (1)
- 595B. Clinical Internship (6)

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

PSYCHOLOGY (PSYC) course list

Last Revised by the Department: Fall Semester 2004

Blue Sheet Item #: 32-07-018

Review Date: 6/15/04

Last updated by Publications: 1/20/09

Applied Linguistics (APLNG)

Program Home Page

JOAN KELLY HALL, *Department Head*
Linguistics and Applied Language Studies
305 Sparks Building
814-865-7365

Degree Conferred:

Ph.D.
Dual-Title Ph.D. Degree in Applied Linguistics and Asian Studies

The Graduate Faculty

- Gabriela Appel-Lantolf, Ph.D. (Delaware) Senior Lecturer in German and Applied Linguistics
- Joan Kelly Hall, Ph.D. (SUNY Albany) Professor of Applied Linguistics
- Karen E. Johnson, Ph.D. (Syracuse) Professor of Applied Linguistics
- Celeste Kinginger, Ph.D. (Illinois, Urbana-Champaign) Associate Professor of Applied Linguistics
- James Lantolf, Ph.D. (Penn State) Professor of Applied Linguistics
- Xiaofei Lu, Ph.D. (Ohio State) Assistant Professor of Applied Linguistics
- Sinfree Makoni, Ph.D. (Edinburgh, Scotland) Associate Professor of Applied Linguistics and African American Studies
- Sandra J. Savignon, Ph.D. (Illinois,Urbana-Champaign) Professor of Applied Linguistics
- Robert Schrauf, Ph.D. (Case Western) Associate Professor of Applied Linguistics
- Susan Strauss, Ph.D. (California, Los Angeles) Associate Professor of Applied Linguistics
- Steve Thorne, Ph.D. (California, Berkeley) Assistant Professor of Applied Linguistics

The Ph.D. in Applied Linguistics helps prepare scholars who will conduct systematic examinations of individual and societal multilingualism in order to build and test theories of how linguistic systems develop, are acquired, used, and taught in global contexts. The Ph.D. degree program includes the foundational theory and research of linguistics, applied linguistics, second language acquisition, psycholinguistics, and sociolinguistics. It will prepare doctoral candidates to utilize a range of research perspectives, both qualitative and quantitative, e.g., sociocultural, historical, linguistic, stylistic, discourse analytical. Overall, the purpose of the research undertaken in graduate study in Applied Linguistics will be to illuminate, in all its complexity, the multiple dimensions of the study of language as a mode of social existence, communication, and cognition.

Admission Requirements

Applicants are required to submit transcripts of all previous course work from institutions of higher learning. In addition, scores from the Graduate Record Examinations (GRE) are required for applicants who have received a degree from an institution of higher education in the United States or abroad in which the medium of instruction is English. GRE scores are optional for applicants who have received a degree from an institution of higher education in which the medium of instruction is a language other than English. All applicants are required to submit three letters of reference (at least two from faculty with whom the applicant has studied) evaluating aptitude for doctoral study. Applicants must submit at least one sample of scholarly writing (published or unpublished research paper, thesis, etc.) and an academic statement describing their teaching and research experience and their specific professional goals and interests.

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 600 for the paper-based test, 250 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. In addition, international applicants are encouraged to submit a cassette tape recording on which they describe their career goals and the reasons for wanting to pursue doctoral studies at Penn State.

Candidacy Evaluation

In the third semester (a minimum of 18 credits) of graduate study, all candidates must satisfactorily complete a candidacy evaluation in which they are required to present a portfolio of work completed in their program of study. The portfolio will include a transcript of the candidate's academic record, a program plan, samples of scholarly work in Applied Linguistics and related areas, and a brief description of the proposed dissertation research, showing relevant course work completed and projected. Following submission of this portfolio, the candidate will meet with the members of his/her doctoral committee for an oral candidacy evaluation. The purpose of this evaluation is threefold: (a) to determine whether the candidate has achieved a level of learning and understanding sufficient to justify acceptance as a doctoral candidate, (b) to discover what further study is required to bring the candidate to the competence required for the research being proposed, and (c) to secure approval of a program of course work and independent study to achieve the requisite competence. The particulars of each candidate's program of study and research are defined on the basis of the candidacy evaluation.

English Language Competence

During course work prior to the candidacy examination, candidates will be assessed for communicative competence in reading, writing, and speaking English. Should a higher level of competence be required, the candidate will be directed to the appropriate resources. International candidates will be advised that the passage of the minimal TOEFL requirement does not demonstrate the level of competence required for completion of the Ph.D. program.

English Language Competence

During course work prior to the candidacy examination, candidates will be assessed for communicative competence in reading, writing, and speaking English. Should a higher level of competence be required, the candidate will be directed to the appropriate resources. International candidates will be advised that the passage of the minimal TOEFL requirement does not demonstrate the level of competence required for completion of the Ph.D. program.

Additional Language Competence

All candidates must demonstrate competence in reading relevant research literature in one language other than English and intermediate speaking competence in an additional language. The additional language competence requirements may be demonstrated in a variety of ways.

Committee Composition

The doctoral committee will consist of four or more active members of the Graduate Faculty and must include at least two faculty in the major field. One member of the doctoral committee must be from outside of the candidate's field of study. Members of the Graduate Faculty with courtesy appointments in LALS who are members of the Applied Linguistics Graduate Faculty may serve as the chair of the doctoral committee with approval of the Director of LALS.

Comprehensive Examination

All doctoral candidates must pass a comprehensive examination designed to assess mastery of and ability to synthesize and integrate theoretical issues in Applied Linguistics. This examination is taken upon completion of all course work and the fulfillment of all degree requirements. The content and format of the comprehensive exam will be established by the members of the candidate's doctoral committee in accordance with degree requirements of LALS and consist of two course papers that are of publishable quality and two or three research papers based on questions developed by members of the doctoral committee. The original papers must be submitted by end of semester prior to that in which the student plans to take the comprehensive exam. The student will be given two months' time in which to complete and submit these exam papers. Within three weeks of submission of the exam papers, the student will take an oral exam based on the original research papers and the exam papers. Candidates who fail the examination on the first attempt may repeat it once. Candidates who fail the examination the second time will not be permitted to continue in the program.

Dissertation

Each doctoral candidate is required to conduct an original and independent research project representing a significant contribution to knowledge in the field of study. The project should be presented in a scholarly manner, show an ability on the part of the candidate to do independent research of high quality, and demonstrate considerable experience in using appropriate research techniques. The content and conclusions of the dissertation will be defended at the time of the final oral examination. A written dissertation proposal is required and must be approved at a proposal hearing by a majority vote of the candidate's dissertation committee. A majority vote is also required for approval of the completed written dissertation at the final oral defense.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Dual-Title Graduate Degree in Applied Linguistics and Asian Studies

Graduate students with research and educational interests in international education may apply to the Applied Linguistics/Asian Studies Degree Program. The goal of the dual-title degree Applied Linguistics and Asian Studies is to enable graduate students from Applied Linguistics to acquire the knowledge and skills of their major area of specialization in Applied Linguistics while at the same time gaining the perspective of Asian Studies.

In order to prepare graduate students for the competitive job market, this program provides them with a solid disciplinary foundation that will allow them to compete for the best jobs in their field. For such students the dual-title Ph.D. in Asian Studies will add value to their degree and their status as candidates. It will produce excellent linguists who are experts in Asian Studies as well.The dual-title degree in Applied Linguistics and Asian Studies will build curricular bridges beyond the student’s major field so as to provide a unique training regime for the global scholar.

Additional details of the dual degree program are available in separate documentation and from the Asian Studies Program (see http://asian.la.psu.edu/graduate.shtml).

Admission Requirements

For admission to the dual-title Ph.D. degree under this program, a student must first apply and be admitted to the Applied Linguistics graduate program. Once accepted into the Applied Linguistics program, the student can apply to the Admissions Committee of the Asian Studies. The Asian Studies Admissions Committee reviews applications and recommends students for admission to the Asian Studies program to the Graduate School. Students already in their first and second years of the Applied Linguistics graduate program may also apply to the dual-title program.

Applicants are required to submit transcripts of all previous course work from institutions of higher learning. In addition, scores from the Graduate Record Examinations (GRE) are required for applicants who have received a degree from an institution of higher education in the United States or abroad in which the medium of instruction is English. GRE scores are optional for applicants who have received a degree from an institution of higher education in which the medium of instruction is a language other than English.

There are no specific requirements for admissions into the dual-title program beyond the requirements of the Graduate School and Applied Linguistics, though applicants interested in the program should also make their interest in the dual-degree program known clearly on their applications and include remarks in their essays that explain their training, interests, and career goals in an area of Asian Studies.

General Graduate School requirements are stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Degree Requirements

To qualify for an Asian Studies degree, students must satisfy the requirements of the Applied Linguistics program in which they are primarily enrolled. In addition, they must satisfy the requirements described below, as established by the Asian Studies committee. Within this framework, final course selection is determined by the student, their Asian Studies advisor, and their Applied Linguistics program

advisor.

Upon a student's acceptance by the Asian Studies Admissions Committee, the student will be assigned an Asian Studies academic advisor in consultation with the Asian Studies chair. As students develop specific scholarly interests, they may request that a different Asian Studies faculty member serve as their advisor. The student and advisor will discuss a program of study that is appropriate for the student's professional objectives and that is in accord with the policies of The Graduate School, the Applied Linguistics department and the Asian Studies program.

Requirements for the Applied Linguistics/Asian Studies Ph.D.

The doctoral degree in Applied Linguistics and Asian Studies is awarded only to students who are admitted to the Applied Linguistics doctoral program and admitted to the dual-title degree in Asian Studies. The minimum course requirements for the dual-title Ph.D. degree in Applied Linguistics and Asian Studies are as follows:
60 credits beyond the master's degree, INCLUDING

- 1 credit of APLNG 580
- 6 credits in foundations courses, which may include but need not be limited to the following: APLNG 591, APLNG 597 (Special Topics)
- 6 credits in research methods, which may include but need not be limited to the following: APLNG 593, APLNG 597 (Language Analysis), APLNG 581, APLNG 586.
- 6 credits in Applied Linguistics electives, to be selected in consultation with the applied linguistics advisor
- 15 credits of Asia-related coursework at the 400 or 500 level. At least 6 of these 15 credits will be from ASIA 501 and 502. As many as 6 may come from Applied Linguistics, as approved by the student's doctoral advisor and the Asian Studies Program director of graduate studies. The remaining credits can be taken in ASIA or in any department other than Applied Linguistics.
- All-skills proficiency in one Asian language AND intermediate speaking competence in an additional language other than English

Particular courses may satisfy both the Applied Linguistics requirements and those of the Asian Studies program. Final course selection is determined by the student in consultation with their dual-title program advisors and their major program advisors.

APPLIED LINGUISTICS (APLNG) course list

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-089

Review Date: 01/12/2010

Date last updated by Publications: 3/23/09 (link only)

Applied Psychological Research (APSYR)

Program Home Page (Opens New Window)

THOMAS G. BOWERS, *Graduate Program Coordinator*
Penn State Harrisburg
777 West Harrisburg Pike
Middletown, PA 17057
717-948-6063
dvo@psu.edu

Degree Conferred:

M.A.

The Graduate Faculty

- John Steven Backels, Ph.D. (Ball State) Affiliate Assistant Professor of Psychology
- Michael A. Becker, Ph.D. (SUNY, Albany) Associate Professor of Psychology
- Thomas G. Bowers, Ph.D. (Virginia Tech) Associate Professor of Psychology
- Gina M. Breisford, Ph.D. (Bowling Green) Assistant Professor of Psychology
- Barbara A. Bremer, Ph.D. (Bryn Mawr) Associate Professor of Psychology
- Richard Fiene, Ph.D. (Newport) Associate Professor of Human Development and Family Studies
- Marissa Harrison, Ph.D. (SUNY, Albany) Assistant Professor of Psychology
- Senel Poyrazli, Ph.D. (Houston) Assistant Professor of Counseling Psychology
- Maria A. Turkson, Ph.D. (Maryland) Assistant Professor of Psychology
- Xu Xu, Ph.D. (Northern Illinois) Assistant Professor of Psychology

The Master of Arts program in Applied Psychological Research focuses on the development of research skills within the context of scientific training in psychology. The program requires 35 credits of course work (29 credits of core courses and 6 credits of electives).

The program is designed to meet the needs of students who plan careers in research or administration within human service or similar organizations, who plan to conduct research in other settings, or who plan to pursue doctoral study. Students can select electives and research experiences to reflect their individual interests in consultation with their adviser.

The program is intended for both part-time and full-time students. Admission is possible for the fall or spring semesters. The deadline for fall admission is May 1 and for spring admission, November 1.

Admission Requirements

Students will be admitted on a competitive basis and must submit the following:

- a completed application form with the application fee
- two official transcripts of all colleges and universities attended
- three professional letters of recommendation
- a brief (two-page) interest statement
- verbal, quantitative, and analytical scores on the Graduate Record Examinations

The applicant must have a bachelor's degree from a regionally accredited academic institution, must have completed at least 18 credits in psychology, and must have a cumulative grade-point average of 3.0 or above in the last 60 credits of coursework. The undergraduate work must include a statistics course and a psychology research methods course with grades of B or higher. A personal interview is required.

Transfer Credits

Penn State allows for the approval of up to 10 transfer credits to graduate programs.

Degree Requirements

The M.A. in Applied Psychological Research requires 35 credits of course work, including 6 credits of supervised research experience and a master's research paper.

Psychology Core Courses(29 credits) (provide a foundation in professional ethics, individual differences and cultural diversity, the scientific bases of behavior, and scientific research skills)

PSYCHOLOGY (PSYC)

- 500. Ethics and Professional Practice in Psychology (3)
- 501. Cultural Competency in Psychology (3)
- 502. Applied Social Psychology (3)
- 520. Research Methods (4)
- 521. Statistics (4)
- 524. Biological Basis of Behavior (3)
- 530. Research Paper (3)
- 594. Applied Psychological Research (6)

Elective Courses (6 credits) (should be selected in consultation with the student's adviser in support of the student's research focus) Possible elective courses include:

PSYCHOLOGY (PSYC)

- 400. Health Psychology (3)
- 403. Adult Development (3)
- 405. Child Development (3)
- 406. Adolescence (3)
- 409. Child Behavior Disorders (3)
- 410. Psychology of the Differently-Abled (3)
- 415. Abnormal Psychology (3)
- 421. Behavior Modification (3)
- 425. Cognition and Perception (3)
- 427. Learning Theory (3)
- 465. Psychology of Women (3)
- 482. Personality Theory (3)
- 514. Preventive Psychology (3)
- 515. Clinical Health Psychology (3)
- 516. Child Health Psychology (3)
- 525. Forensic Psychology (3)
- 526. Behavioral Systems in Criminal Justice (3)
- 535. Behavioral Management (3)

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

PSYCHOLOGY (PSYC) course list

SCR 29-07-034

Last updated by Publications: 1/20/09

Statistics (STAT)

Program Home Page (Opens New Window)

BRUCE G. LINDSAY, *Head of the Department*
326 Thomas Building
814-865-1348

Degrees Conferred:

- M.A.S.
- M.S., M.A.
- Ph.D.
- Integrated B.S. in Statistics and Master of Applied Statistics (M.A.S.)

The Graduate Faculty

- Michael G. Akritas, Ph.D. (Wisconsin) Professor of Statistics
- Naomi S. Altman, Ph.D. (Stanford) Associate Professor of Statistics
- Charles E. Antle, Ph.D. (Oklahoma State) Professor Emeritus of Statistics
- Steven F. Arnold, Ph.D. (Stanford) Professor of Statistics
- Gutti Jogesh Babu, Ph.D. (ISI-Calcutta, India) Professor of Statistics
- Jesse L. Barlow, Ph.D. (Northwestern) Professor of Computer Science and Engineering, and Statistics
- Ottar N. Bjørnstad, Ph.D. (Oslo, Norway) Professor of Biology, Entomology, and Statistics
- Marllyn T. Boswell, Ph.D. (California, Riverside) Associate Professor Emeritus of Statistics
- Francesca Chiaromonte, Ph.D. (Minnesota) Associate Professor of Statistics and Public Health Sciences
- Vernon M. Chinchilli, Ph.D. (North Carolina) Distinguished Professor of Biostatistics and Statistics
- Mosuk Chow, Ph.D. (Cornell) Associate Professor of Statistics; Senior Research Associate
- Linda M. Collins, Ph.D. (USC) Professor of Human Development and Family Studies, and Statistics
- Enrique del Castillo, Ph.D. (Arizona State) Associate Professor of Industrial Engineering and Statistics
- Manfred Denker, Ph.D. (Nürnberg) Professor of Statistics and Mathematics
- Duncan Fong, Ph.D. (Purdue) Professor of Marketing and Statistics
- John Fricks, Ph.D. (North Carolina) Assistant Professor of Statistics
- Debashis Ghosh, Ph.D. (Washington) Associate Professor of Statistics and Public Health Sciences
- Murali Haran, Ph.D. (Minnesota) Assistant Professor of Statistics
- William L. Harkness, Ph.D. (Michigan State) Professor Emeritus of Statistics
- Thomas P. Hettmansperger, Ph.D. (Iowa) Professor Emeritus of Statistics
- Robert A. Hultquist, Ph.D. (Oklahoma State) Professor Emeritus of Statistics
- David R. Hunter, Ph.D. (Michigan) Associate Professor of Statistics
- Bing Li, Ph.D. (Chicago) Professor of Statistics
- Jia Li, Ph.D. (Stanford) Associate Professor of Statistics and Computer Science and Engineering
- Runze Li, Ph.D. (North Carolina) Professor of Statistics
- John C. Liechty, Ph.D. (Cambridge) Associate Professor of Marketing and Statistics
- Dennis K. J. Lin, Ph.D. (Wisconsin) University Distinguished Professor of Statistics and Supply Chain Management
- Bruce G. Lindsay, Ph.D. (Washington) Willaman Professor of Statistics
- David T. Mauger, Ph.D. (Michigan) Associate Professor of Public Health Sciences and Statistics
- Ganapati P. Patil, Ph.D., D.Sc. (Michigan) Distinguished Professor Emeritus of Mathematical Statistics
- Calyampudi R. Rao, Sc.D. (Cambridge) Eberly Professor Emeritus of Statistics
- Donald St. P. Richards, Ph.D. (UWI) Professor of Statistics
- James L. Rosenberger, Ph.D. (Cornell) Professor of Statistics
- Thomas A. Ryan, Jr., Ph.D. (Cornell) Associate Professor Emeritus of Statistics
- Joseph L. Schafer, Ph.D. (Harvard) Associate Professor of Statistics
- Michele L. Shaffer, Ph.D. (Penn State) Associate Professor of Public Health Sciences and Statistics
- Damla Sentürk, Ph.D. (California, Davis) Assistant Professor of Statistics
- Durland L. Shumway, Ph.D. (Penn State) Assistant Professor of Statistics; Research Associate
- Laura B. Simon, Ph.D. (Penn State) Lecturer in Statistics
- Aleksandra B. Slavkovic, Ph.D. (Carnegie Mellon) Assistant Professor of Statistics
- Linda C. Strauss, Ph.D. (Penn State) Assistant Professor of Statistics; Research Associate
- Arkady A. Tempelman, D.Sc. (Vilnius, Lithuania) Professor of Statistics and Mathematics
- Rongling Wu, Ph.D. (U of Washington) Professor of Public Health Sciences and Statistics
- Fuqing Zhang, Ph.D. (North Carolina State) Professor of Meteorology and Statistics
- Yu Zhang, Ph.D. (Southern California) Assistant Professor of Statistics
- Zhibiao Zhao, Ph.D. (Chicago) Assistant Professor of Statistics

Graduate instruction and research opportunities are available in most areas of statistics and probability, including linear models, nonparametric statistics, robustness, statistical computing, analysis of count data, multivariate analysis, experimental design, reliability, stochastic processes and probability (applied and theoretical), distribution theory, statistical ecology, and biometrics.

Graduate students can gain practical experience in the application of statistical methodology through participation in the department's statistical consulting center and collaborative research activities. In addition, collaborative projects with other departments provide longer term experience and support for selected students. Most students gain valuable teaching experience by assisting in the teaching and grading of courses. In addition, Ph.D. candidates with proper qualifications can receive support for teaching undergraduate courses.

The Master of Applied Statistics (M.A.S.) program is a professional degree designed to provide training in statistics focused on developing data analysis skills, and exploration of all core areas of applied statistics, without going deeply into the mathematical statistics foundations. It aims to provide its graduates with broad knowledge in a wide range of statistical application areas.

The Doctor of Philosophy (Ph.D.), Master of Arts (M.A.), and Master of Science (M.S.) degrees in Statistics are designed for advanced studies in applied and theoretical statistics. Special emphases include biostatistics, statistical ecology, environmental statistics, genometrics, biometrics and statistical computation. The M.S. degree is appropriate preparation for the department's Ph.D. degree.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. Entering graduate students in statistics for whom English is not the first language are required to take the TOEFL (Test of English as a Foreign Language) examination. The results of this examination must be received by the Department of Statistics at least six months prior to the requested date of admission to the Graduate School and must pass the PSU test of spoken English in the first year of the program. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the Internet-based test (iBT). Applicants with lower scores may be considered for provisional admission.

While applications from all students (including those who already have done graduate work) are reviewed, completion of a standard calculus sequence is regarded as a prerequisite. Students with a 3.00 or better junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Students hoping to earn a Ph.D. in statistics may apply directly to the Ph.D. program without need for a master's degree.

Degree Requirements

Professional Master of Applied Statistics Requirements

For the M.A.S. degree, a minimum of 30 credits and a minimum grade-point average of 3.0 are required for graduation. Of the 30 credits, 24 must be courses from the Statistics department and 21 must be at the 500 level. The candidate must complete 6 credits in applied statistics (STAT 501, STAT 502), 6 credits in mathematical statistics (STAT 414, STAT 415) and 3 credits in statistical consulting (STAT 580-581). For all M.A.S. students, the Stat 581 course will have a comprehensive written project report required as part of the course, which serves as the culminating experience. To complete the remaining credit requirements, a candidate can select 9-15 credits from the following applied statistics courses: STAT 464, STAT 480, STAT 500, STAT 503, STAT 504, STAT 505, STAT 506, STAT 507, STAT 509, and STAT 510. In addition, students with suitable backgrounds may choose up to 6 credits from a departmental list of additional courses with approval from their adviser.

Master of Arts and Master of Science Degree Requirements

For the M.A. and M.S. degrees, a candidate must complete at least 30 credits, including at least 27 at the 500 or 600 level; 21 of the 27 500-level credits must be formal course work from the department of Statistics. A candidate must complete 6 credits in applied statistics (STAT 511, STAT 512), 6 credits in mathematical statistics (STAT 513, STAT 514), 3 credits in stochastic processes (STAT 515) and 3 credits in statistical consulting (STAT 580-581). The student must also pass a written master's qualifying examination taken at the end of the first year. Finally, an M.A. candidate must submit an acceptable master's paper to the department, and an M.S. candidate must submit a thesis.

Doctoral Degree Requirements

In addition to the course requirements for the M.A. and M.S. degrees given above, a Ph.D. candidate in Statistics must complete further courses in linear models (STAT 551), asymptotic tools (STAT 553), statistical inference (STAT 561), and advanced probability (STAT 517), as well as 15 credits of electives taken from STAT 518, STAT 544, STAT 545, STAT 552, STAT 562, STAT 564, STAT 565, and STAT 572, or other courses suggested by the Ph.D. committee and approved by the Graduate Studies Committee. The student also must pass a written Ph.D. qualifying exam, typically during the second year, and a comprehensive exam given at the end of the third year. The comprehensive exam will have a written component, whose content will be determined and administered by the student's Ph.D. graduate committee, and an oral component, which includes the presentation of a thesis research proposal. The candidate then must submit an acceptable Ph.D. thesis and defend it.

The Ph.D. in Statistics offers options in Biometrics, Biostatistics, Environmental Statistics, and Genometrics. The course and the examination requirements remain the same under these options, however, the candidate must take 15 credits from a list of courses identified by the option.

Minor in Statistics Requirements

The Department of Statistics has three possible options for a Graduate Minor in Statistics:

- **Option 1**: STAT/MATH 414-415 and at least three 500-level courses from the department.
- **Option 2**: Five or more courses totaling 15 credits at the 500-level from the department. Stat 464 may also count toward the 15 credits.
- **Option 3**: Four 500-level courses totaling 12 credits from the department and one additional course of 3 credits approved by the department head or graduate studies chairman.

Please note: STAT 500 will not be counted toward the Graduate Minor in Statistics under any option.

For all options, a 3.5 GPA is required in the courses to be counted toward the minor. Completion of one of the options listed above, with the specified grade-point average, and the signature on the Graduate Minor Program form (www.stat.psu.edu/grad/degrees/Minor/Graduate_Minor_Application_Form.pdf) constitutes approval of the Minor in Statistics. The candidate must indicate the wish to have a Graduate Minor in Statistics when the diploma card is filed and indicate the semester the Ph.D. degree is expected.

Other Relevant Information

Students in the Statistics program may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (*See also* Operations Research.)

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. GRE scores are required for consideration for assistantships.

Integrated B.S. in Statistics and Master of Applied Statistics (M.A.S.)

The Integrated Undergraduate-Graduate (IUG) degree with B.S. in Statistics and Master of Applied Statistics (M.A.S.) is designed to be completed in five years. This integrated degree will enable a select number of highly qualified and career-oriented students to obtain training in statistics focused on developing data analysis skills and exploration of core areas of applied statistics at the undergraduate and graduate levels. The M.A.S. degree is a professional master's degree that emphasizes applications and does not provide as much training in the mathematical and statistical theory. The degree prepares students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analyst. Research divisions in the pharmaceutical industry, quality control and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and research units, and other data-intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this program will provide.

Application Process

The number of openings in the integrated B.S./M.A.S. program is limited. Admission will be based on specific criteria and the recommendation of faculty. Applicants to the integrated program:

- Must be enrolled in the Statistics B.S. program.
- Must have completed at least 60 credits of the undergraduate degree program, including the two courses: STAT 414 and STAT 415 and the students must apply to the program prior to completing 110 credits.
- Must submit a transcript and a statement of purpose.
- Must present a departmental approved plan of study in the application process in consultation with the M.A.S. program director.
- Must be recommended by the chair of the department's undergraduate program committee.
- Must be accepted into the M.A.S. program in Statistics.

For the IUG B.S./M.A.S. degree, 120 credits are required for the B.S. and 30 credits for the M.A.S. The following twelve graduate-level credits (number of credits in parentheses) can apply to both B.S. and M.A.S. degrees; six of these are at the 500 level:

STATISTICS (STAT)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)

Assuming all requirements for the B.S. are completed, students in the program can complete the B.S. degree and not advance to the M.A.S. Degree if they desire.

Degree Requirements

IUG Statistics B.S. prescribed Statistics courses (25 credits)

STATISTICS (STAT)
220. Basic Statistics (3)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
416. Stochastic Modeling (3)
464. Applied Nonparametric Statistics (3)
470W. Problem Solving and Communication in Applied Statistics (3)
480. Introduction to Statistical Analysis System (SAS) (1)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)

Note that students in IUG Statistics B.S. take STAT 501 and STAT 502 instead of STAT 460 and STAT 462 for the regular Statistics B.S.

IUG Statistics M.A.S. requirement (30 credits)

STATISTICS (STAT)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)
580.** Statistical Consulting Practicum (2)
581.**Stastical Consulting Practicum II (1)

Electives (15 credits)
Select from STAT 503, STAT 504, STAT 505, STAT 506, STAT 507, STAT 509, STAT 510 and the departmental list of additional courses for the M.A.S program with the approval of the adviser.

**For all students in the M.A.S program, the STAT 581 courses will have a comprehensive written project report required as part of the course, which serves as the culminating experience.

Integrated B.A./B.S. in Mathematics and Master of Applied Statistics (M.A.S.)

The Integrated Undergraduate-Graduate (IUG) degree with B.A./B.S. in Mathematics and Master of Applied Statistics (M.A.S.) is designed to be completed in five years. This integrated degree will enable a select number of highly qualified and career oriented students to obtain training in statistics focused on developing data analysis skills, and exploration of core areas of applied statistics at the graduate levels in addition to an undergraduate degree in Mathematics. The M.A.S. degree is a professional masters degree that emphasizes applications. The degree prepares students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analysts. Research divisions in the pharmaceutical industry, quality control, and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and research units, and other data intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this program will provide.

Application Process

The number of openings in the integrated B.A./B.S. in Mathematics and M.A.S. program is limited. Admission will be based on specific criteria and the recommendation of faculty. Applicants to the integrated program:

- Must be enrolled in the Mathematics B.A./B.S. program.
- Must have completed at least 60 credits of the undergraduate degree program including the two courses: STAT 414 and STAT 415 and the students must apply to the integrated program prior to completing 110 credits.
- Must submit a transcript and a statement of purpose.
- Must present a departmental approved plan of study in the application process in consultation with the M.A.S. program director.
- Must be recommended by the chair of Mathematics Department's undergraduate program committee. Two additional recommendation letters must be sent to the M.A.S. admissions committee.
- Must submit the GRE to the M.A.S. admissions committee.
- Must apply to the M.A.S. program in Statistics.

For the IUG B.A./B.S. in Mathematics and M.A.S. degree, 120 credits are required for the B.A./B.S. and 30 credits for the M.A.S. The following twelve graduate level credits (number of credits in parentheses) can apply to both B.A./B.S. and M.A.S. degrees, six of these are at the 500 level:

STATISTICS (STAT)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)

Assuming all requirements for the B.A./B.S. in Mathematics are completed, students in the program can complete the B.A./B.S. degree and not advance to the M.A.S. degree if they desire.

Degree Requirements

IUG Math B.A./B.S. students must fulfill the Math B.A./B.S. requirement while counting these prescribed Statistics courses (15 credits)

STATISTICS (STAT)
220.* Basic Statistics (3)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)

IUG M.A.S. Requirements (30 credits)

STATISTICS (STAT)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)
580. Statistical Consulting Practicum (2)
581.** Statistical Consulting Practicum II (1)

Electives: (15 credits)
Select from STAT 464, STAT 503, STAT 504, STAT 505, STAT 506, STAT 507, STAT 509, STAT 510 and the departmental list of additional courses for the M.A.S. program with the approval of the adviser.

For the IUG B.A./B.S. in Mathematics and M.A.S. degree, the four courses: STAT 414, STAT 415, STAT 501 and STAT 502 can apply to both the B.A./B.S. and M.A.S. degrees.

*Can be waived for students with an equivalent course, e.g., STAT 250 or STAT 301.

** For all students in the M.A.S. program, the STAT 581 course will have a comprehensive written project report required as part of the course, which serves as the culminating experience.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

STATISTICS (STAT) course list

LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

IUG PROGRAM - B.S. in Statistics and Master of Applied Statistics
Last Revised by the Department: Summer Session 2003
Blue Sheet Item #: 31-05-138

IUG PROGRAM - B.A./B.S. in Mathematics and Master of Applied Statistics
Last Revised by the Department: Fall Semester 2006
Blue Sheet Item #: 34-06-361 and 34-06-361A
Review Date: 4/11/06

REVISED BY SENATE: 1/5/06 [course number update]

Last updated by Publications: 8/17/09

Applied Youth, Family and Community Education (AYFCE)

Program Home Page

TRACY S. HOOVER, *Head of the Department*
114 Ferguson Building
814-865-1688

Degree Conferred:

M.Ed.

The Graduate Faculty

- Connie D. Baggett, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- Blannie E. Bowen, Ph.D. (Ohio State) Professor of Agricultural and Extension Education
- Cathy F. Bowen, Ph.D. (Ohio State) Associate Professor of Agricultural and Extension Education
- Jacklyn A. Bruce, Ph.D. (Texas A&M) Assistant Professor of Agricultural and Extension Education
- Thomas H. Bruening, Ph.D. (Iowa State) Associate Professor of Agricultural and Extension Education
- Ann H. Dodd, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- John C. Ewing, Ph.D. (Ohio State) Assistant Professor of Agricultural and Extension Education
- Constance A. Flanagan, Ph.D. (Michigan) Professor of Agricultural and Extension Education
- Tracy S. Hoover, Ph.D. (Penn State) Professor and Head of Agricultural and Extension Education
- Patreese D. Ingram, Ed.D. (Western Michigan) Associate Professor of Agricultural and Extension Education
- Matthew S. Kaplan, Ph.D. (CUNY) Associate Professor of Agricultural and Extension Education
- Claudia C. Mincemoyer, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- Daniel F. Perkins, Ph.D. (Michigan State) Professor of Agricultural and Extension Education
- Rama B. Radhakrishna, Ph.D. (Penn State) Associate Professor of Agricultural and Extension Education
- Jan F. Scholl, Ph.D. (Iowa State) Associate Professor of Agricultural and Extension Education
- Joan S. Thomson, Ph.D. (Wisconsin, Madison) Professor of Agricultural Communications
- Barbara K. Wade, Ph.D. (Penn State) Affiliate Assistant Professor of Agricultural and Extension Education
- Nicole S. Webster, Ph.D. (Michigan State) Assistant Professor of Agricultural and Extension Education
- Edgar P. Yoder, Ph.D. (Ohio State) Professor of Agricultural and Extension Education

The curriculum prepares students to assume leadership roles in education and human service organizations whose goals are to support and enhance the well-being of youth and families within community settings. Through this graduate program, students will: (1) design, implement, and evaluate educational programs for youth and families; (2) interpret relevant research in youth and family education; and (3) apply research and problem-solving strategies to increase professional effectiveness.

Admission Requirements

Applicants whose junior/senior grade-point average is below 3.00 on a 4.00 scale for their baccalaureate degree are required to submit Graduate Record Examinations (GRE) scores. The program is tailored to students with baccalaureate degrees in family and consumer science, youth development, or other disciplines closely related to the human sciences.

Degree Requirements

For the M.Ed., a minimum of 30 credits is required, including a 3-credit professional paper or thesis. The paper or thesis is defended in a one-hour oral examination. The graduate program is organized around the following themes: youth and family education, community-based education, and research. Students have the flexibility to focus their programs in areas of professional interest within youth and family education.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

YOUTH AND FAMILY EDUCATION (YFE) course list

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-03-106

Review Date: 11/17/09

Last updated by Publications: 3/2/09

Architectural Engineering (A E)

LINDA M. HANAGAN, *Graduate Program Officer*
104 Engineering A
814-863-2084
lhanagan@psu.edu

Degree Conferred:

- Ph.D., M.S., M.A.E., M.Eng.
- Integrated Programs

The Graduate Faculty

- Chimay J. Anumba, Ph.D. (U of Leeds, UK); D.Sc. (Loughborough, UK) Head; Professor of Architectural Engineering
- William P. Bahnfleth, Ph.D. (Illinois) P.E. Professor of Architectural Engineering
- Richard A. Behr, Ph.D. (Texas Tech) P.E. Charles and Elinor Matts Professor of Architectural Engineering
- Thomas E. Boothby, Ph.D. (Washington) P.E., R.A. Professor of Architectural Engineering
- James D. Freihaut, Ph.D. (Penn State) Associate Professor of Architectural Engineering
- Louis F. Geschwindner, Ph.D. (Penn State) P.E. Professor Emeritus of Architectural Engineering
- Linda M. Hanagan, Ph.D. (Virginia Tech) P.E. Associate Professor of Architectural Engineering
- Michael J. Horman, Ph.D. (Melbourne) Associate Professor of Architectural Engineering
- Bohumil Kasal, Ph.D. (Oregon) Professor of Architectural and Civil Engineering; Bernard and Henrietta Hankin Chair in Residential Building Construction; Director of Research, Pennsylvania Housing Research Center
- Andres LePage, Ph.D. (Illinois) P.E. Assistant Professor of Architectectural Engineering
- Ali. M. Memari, Ph.D. (Penn State) P.E. Associate Professor of Architectural Engineering
- John I. Messner, Ph.D. (Penn State) Associate Professor of Architectural Engineering
- Richard G. Mistrick, Ph.D. (Penn State) P.E. Associate Professor of Architectural Engineering
- Stanley A. Mumma, Ph.D. (Illinois) P.E. Professor Emeritus of Architectural Engineering
- M. Kevin Parfitt, M.Eng. (Cornell) P.E. Associate Professor of Architectural Engineering
- David R. Riley, Ph.D. (Penn State) Associate Professor of Architectural Engineering
- Jelena Srebric, Ph.D. (MIT) Associate Professor of Architectural Engineering
- Stephen Treado, Ph.D., P.E. (Maryland) Associate Professor of Architectural Engineering

Students may specialize in building construction, building illumination systems, building mechanical and energy systems, or building structural systems.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission to the Ph.D. and M.S. programs.

Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission to the AE graduate programs. Students accepted into the Architectural Engineering program generally have an undergraduate degree in mechanical engineering, electrical engineering, civil engineering, architectural engineering, science, or architecture.

All degree candidates are required to provide a letter of intent outlining the student's intended area of study as well as three letters of recommendation. The best-qualified applicants will be accepted up to the number of spaces that are available for new students.

A limited number of undergraduate students in the B.A.E. program will be considered for admission to the integrated undergraduate/graduate program leading to the B.A.E. and the M.A.E. degrees. Students who are currently enrolled in the seventh semester of the B.A.E. degree program may be admitted to the integrated B.A.E./M.A.E. program, following a positive review of an application specific to this program, by the faculty committee on graduate admissions. Students must have maintained a GPA for classes taken in the third and fourth years of at least 3.00 and must have attained a grade of C or better in all classes listed as A E. Students admitted to the integrated program must maintain a GPA of at least 3.00 in classes used toward the M.A.E. degree.

Degree Requirements

A thesis is required for the M.S. degree, which consists of 24 credits of courses and a 6-credit research thesis. A minimum of 12 of the course credits must be completed at the graduate (500) level. A student's program of courses in the M.S. program is developed in cooperation with the student's academic adviser.

For the Ph.D. degree, a dissertation that displays a student's ability to conduct high-quality original scholarly work is required of all Ph.D. students. Each student accepted into the Ph.D. degree program must pass the Ph.D. Candidacy Examination, which requires students to display an understanding of basic material in all AE option areas, along with an in-depth understanding of material covered in the AE undergraduate courses within their area of focus. This examination must be taken no later than the beginning of the student's second year in the program. Each Ph.D. student must also pass an English Proficiency Examination that is administered by the department, typically during the first semester. The student's program of courses is developed in cooperation with the student's Ph.D. committee. It is recommended that this consist of approximately 30 credits of courses beyond the master's degree, although there is no established minimum or maximum. At the conclusion of the student's course work, the Ph.D. student must take a two-day written comprehensive examination that is developed by the student's Ph.D. committee. Following the comprehensive exam, continuous registration is required for all Ph.D. graduate students until the dissertation is approved. Each student presents a comprehensive thesis proposal to his/her committee prior to starting his/her dissertation research and must present the results of this research in a final oral examination.

The M.Eng. degree is a nonthesis professional master's degree. Candidates for the M.Eng. degree are required to complete 30 credits of course work. A minimum of 18 credits must be at the 500 level or above. Students must follow the approved program of courses for one of the four available specialty areas. Minor modifications to these programs are permitted, with approval of the Graduate Program Officer. Each student must also complete a capstone project/report, supervised by a member of the graduate faculty.

For the integrated B.A.E./M.A.E. degree program, 30 credits of the 172 total credits required to receive both degrees are applied toward the master's degree (a portion of these credits count toward both degrees). A minimum of 18 credits of graduate-level course work is required (500 and 800 level). Approved M.A.E. course sequences are available for each of the four undergraduate option areas. Each

student must submit an M.A.E. course plan for approval when applying to this program and must request approval from the Graduate Program Officer of any proposed modifications to this plan following admission to the program.

All students in the M.Eng., M.S., and Ph.D. programs must also attend a minimum of 10 approved lectures during their degree program.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. A limited number of research and teaching assistantships, scholarships, and fellowships are available to M.S. and Ph.D. students in the Department of Architectural Engineering. The intent of these assistantships and awards is to support students conducting research under faculty supervision. For this reason, students in the M.S. and Ph.D. programs who receive these types of financial support are expected to complete their degree program, including the thesis or dissertation, and may not transfer to the Master of Engineering degree program.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ARCHITECTURAL ENGINEERING (A E) course list

Last updated by Publications: 2/16/10

Architecture (ARCH)

Program Home Page

DANIEL WILLIS, Head, Department of Architecture
121 Stuckeman Family Building
814-865-9535; dew2@psu.edu

LOUKAS KALISPERIS, Professor in Charge of Graduate Program in Architecture
324 Stuckeman Family Building
814-865-0877; lnk@psu.edu

gradarch@psu.edu

Degree Conferred:

- M.Arch.
- Integrated B.Arch.-M.Arch. Program
- Ph.D.

Ph.D. Program Faculty

- Chimay Anumba, Ph.D. (Leeds) Professor of Architectural Engineering
- Irina Aristarkhova, Ph.D. (Moscow) Assistant Professor of Women Studies and Art
- Jin Baek, Ph.D. (Penn) Assistant Professor of Architecture
- Mark Ballora, Ph.D. (McGill) Associate Professor of Integrative Arts and Music
- Thomas E. Boothby, Ph.D. (Washington) P.E., R.A. Professor of Architectural Engineering
- Malika Bose, Ph.D. (Wisconsin) Associate Professor of Landscape Architecture
- Gary L. Catchen, Ph.D. (Columbia) Professor of Nuclear Engineering
- Sidney Cohn, Ph.D. (North Carolina) Professor Emeritus of Urban Design
- James Cooper, Ph.D. (Virginia) Assistant Professor of Architecture
- Madhuri Desai, Ph.D. (Berkeley) Assistant Professor of Art History
- Mary I. Frecker, Ph.D. (Michigan) Professor of Mechanical Engineering
- Jawaid Haider, Ph.D. (Penn State) Professor of Architecture
- Deryck Holdsworth, Ph.D. (British Columbia) Professor of Geography
- Larry Gorenflo, Ph.D. (California - Santa Barbara) Associate Professor of Landscape Architecture
- Loukas Kalisperis, Ph.D. (Penn State) Professor of Architecture
- James Kalsbeek, M.S. Arch. (Cincinnati) Associate Professor of Architecture
- Donald E. Kunze, Jr., Ph.D. (Penn State) Associate Professor of Architecture and Integrative Art
- Nancy Locke, Ph.D. (Harvard) Associate Professor of Art History
- John I. Messner, Ph.D. (Penn State) Assistant Professor of Architectural Engineering
- Richard G. Mistrick, Ph.D. (Penn State) P.E. Associate Professor of Architectural Engineering
- Timothy Murtha, Ph.D. (Penn State) Assistant Professor of Landscape Architecture
- Ute Poerschke, Ph.D. (Cottbus, Germany) Associate Professor of Architecture
- Daniel Purdy, Ph.D. (Cornell) Associate Professor of German
- Sarah K. Rich, Ph.D. (Yale) Assistant Professor of Art History
- Timothy W. Simpson, Ph.D. (Georgia Tech) Professor of Industrial and Mechanical Engineering
- Elizabeth Smith, Ph.D. (NYU) Associate Professor of Art History
- Alexandra Staub, Ph.D. (Cottbus, Germany) Associate Professor of Architecture
- Allan Stoekl, Ph.D. (SUNY, Buffalo) Professor of French and Comparative Literature
- S. Shyam Sundar, Ph.D. (Stanford) Professor of Media Studies and Communications
- Robin Thomas, Ph.D. (Columbia) Assistant Professor of Art History
- Robert Yarber, M.F.A. (Louisiana) Distinguished Professor of School of Visual Art
- Craig Zabel, Ph.D. (Illinois, Urbana-Champaign) Associate Professor of Art History

M.Arch Program Faculty

- Arthur K. Anderson, Jr., M.F.A. (Princeton) Professor Emeritus of Architecture
- Jin Baek, Ph.D. (Penn) Assistant Professor of Architecture
- Pier Luigi Bandini, Lau.Arch. (U of Florence, Italy) Associate Professor of Architecture
- David Celento, M.Arch. (Harvard) Assistant Professor of Architecture
- Sidney Cohn, Ph.D. (North Carolina) Professor Emeritus of Urban Design
- James Cooper, Ph.D. (Virginia) Assistant Professor of Architecture
- Christine Gorby, M.Arch. (Harvard) Associate Professor of Architecture
- Jawaid Haider, Ph.D. (Penn State) Professor of Architecture
- Lisa Iulo, M.Arch. (CUNY) Assistant Professor of Architecture
- Loukas Kalisperis, Ph.D. (Penn State) Professor of Architecture
- James Kalsbeek, M.S. Arch. (Cincinnati) Associate Professor of Architecture
- Donald E. Kunze, Jr., Ph.D. (Penn State) Professor of Architecture and Integrative Arts
- Jodi L. LaCoe, M.Arch. (McGill) Instructor in Architecture
- Darla Lindberg, M.Arch. (Iowa State) Associate Professor of Architecture
- John P. Lucas, M.Arch. (North Carolina State) Professor of Architecture
- Romolo Martemucci, M.S.Urb Des. (Pratt Institute) Professor of Architecture
- Raymon J. Masters, M.S.Arch.Eng. (Penn State) Affiliate Associate Professor of Architecture
- Katsuhiko Muramoto, M.Arch.(Cranbrook Academy) Associate Professor of Architecture
- Madis Pihlak, M.C.P. (Berkeley) Associate Professor of Architecture and Landscape Architecture
- Ute Poerschke, Ph.D. (Cottbus, Germany) Associate Professor of Architecture
- Alexandra Staub, Ph.D. (Cottbus, Germany) Associate Professor of Architecture
- Daniel Willis, M.S.Arch. (Penn State) Professor of Architecture: Head, Department of Architecture
- James Wines, B.S. (Syracuse) Professor of Architecture
- Scott W. Wing, M.Arch. (Princeton) Associate Professor of Architecture

The Master of Architecture program emphasizes three areas central to the school: Community and Urban Design (CUD), Digital Design (DD), and Culture, Society and Space (CSS). The program allows opportunities for graduate students to assist in undergraduate courses and work with the two endowed centers: the Hamer Center for Community Design Assistance and the Stuckeman Center for Design Computing. In addition, selected graduate students can also participate in the department's Rome program for undergraduates. The Master of Architecture is a post-professional degree. Post-professional degrees do not qualify the recipient for professional licensure in the United States. The program is intended for students already holding professional degrees in architecture, and in exceptional cases, for students with nonprofessional architectural degrees who seek to develop a better understanding of architecture. The Master of Architecture program is specially designed for students interested in advanced studies in Community and Urban Design, Digital Design and Culture, Society and Space. It is expected that such students will have previously studied the technical and professional aspects of architectural practice and are primarily interested in strengthening the intellectual underpinnings of their work through intensive studio investigations, design applications, and rigorous theoretical inquiry.

The Ph.D. in Architecture is a research-based degree supporting a number of areas of research inquiry. The program's distinguishing quality is its broad-based research core, grounded in contemporary critical theory and methods. Faculty include Penn State scholars with an expertise in architectural theory, the design process, digital design, digital fabrication, building construction and technology, cultural and environmental behavior, housing, urban design, and sustainability. Visiting scholars further enhance the program and course offerings. The program allows opportunities for graduate students to assist in undergraduate courses and work with the research centers of the department. It is expected that students will have previously studied the technical and professional aspects of architectural practice and are primarily interested in strengthening the intellectual underpinnings of their work through intensive investigation, design applications, and rigorous theoretical inquiry.

M.Arch. Admission Requirements

M.Arch degree applicants should have a five-year professional degree in architecture. This M.Arch. program culminates in a post-professional degree for students with a five-year professional degree that is accredited by the National Architectural Accrediting Board (NAAB) or its equivalent. Any exceptions must have the approval of the department head. International applicants with a five-year degree in architecture are considered equivalent to a graduate from a five-year NAAB-accredited program for admission purposes. In exceptional cases, the M.Arch. program may serve students with a four-year architecture degree or other degrees who seek to develop a better understanding of the principles and theory that underlie the profession of architecture. It is understood that such students are interested in the academic path and eventually intend to pursue the Ph.D. degree. These students would be required to take remedial undergraduate or graduate courses and may have to significantly extend the duration of their study.

In addition to the application to the University for admission to the Graduate School, all applicants for the M.Arch degree must submit the following to the Department of Architecture.

A statement of intent should be primarily a description of the applicant's professional goals, desired option and subjects of study, and the area(s) of anticipated architectural inquiry. A portfolio of creative and design work (architecture and planning projects) executed at the undergraduate level or under professional guidance or independently, provided that such work can be evidenced as executed by the applicant, is an important part of the graduate application. A minimum portfolio representation of one project for each year of academic undergraduate study, or its equivalent, is required. The applicant is encouraged to include other evidence of academic excellence, such as awards, design and scholarly achievements, and other recognitions. A complete set of official transcripts is required for all applications. A minimum of three statements of recommendation from faculty members acquainted with the applicant's academic history and/or recommendations by an undergraduate review committee should accompany the application.

Scores from the Graduate Record Examinations (GRE) are required for admission for all applicants. A minimum grade-point average of 3.00 is required for admission.

Ph.D. Admission Requirements

To be admitted into the Doctor of Philosophy in Architecture degree program, an applicant must have received a professional degree in architecture from an accredited institution and a Masters degree in architecture or related field. Outstanding candidates who do not hold a professional architecture degree but who satisfy all other entrance to major requirements may be admitted by the PH.D. program director with the concurrence of the Department Head. Scores from the Graduate Record Examination (GRE) will be required for admission. An overall minimum grade-point average of 3.20 for graduate and undergraduate degrees is required for admission. In addition to the application to the University for admission to the Graduate School, all applicants must submit the following to the Department of Architecture: 1)an official transcript from all institution of higher education attended, both undergraduate and graduate, 2) official diploma/certificates for each degree obtained, 3) three letters of recommendation, 4) a statement of intent, and 50 a CV.

The best-qualified applicants will be accepted up to the number of spaces that are available for new students**.** Exceptions to the minimum 3.20 grade-point average may be made for student with special backgrounds, abilities, and interests.

English Language Requirements

The language of instruction at Penn State is English. International applicants for all degrees must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the Internet-based test (iBT). Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. Specific graduate programs may have more stringent requirements. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec) England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

M.Arch. Degree Requirements

The capstone of the M.Arch. Program is a Master's Thesis or Thesis [Design] Project, which requires the student to identify and formulate an area of inquiry within which he or she will be expected to do original research and to complete a project or a written thesis that tests the theoretical ideas. The Master of Architecture is a 30-credit program that requires 24 credits of course work and 6 credits of thesis or thesis project. At least 18 credits must be at the 500 or 600 levels, and at least 20 credits must be taken in residence at University Park. The core courses consist of a total of 12 credits.

A graduate student may be able to complete the requirements for the M.Arch. degree in one year. Those students who are awarded an assistantship will require more than two semesters to complete the requirements for the M.Arch. degree. Directed Electives include courses related to one of the three options from other disciplines, such as Landscape Architecture, Geography, Sociology, Philosophy,

Psychology, and Computer Science, as well as within the Department of Architecture. Architectural Research (Arch 591) is specifically designed for each of the three options and counts toward the 12 credits necessary to satisfy the option within the major. The thesis requirement can be fulfilled in two ways: through a written thesis, which conforms to the scholarly standards of the Graduate School or through a design project that tests theoretical ideas. A written monograph will accompany all thesis design projects.

Ph.D. Degree Requirements

The capstone of the Ph.D. program is a dissertation, which requires the student to identify and formulate an area of inquiry within which he or she will be expected to conduct high-quality original scholarly research. Each student accepted into the Ph.D. degree program must pass the Ph.D. Candidacy Examination, which requires students to display an understanding of basic material in all areas, along with an in-depth understanding of material covered in courses within their area of focus. This examination must be passed within three semesters, not counting summer session, of entry into the doctoral program. The student's program of courses is developed in cooperation with the student's Ph.D. committee. It is recommended that this consist of approximately 30 credits of courses beyond the master's degree. At the conclusion of the student's course work, the Ph.D. student must take a written comprehensive examination that is developed by the student's Ph.D. committee. Following the comprehensive exam, continuous registration is required for all Ph.D. graduate students until the dissertation is approved. Each student presents a comprehensive thesis proposal to his/her committee prior to starting his/her dissertation research and must present the results of this research in a final oral examination.

Ph.D. Coursework

- 6 credits of Critical Theory and Methods in Architecture (ARCH 512)
- 12 credits of Architectural Research and/or Design Inquiry (ARCH 520, 536,591)
- 12 credits of research-area related courses such as Computational Methods in Architectural Design or Pedagogical Topics in Architecture (ARCH 522,545,590)
- 12 credits of Dissertation

Integrated B.Arch.-M.Arch. Program

The Department of Architecture offers a limited number of academically superior students enrolled in the fourth year of the Bachelor of Architecture degree program the opportunity to enroll in an integrated program leading to both the B.Arch. and the Master of Architecture degrees. The program permits the student to integrate the fifth year of study for the professional B.Arch. degree with the program of study for the M.Arch. degree into a continuous program of study culminating in the award of both degrees. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to achieve greater depth and comprehensiveness than if the degrees are pursued sequentially and to earn the two degrees in a shorter period of time. In particular, the program encourages the student to integrate the undergraduate thesis design project with the master's thesis, thereby achieving a greater depth of inquiry.

The number of openings to this special program is limited; admission is by invitation of the faculty and is extremely selective.

Admission Requirements

Applicants to the integrated program must be enrolled in the fourth year of a B.Arch. program or otherwise qualified to apply for admission to the fifth year of the B.Arch. program at Penn State. To be admitted, applicants must be able to meet the following requirements:

1. Must have completed the first through fourth years of the B.Arch., or other degree qualifying for admission to the fifth-year standing in the B.Arch. program, prior to entry into the Integrated Degree Program.
2. Must be unconditionally accepted into the fifth year of the B.Arch. program at the Penn State University (see B.Arch. requirements above).
3. Must be unprovisionally accepted into the M.Arch. program at Penn State (see application requirements for the M.Arch. degree in the Penn State Graduate Degree Programs Bulletin).
4. Must have a minimum 3.2 junior/senior overall GPA (on a 4.0 scale) as well as: (1) a minimum 3.2 GPA in architectural design courses (studio), and (2) a minimum 3.2 GPA in all coursework except architectural design courses (studio).

In addition to the normal application requirements for the M.Arch. degree, the student applicant shall provide a Plan of Study of not more than 1,500 words.

The best-qualified students will be accepted up to the number of spaces available for new students. Acceptance to the program prior to the completion of all required course work is provisional, contingent upon meeting the above requirements.

Degree Requirements

Students must complete the requirements for both the B.Arch. and M.Arch. degrees except that not more than 12 credits earned in either degree program may be used to the meet the requirements of both degrees. Therefore, a minimum total of 48 credits are required to complete the Integrated B.Arch.-M.Arch. Program and earn both degrees. The student must maintain not less than a 3.2 overall GPA and shall achieve not less than a B grade in each required course.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.* All applicants who are accepted are considered for departmental financial aid.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-03-105

Graduate Bulletin Archive - July 2010

Review Date: 11/17/09

Last updated by Publications: 6/30/05

Art (ART)

Program Home Page

JEAN SANDERS, *Studio Graduate Programs Coordinator for the M.F.A. in Art Program*
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Degrees Conferred:

M.F.A.

The Graduate Faculty

- Micaela Amato, M.F.A. (Colorado) *Professor of Art and Women's Studies*
- Irina Aristarkhova, Ph.D. (Russian Academy of Sciences) *Associate Professor of Women's Studies and Visual Arts*
- John Bowman, B.F.A. (Rutgers) *Associate Professor of Art*
- Paul Chidester, M.F.A. (Art Institute, Chicago) *Associate Professor of Art*
- Bonnie Collura, M.F.A. (Yale) *Assistant Professor of Art*
- David M. Ebitz, Ph.D. (Harvard) *Associate Professor of Art and Art Education*
- Charles R. Garoian, Ph.D. (Stanford) *Professor of Art Education; Director, School of Visual Arts*
- Robin L. Gibson, M.F.A. (Wisconsin, Madison) *Associate Professor of Art*
- Lonnie Graham, M.F.A. (San Francisco Art Inst) *Assistant Professor of Art*
- Matthew Kenyon, M.F.A. (Virginia Commonwealth) *Assistant Professor of Art*
- Jerrold Maddox, M.F.A. (Indiana) *Professor of Art*
- Cristin Millett, M.F.A. (Arizona State) *Associate Professor of Art*
- Helen O'Leary, M.F.A. (Art Institute, Chicago) *Associate Professor of Art*
- Simone Ostoff, M.F.A. (Maryland) *Associate Professor of Art*
- Elizabeth Quackenbush, M.F.A. (Rochester Inst of Technology) *Associate Professor of Art*
- Carlos Rosas, M.F.A. (Cranbrook Academy of Art) *Associate Professor of Art*
- Steven Rubin, M.F.A. (California, San Diego) *Assistant Professor of Photography*
- Jean Sanders, M.F.A. (Wisconsin, Madison) *Associate Professor of Art*
- Keith Shapiro, M.F.A. (Penn State) *Assistant Professor of Integrative Arts and Art*
- Christopher P. Staley, M.F.A. (Alfred) *Professor of Art*
- James Thurman, M.F.A. (Cranbrook Acad of Art) *Assistant Professor of Art*
- Robert Yarber, M.F.A. (Louisiana State) *Distinguished Professor of Art*

M.F.A. program is planned to provide professional emphasis in a specific area of art.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

The Master of Fine Arts program in art, with its emphasis on professional study, is designed for the mature individual who by previous training and study has sufficiently prepared for the undertaking. It is strongly suggested that applicants have a minimum of 12 credits of art history at the undergraduate level. Any qualified student who has graduated from an accredited college that offers a bachelor of arts, bachelor of science, or bachelor of fine arts in the area of art of the equivalent may seek admission. The School of Visual Arts requires a minimum of 3.00 junior/senior grade-point average (on a 4.00 scale) for admission to the master of fine arts program. Exceptions to the minimum 3.00 average may be made for students with special backgrounds, abilities, and interests.

In addition to the previous requirements, all applicants must submit:

1. A portfolio of his/her work to illustrate his/her preparation for graduate study. A portfolio of slides, rather than actual work, is required. A selection of no fewer than twenty examples should be presented. The majority should be in the area of the applicant's interest.
2. A statement of professional aims. This statement should include the applicant's intentions for his/her proposed study. Some indications of his/her philosophy, beliefs, and goals in regard to education and art should give evidence that he/she is prepared to undertake the work outlined for the Master of Fine Arts program.
3. Three letters of reference attesting to the applicant's scholarship and ability to work independently.

Degree Requirements

The School of Visual Arts requires a minimum total of 60 credits for the Master of Fine Arts degree. Not more than 10 credits may be transferred from other accredited graduate institutions. Of the 60 credits required for graduation, candidates are expected to complete the following distribution of credits: 30 credits in a major area of concentration, 12 credits in art history and critical studies, 10 credits in related areas, and 8 credits in graduate seminar.

Additional M.F.A. Requirements

For M.F.A. candidates, at least 24 credits of the required 60 credits must be at the 500 level. In addition to course work, M.F.A. candidates must pass a candidacy review, which is usually held at the end of the second semester of study, submit an artist's statement, pass the M.F.A. comprehensive oral examination and produce an M.F.A. exhibition.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ART (ART) course list

Last Revised by the Department: Spring Semester 2005

Blue Sheet Item #: 33-03-308

Review Date: 11/23/04

Date last updated by Publications: 5/25/10

Art Education (A ED)

Program Home Page

WANDA B. KNIGHT, *Art Education Graduate Coordinator and Post baccalaureate Certification Officer in Art Education*
211 Arts Cottage
814-865-6570
wbk10@psu.edu

Degrees Conferred:

Ph.D., M.S., M.Ed., M.P.S., Dual Degrees in Art Education and Women's Studies

The Graduate Faculty

- Patricia Amburgy, Ph.D. (Illinois) Associate Professor of Art Education
- David Ebitz, Ph.D. (Harvard) Associate Professor of Art and Art Education; Professor-in-Charge of Art Education
- Charles R. Garoian, Ph.D. (Stanford) Professor of Art Education; Director, School of Visual Arts
- Yvonne M. Gaudelius, Ph.D. (Penn State) Assistant Vice President and Associate Dean for Undergraduate Education; Professor of Art Education
- Grace Hampton, Ph.D. (Arizona State) Head of the Department of African and African American Studies; Professor of Art, Art Education, and Integrative Arts
- Karen Keifer-Boyd, Ph.D. (Oregon) Professor of Art Education; Affiliate Professor of Women's Studies
- Wanda B. Knight, Ph.D. (Ohio State) Associate Professor of Art Education
- Kimberly Powell, Ph.D. (Stanford) Assistant Professor of Art Education, and Curriculum and Instruction
- Mary Ann Stankiewicz, Ph.D. (Ohio State) Professor of Art Education
- Christine Marmé Thompson, Ph.D. (Iowa) Professor of Art Education

This program helps students prepare for careers in college teaching, administration, research, public school art teaching, and art supervision.

Admission Requirements

For admission to the Graduate School, an applicant must hold either (1) a bachelor's degree from a U.S. regionally accredited institution or (2) a postsecondary degree that is equivalent to a U.S. baccalaureate degree earned from an officially recognized degree-granting international institution.

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the Internet-based test (iBT). Applicants with iBT speaking scores between 15 and 19 may be considered for provisional admission, enrollment, and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

Scores from the Graduate Record Examinations (GRE) or from the Miller Analogies Test (MAT) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Students who seek admission to the graduate program must make formal application to the admissions committee of the Art Education program. To be admitted without deficiencies, the student is expected to have completed either a baccalaureate degree in art education or a program considered by the admissions committee to provide an appropriate background for the application's degree objectives. Related programs include work in studio art, art history, art education, education, museum education, etc. Deficiencies may be made up by course work that is not counted as credit toward an advanced degree. Students pursuing graduate degrees may simultaneously take course work leading to teaching certification and art supervisory certification. The students who plan to teach art education at the college level should note that some institutions require professors to hold a public school art teaching certificate and to have had public school teaching experience.

Students with a minimum 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The most qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 average may be made for students with special backgrounds, abilities, and interests. Transcripts should indicate high attainment in appropriate academic and creative work. Letters of recommendation should attest to scholarship and ability to work independently. In addition to the above requirements, all applicants must submit an example of scholarly writing and a one- to two-page statement of:

1. professional objectives; and
2. the areas in which research and creative work are planned. The statement should indicate how these objectives will be furthered by graduate study. For applications with a studio background, the inclusion of slides of creative work showing the depth and range of studio abilities is also recommended. Teachers may also submit slides of student works. Applicants planning to pursue studio work as a part of their graduate program must submit ten to fifteen slides of their creative work showing the depth and range of their studio abilities.

Master's Degree Requirements

A minimum of 30 graduate credits is required for the M.S. and M.Ed. degrees. Students must take a minimum of 15 credits in art education. Of those, M.Ed. and M.S. candidates are expected to complete the following 3-credit core: A ED 502, 505; 536 or 588; and A ED 590 (1 credit for each two semesters enrolled in course work). Students must take additional credits to total a minimum of 15 credits. All master's degree candidates must also complete 6 credits of foundational studies at the 400 level or above in areas such as art history, studio, philosophy, educational theory and policy, educational psychology, psychology, and anthropology. The remaining 9 credits are made up of elective studies.

Additional M.Ed. requirements. For M.Ed. candidates, 12 credits of course work must be at the 500 level or above. In addition to course work, M.Ed. candidates must write a substantial paper or present an exhibition in lieu of a thesis.

Additional M.S. requirements. For M.S. candidates, 18 credits of course work must be at the 500 level or above. M.S. candidates must prepare and orally defend a thesis. Requirements include 6 credits of thesis research within the 30 credits.

Students who seek admission to the M.P.S. in Art Education program should have current or recent teaching positions in a school, museum, cultural institution, or other community site at the time of application, with the expectation that the student continue to teach art in schools, museum, or other sites throughout the M.P.S. program. Applicants may apply to be admitted as a Graduate Non-degree Student for no more than 15 credits of course work accumulated in non-degee status.

For the M.P.S. in Art Education program, a minimum of 30 graduate credits is required. Students must complete 18 credits in 500-level courses and above, with a minimum of 6 credits at the 500-level. A minimum of 18 credits in art education includes the following Internet-based 3-credit courses: A ED 811, 812, 813, 814, 815, and A ED 594. Selecting from World Campus offering in other programs, students must take an additional 6 credits of Foundational courses at the 400 level or above in art history, studio, philosophy, educational theory and policy, educational psychology, psychology, and/or anthropology, and 6 credits of Elective courses.

M.P.S. in Art Education program participants can start in any semester, taking one online art education course and one or more foundation or elective courses in other programs per semester. A ED 594 is the culminating experience for the program with an action research project in one's teaching context.

Doctoral Degree Requirements

Admission to Candidacy. Once admitted to the doctoral program, all students must take a candidacy examination, which is given during the first year that the student is in residence. During the candidacy examination there is a review of (1) the student's professional resume; (2) a statement regarding the general direction of the student's research interests and possible areas of thesis inquiry; (3) completed graduate courses; (4) proposed course of study for subsequent semesters; (5) selected graduate papers written by the student; (6) slides or original work if studio inquiry is part of the student's program of study.

English competence. At or before the candidacy exam, all candidates for doctoral degrees are required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking, as part of the requirement for the doctoral program. Competency must be formally attested to by the student's committee before the comprehensive examination is held.

Course requirements. All doctoral students are expected to complete the following 3-credit core courses: A ED 502, 505, 536, 588; and A ED 590 (1 credit for each two semesters enrolled in course work).

Additional Ph.D. requirements. All Ph.D. students must complete at least 2 continuous semesters of residency after being admitted to candidacy. Although not required by the program, Ph.D. students are strongly encouraged to complete a minor area of study. A foreign language is not required of Ph.D. candidates. Instead, the inquiry and foreign language requirement for the Ph.D. is met through 12 credits of graduate-level course work in a related discipline as determined by the student's committee. All Ph.D. students are required to complete 18 credits of course work in art education. These 18 credits comprise the core courses plus two other courses in art education.

Comprehensive examination. Ph.D. candidates are required to take a written and oral comprehensive examination once their course work is substantially completed. The examination, prepared by the student's doctoral committee, covers all phases of the student's doctoral work both inside and outside the field of art education.

Doctoral dissertation. Ph.D. candidates are required to complete a dissertation on a topic of research approved by the student's doctoral committee. The dissertation must be defended before the academic community at a final oral examination.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ART EDUCATION (A ED) course list

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-090

Review Date: 01/12/2010

Last updated by Publications: 8/20/09

Art History (ART H)

Program Home Page (Opens New Window)

CRAIG ZABEL, *Head of the Department*
240 Borland Building
814-865-6326
ccw2@psu.edu

Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- Brian A. Curran, Ph.D. (Princeton) Associate Professor of Art History
- Anthony Cutler, Ph.D. (Emory) Evan Pugh Professor of Art History
- Madhuri Desai, Ph.D. (California, Berkeley) Assistant Professor of Art History and Asian Studies
- Roland E. Fleischer, Ph.D. (Johns Hopkins) Professor Emeritus of Art History
- Hellmut Hager, Ph.D. (Universität Bonn) Evan Pugh Professor and Professor Emeritus of Art History
- Charlotte M. Houghton, Ph.D. (Duke) Associate Professor of Art History
- Nancy Locke, Ph.D. (Harvard) Associate Professor of Art History
- Leo Mazow, Ph.D. (North Carolina, Chapel Hill) Affiliate Associate Professor of Art History
- Patrick McGrady, Ph.D. (SUNY, Binghamton) Affiliate Assistant Professor of Art History
- Randy J. Ploog, Ph.D. (Penn State) Affiliate Assistant Professor of Art History
- Jeanne Chenault Porter, Ph.D. (Michigan) Associate Professor Emerita of Art History
- Sarah K. Rich, Ph.D. (Yale) Associate Professor of Art History
- Joyce Henri Robinson, Ph.D. (Virginia) Affiliate Associate Professor of Art History
- Elizabeth B. Smith, Ph.D. (NYU, Institute of Fine Arts) Associate Professor of Art History
- Robin Thomas, Ph.D. (Columbia) Assistant Professor of Art History
- Elizabeth Walters, Ph.D. (NYU, Institute of Fine Arts) Associate Professor of Art History
- Kristi Ann Wormhoudt, Ph.D. (Iowa) Affiliate Assistant Professor of Art History
- Craig Zabel, Ph.D. (Illinois, Urbana-Champaign) Associate Professor of Art History

Graduate work is offered in the following areas: Ancient, Byzantine, Medieval, Renaissance, Baroque, Modern, Contemporary, American, African, and Asian art and architectural history.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) Aptitude Test (verbal, quantitative, and analytical) are required for admission to the Department of Art History. Special emphasis will be given to the verbal part of the GRE scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Candidates with a 3.00 junior/senior grade-point average and a minimum of 21 credits in art history will be considered for admission to the master's program. Lacking these, a promising candidate may be accepted on condition that deficiencies be remedied, but without graduate degree credit. Applicants to the Ph.D. program must have an M.A. in art history or a closely related field. The best-qualified applicants will be accepted up to the number of spaces that are available for new students.

Master's Degree Requirements

Candidates for the M.A. degree are required to complete a minimum total of 36 credits (including a master's thesis or paper), divided as follows:

- ART H 551 (3 credits), to be taken during one's first fall semester
- 12 credits at the 400 level, of which 3 credits must be taken in four of the five following areas of art history: African/Asian, Ancient, Byzantine/Medieval, Renaissance/Baroque, and Modern
- 9 credits of 500-level seminars in art history (ART H 551, and ART H 596 may not be used to fulfill this requirement). Each seminar in this 9-credit requirement must be taken with a different faculty member.
- 6 additional credits in art history at the 400 or 500 level. With the approval of one's adviser and the graduate officer, 3 credits of this requirement may be a course at the 400 or 500 level outside the Department of Art History.
- 6 credits of ART H 600 for a master's thesis or 6 credits of ART H 596 for a master's paper. ART H 596 may be used only by a master's candidate for a master's paper; all other individual studies should use ART H 496.

In addition, candidates must demonstrate a reading proficiency in two foreign languages. One of these languages must be German, and the other being French, Italian, or Spanish. On the recommendation of a student's adviser, and with the approval of the graduate officer, a student may substitute one of the above-named languages with another foreign language deemed appropriate for a specialized field. Proficiency in one language must be demonstrated before the end of one year of study. A reading knowledge of the second language must be demonstrated before the end of the second year. A master's examination must also be passed before completing the M.A. degree.

Doctoral Degree Requirements

Thirty additional credits, not including doctoral dissertation research, are required for the Ph.D. At least 24 of these credits must be in art history and 3 to 6 must be in a related area outside art history. At least 9 of the art history credits must be at the 500 level, exclusive of Art History 510 and Art History 596. At the discretion of the candidate's doctoral committee, the candidate may be required to take additional specialized courses pertaining to his or her major area of study. For students who have received a master's degree from another university, a reading competency in German and in French or Italian must be demonstrated before the end of one year of study. For the Ph.D., a candidacy examination, a comprehensive examination, and a final oral examination must be successfully completed in addition to the student's doctoral dissertation.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ART HISTORY (ART H) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/17/04

Last updated by Publications: 8/19/09

Dual-Title Graduate Degree in Asian Studies (ASIA)

Eric Hayot
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ehayot@psu.edu

Degrees Conferred:

Students electing this program through primary departments will earn a Ph.D. in (graduate program name) and Asian Studies.

The following graduate programs offer dual degrees in Asian Studies: Applied Linguistics, Comparative Literature, and History.

Faculty

Asian Studies faculty include individuals with budgeted appointments in Asian Studies and individuals with courtesy joint appointments. The following faculty members have budgeted or courtesy joint appointments in Asian Studies:

Jonathan Abel, Assistant Professor of Comparative Literature and Asian Studies
David Atwill, Assistant Professor of History and Asian Studies
Erica Brindley, Assistant Professor of Religious Studies and History and Asian Studies
Suresh Canagarajah, Kirby Professor of Language Learning, English, and Asian Studies
Gretchen Caspar, Associate Professor of Political Science and Asian Studies
Kumkum Chaggerjee, Associate Professor of History and Asian Studies
Tina Chen, Associate Professor of English and Asian Studies
Madhuri Desai, Assistant Professor of Art and Art History and Asian Studies
Charlotte Eubanks, Assistant Professor of Comparative Literature and Asian Studies
Eric Hayot, Associate Professor of Comparative Literature and Asian Studies
Ronnie Hsia, Edwin Earle Sparks Professor of History and Asian Studies
Alexander Huang, Assistant Professor of Comparative Literature and Asian Studies
On-cho Ng, Professor of History and Religious Studies and Asian Studies
Sumita Raghuram, Associate Professor of Labor Studies and Employment Relations and Asian Studies
Bee-yan Roberts, professor of Economics and Asian Studies
Gonzalo Rubio, Associate Professor of Classics and Mediterranean Studies and Asian Studies
Denis Simon, Professor of International Affairs
Mrinalini Sinha, Professor of History, Women's Studies, and Asian Studies
Gregory Smits, Associate Professor of History and Asian Studies
Susan Strauss, Associate Professor of Applied Linguistics and Asian Studies
Reiko Tachibana, Associate Professor of Comparative Literature and Asian Studies
Xiaoye You, Assistant Professor of English and Asian Studies

Program Objectives of a Dual-Title Degree in Asian Studies

A dual-title degree in Asian Studies and a given discipline acknowledges and fosters scholarly work across the disciplines, and increases the intellectual rigor and breadth of graduate work. The dual-title degree teaches student to synthesize knowledge within and across disciplinary boundaries.

The primary advantages of a dual-title degree includes the intellectual and academic advantages of interdisciplinarity, strengthening the reputation of individual programs/departments through innovative degree programs, increased recruitment of quality graduate students, and improved placement of doctoral graduates.

The dual-title degree program in Asian Studies does not duplicate any other degree program at Penn State.

Admission Requirements

In addition to the admission requirements set forth by the Graduate School and the cooperating department, students seeking admission to the dual-title program will be admitted to graduate study in Asian Studies by an admissions committee of Asian Studies-affiliated faculty. Students must be admitted to a primary program before applying for the dual-title degree. Therefore, the Asian Studies program will follow the timetable and admission requirements of the cooperating department. Applicants should have a junior/senior cumulative average of a 3.00 (on a 4.00 scale) and appropriate course background. Prospective students seeking admission to the dual-title degree program will write a statement of purpose that addresses the ways in which their research and professional goals will reflect an interest in interdisciplinary and Asian Studies-related research.

Degree Requirements

The requirements for the dual-title Ph.D. include Asia-related coursework, Asia-related components to the candidacy and comprehensive exams, strong all-skills proficiency in one Asian language and either two-years' college study (or equivalent) of another Asian language or else an alternative proficiency appropriate to the student's field; and the completion of an Asian Studies-related dissertation.

Ph.D. Requirements

Coursework: 15 credits of Asia-related coursework at the 400 or 500 level. At least 9 of these 15 credits will be from ASIA 501, 502, and 597; the remainder may come from Asian Studies or from the student's home department, as approved by the student's doctoral adviser and the Asian Studies program director of graduate studies.

Language requirement: Students will show strong all-skills proficiency in one Asian language and either two years' college study (or equivalent) of another Asian language or else an alternative proficiency appropriate to the student's field.

Graduate committee, examinations, dissertation: A representative of the Asian Studies program will serve on the student's doctoral

committee, which will take the student's home departmental practice into consideration in determining how to include an appropriate Asian Studies component in the student's candidacy and comprehensive examinations and in the dissertation.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are in the STUDENT AID section of the *Graduate Bulletin*.

Course Listings

Courses in Asian Studies

ASIA 401. East Asian Studies (3)
ASIA 501. Asian Studies: Theories, Methods, and Archives I (1-3)
ASIA 502. Asian Studies: Theories, Methods, and Archives II (1-3)
ASIA 594. Research Topics (1-15)
ASIA 595. Internship (1-12)
ASIA 596. Independent Study
ASIA 597. Special Topics in Asian Studies
ASIA 599. Foreign Studies (3 per semester, maximum of 4)
ASIA 600. Thesis Research

Asian Studies (ASIA) course list

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 37-07-029

Review Date: 06/16/2009

Last updated by Publications: 3/2/10

Dual-Title Graduate Degree in Astrobiology (ABIOL)

LEE R. KUMP, Program Coordinator
435 Deike Building
814-865-8761; psarc.geosc.psu.edu (Opens New Window)

Degree Conferred

Students electing this degree program through participating programs earn a degree with a dual title in the Ph.D., i.e., Ph.D. in (graduate program name) and Astrobiology.

The following graduate programs offer dual degrees in Astrobiology: Astronomy and Astrophysics; Biology; Biochemistry, Microbiology, and Molecular Biology; Geosciences; and Meteorology.

The Graduate Faculty

- Michael A. Arthur, Ph.D. (Princeton) Professor of Geosciences
- Susan L. Brantley, Ph.D. (Princeton) Professor of Geosciences; Director, Earth and Environmental Sytems Institute
- Jean E. Brenchley, Ph.D. (California, Davis) Professor of Microbiology and Biotechnology
- Albert Welford Castleman, Jr., Ph.D. (Polytechnic Inst of Brooklyn) Eberly Distinguished Chair in Science; Evan Pugh Professor of Chemistry
- James G. Ferry, Ph.D. (Illinois) Stanley Person Professor of Molecular Biology
- Katherine H. Freeman, Ph.D. (Indiana) Professor of Geosciences
- S. Blair Hedges, Ph.D. (Maryland) Professor of Biology
- Christopher H. House, Ph.D. (California) Assistant Professor of Geosciences
- James F. Kasting, Ph.D. (Michigan) Distinguished Professor of Geosciences
- Lee R. Kump, Ph.D. (South Florida) Professor of Geosciences
- Hiroshi Ohmoto, Ph.D. (Princeton) Professor of Geochemistry; Director, Penn State Astrobiology Research Center
- Mark E. Patzkowsky, Ph.D. (Chicago) Professor of Geosciences
- Beth Shapiro, Ph.D. (Oxford) Assistant Professor of Biology
- Steinn Sigurdsson, Ph.D. (Cal Tech) Associate Professor of Astronomy and Astrophysics
- Aleksander Wolszczan, Ph.D. (Copernicus U, Poland) Evan Pugh Professor of Astronomy and Astrophysics

The Astrobiology dual-title degree program is administered by the Department of Geosciences for the participating graduate programs. A program committee with representatives from each participating department maintains program definition, defines the nature of the candidacy examination and assigns the examining committee, identifies courses appropriate to the program, and recommends policy and procedures for the program's operation to the dean of the Graduate School and to the deans of the participating colleges. The dual-title degree program is offered through participating programs in the College of Earth and Mineral Sciences and the Eberly College of Science and, where appropriate, other graduate programs in the University. The program enables students from several graduate programs to gain the perspectives, techniques, and methodologies of Astrobiology, while maintaining a close association with major program areas of application.

Astrobiology is a field devoted to the exploration of life outside of Earth and to the investigation of the origin and early evolution of life on Earth. For admission to pursue a dual-title degree under this program, a student must apply to (1) the Graduate School; (2) one of the participating major graduate programs; and (3) the Astrobiology program committee. Usually students will apply and be accepted into the major program first. Application to the dual-title degree program can occur upon matriculation, but should be completed before the candidacy examination in the major program is scheduled.

Admission Requirements

Graduate students with research and educational interests in astrobiology may apply to the Astrobiology Dual-Title Degree Program. Candidates must submit transcripts of their undergraduate and graduate course work, a written personal statement indicating the career goals they hope to serve by attaining an Astrobiology dual title, and a statement of support from their dissertation adviser. A strong undergraduate preparation in the basic sciences is expected, with evidence of an interest in multiple disciplines.

Degree Requirements

To qualify for a dual-title degree, students must satisfy the requirements of the major graduate program in which they are enrolled, in addition to the minimum requirements of the Astrobiology program. The minimum course requirements for the dual-title in Astrobiology are ABIOL 574 Planetary Habitability (3 credits), ABIOL 590 Astrobiology Seminar (2 credits), ABIOL 570 Astrobiology Field Experience (2 credits), and at least 2 credits of 400- or 500-level course work outside of the student's major program in an area relevant to Astrobiology (through consultation with their adviser). All students must pass a candidacy examination that assesses their potential in the field of astrobiology. This examination may be part of the candidacy examination in the student's major graduate program if an Astrobiology faculty member serves on the examination committee and if acceptable to the major program. If not, the Astrobiology dual-title program will offer a second candidacy examination. The structure and timing of the second candidacy examination will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the Astrobiology program, but this person may be the adviser and have an appointment in the major program of study. The field of Astrobiology should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of Astrobiology is required. A public oral presentation of the dissertation is required.

Financial Aid

Financial aid is generally available through the major program and through highly competitive University Graduate Fellowships (UGF). In addition, Penn State's Astrobiology Research Center (PSARC) provides support for students through research assistantships and graduate fellowships. Typically, students in Astrobiology are supported 12 months per year on some form of assistantship, fellowship, or summer wages provided by PSARC, UGF, or their home department.

Other Relevant Information

Students intrigued by the possibility of pursuing research in Astrobiology should visit the PSARC Web site and the NASA Astrobiology

Institute Web site (http://nai.arc.nasa.gov).

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ASTROBIOLOGY (ABIOL) course list

Last Revised by the Department: Fall Semester 2004

Blue Sheet Item #: 32-04-078

Review Date: 11/22/04

Last updated by Publications: 3/2/10

Astronomy and Astrophysics (ASTRO)

Program Home Page (Opens New Window)

LAWRENCE W. RAMSEY, *Head of the Department of Astronomy and Astrophysics*
525 Davey Laboratory
814-865-0418

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- W. Nielsen Brandt, Ph.D. (Cambridge, UK) Professor of Astronomy and Astrophysics
- David N. Burrows, Ph.D. (Wisconsin) Senior Scientist/Professor of Astronomy and Astrophysics
- Jane Charlton, Ph.D. (Chicago) Professor of Astronomy and Astrophysics
- George Chartas, Ph.D. (Wisconsin) Senior Research Associate
- Robin Ciardullo, Ph.D. (California, Los Angeles) Professor of Astronomy and Astrophysics
- Stephane Coutu, Ph.D. (Cal Tech) Professor of Physics
- Douglas Cowen, Ph.D. (Wisconsin--Madison) Associate Professor of Physics
- Michael Eracleous, Ph.D. (Columbia) Associate Professor of Astronomy and Astrophysics
- Abraham D. Falcone, Ph.D. (New Hampshire) Senior Research Associate
- Eric D. Feigelson, Ph.D. (Harvard) Professor of Astronomy and Astrophysics
- Lee Samuel Finn, Ph.D. (Cal Tech) Professor of Physics
- Derek B. Fox, Ph.D. (MIT) Assistant Professor of Astronomy and Astrophysics
- Gordon P. Garmire, Ph.D. (MIT) Evan Pugh Professor of Astronomy and Astrophysics
- Caryl Gronwall, Ph.D. (California, Santa Cruz) Research Associate
- Pablo Laguna, Ph.D. (Texas, Austin) Professor of Astronomy and Astrophysics
- Xuexing Li, Ph.D. (Columbia) Assistant Professor of Astronomy and Astrophysics
- Kevin Luhman, Ph.D. (Arizona) Assistant Professor of Astronomy and Astrophysics
- Peter Mészáros, Ph.D. (California, Berkeley) Distinguished Professor of Astronomy and Astrophysics
- John A. Nousek, Ph.D. (Wisconsin) Professor of Astronomy and Astrophysics
- Christopher Palma, Ph.D. (Virginia) Senior Lecturer in Astronmy and Astrophysics
- George G. Pavlov, Ph.D. (Ioffe Physical-Technical Institute) Senior Scientist/Research Associate
- Lawrence W. Ramsey, Ph.D. (Indiana) Professor of Astronomy and Astrophysics
- Mercedes Richards, Ph.D. (Toronto) Professor of Astonomy and Astrophysics
- Peter W. A. Roming, Ph.D. (Brigham Young) Senior Research Associate
- Donald P. Schneider, Ph.D. (Cal Tech) Professor of Astronomy and Astrophysics
- Steinn Sigurdsson, Ph.D. (Cal Tech) Associate Professor of Astronomy and Astrophysics
- Paul Sommers, Ph.D. (Texas, Austin) Professor of Physics
- Leisa K. Townsley, Ph.D. (Wyoming) Senior Scientist
- Richard A. Wade, Ph.D. (Cal Tech) Associate Professor of Astronomy and Astrophysics
- Aleksander Wolszczan, Ph.D. (Copernicus U, Poland) Evan Pugh Professor of Astronomy and Astrophysics
- Jason Wright, Ph.D. (California, Berkeley) Assistant Professor of Astronomy and Astrophysics

The graduate program in Astronomy & Astrophysics prepares students for careers in astronomy, space science and education. Graduate instruction and research opportunities are available in theoretical, observational, and instrumental astronomy and astrophysics. Currently active areas of theoretical research include high-energy astrophysics (including theory of neutron stars, black holes, and gamma ray bursts), relativity and cosmology, stellar dynamics and planet formation, and computational methodology. Observational areas include spectroscopic and photometric observations of high-redshift quasars, galaxies and the intergalactic medium; gamma-ray bursts; X-ray and visible light studies of quasars, starburst and other active galaxies; visible light studies of nearby galaxies and their stellar populations; infrared study of brown dwarfs and protoplanetary disks; spectroscopy and modeling of binary, magnetically active, pre- and post-main sequence stars; spectroscopic searches for planetary systems. Instrumental areas include: development of X-ray telescopes and detectors; and high-precision visible and near-infrared light spectrographs. Department faculty members participate in several university cross-disciplinary organizations: Astrobiology Research Center, Center for Astrostatistics, Center for Gravitational Physics and Geometry, and the Center for Gravitational Wave Physics.

The Department played a seminal role in and leads many science investigations using two NASA-launched satellites, the Chandra X-ray Observatory and the Swift panchromatic gamma-ray burst mission, and the innovative 9-meter Hobby-Eberly Telescope located at the McDonald Observatory in Texas. Faculty and students also observe with other space-based observatories (GALEX, Hubble Space Telescope, Spitzer Space Telescope, XMM-Newton) and ground-based telescopes (Gemini and other national facilities, Magellan, Keck, South Africa Large Telescope, Very Large Telescopes). Physics faculty members closely associated with the Department are involved in particle and gravitational wave observations using the Auger, AMANDA, Ice Cube, and LIGO instruments. The Department has extensive computing facilities, and research is also conducted with university and national supercomputing resources.

Graduate students also have ample opportunity to acquire experience in undergraduate teaching and public outreach.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), including the Physics test, are required for admission. In addition, students coming from non-English speaking undergraduate institutions must submit scores from the TOEFL (Test of english as a Foreign Language) or IELTS (International English Language Testing System) examination. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Normally, students admitted to the program are required to have a bachelor's degree in physics and/or astronomy with a grade-point average of at least 3.0 in their junior/senior courses in physics, astronomy, math, and related subjects. Typical GRE scores for entering students are 720 or more on the general test, and 680 or more on the Physics test. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System). The minimum acceptable score for the TOEFL is 590 for the paper-based test, 243 for the computer-based test, or a total score of 96 with a 23 on the speaking section for the internet-based test. The minimum composite score for the IELTS is 6.5.

Degree Requirements

Course requirements for the Ph.D. consists of 30 credits of 3-credit courses, 3 credits of ASTRO 596 for directed research in the second year, 3 credits of ASTRO 589 Seminars in current research, 1 credit of ASTRO 590 Colloquium, and 1 credit of ASTRO 602 for supervised teaching. The ten 3-credit courses must include ASTRO 501, ASTRO 502, at least four additional ASTRO 500-level courses, and at least two PHYS 500-level courses. One 400-level class may be substituted. A GPA of 3.2 in these courses is required.

The Candidacy Examination is an oral examination with broad coverage of covering any area of astronomy. Students who fail the Examination may make a second attempt. At the Comprehensive Examination, the student presents a significant body of original research conducted at Penn State. This Examination tests the student's mastery of the chosen field of research. The student prepares an extended written report and oral presentation, and answers questions on the research and closely related areas. The Comprehensive Exam can be passed, failed with option retake, or failed followed by dismissal from the Ph.D. program. Graduation requires the completion of a dissertation of original research and a thesis defense before the Doctoral Committee.

While all students are admitted into the Ph.D. program, occasionally students terminate with a M.S. degree. This requires completion of the Ph.D. course requirements (except the three topical seminars) with 3.00 grade point average, passage of the Candidacy Exam, and submission of a suitable thesis.

Student Aid

Graduate Teaching Assistantships, externally funded graduate Research Assistantships, and/or University fellowships are typically provided to student admitted and continuing in good standing. Many students also apply for externally funded fellowships. University sources of funding are described in the STUDENT AID section of the Graduate Bulletin.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ASTRONOMY AND ASTROPHYSICS (ASTRO) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

Last Revised by the Department: Spring Semester 2008

Blue Sheet Item #: 36-04-064

Review Date: 1/15/08

Last updated by Publications: 12/02/09

Biobehavioral Health (BB H)

Program Home Page (Opens New Window)

Collins O. Airhihenbuwa, *Head, Department of Biobehavioral Health*
315 Health and Human Development Building East
814-863-7256

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Frank M. Ahern, Ph.D. (Hawaii) Senior Research Scientist, Biobehavioral Health
- Collins O. Airhihenbuwa, Ph.D. (Tennessee) Professor of Biobehavioral Health
- Donald H. Ford, Ph.D. (Penn State) Professor Emeritus of Human Development
- John Graham, Ph.D. (USC) Professor of Biobehavioral Health and Human Development
- Douglas A. Granger, Ph.D. (California) Associate Professor of Biobehavioral Health and Human Development and Family Studies
- Byron C. Jones, Ph.D. (Arizona) Professor of Biobehavioral Health and Pharmacology; Professor in Charge of the Graduate Program
- Gary King, Ph.D. (Boston) Professor of Biobehavioral Health
- Laura Cousino Klein, Ph.D. (U of the Health Sciences) Associate Professor of Biobehavioral Health
- Patricia Barthalow Koch, Ph.D. (Penn State) Associate Professor of Biobehavioral Health
- Gerald E. McClearn, Ph.D. (Wisconsin) Evan Pugh Professor of Human Development and Psychology
- Elizabeth J. Susman, Ph.D. (Penn State) Jean Phillips-Shibley Professor of Human Development and Nursing
- David J. Vandenbergh, Ph.D. (Penn State) Associate Professor of Biobehavioral Health
- George P. Vogler, Ph.D. (Colorado) Associate Professor of Biobehavioral Health
- Sheila G. West, Ph.D. (North Carolina, Chapel Hill) Associate Professor of Biobehavioral Health
- Linda Ann Wray, Ph.D. (Southern California) Professor of Biobehavioral Health

The graduate program in Biobehavioral Health (BB H) is an interdisciplinary graduate program provided by the College of Health and Human Development and involving faculty from its departments. The focus of the program is on the interaction of biological, behavioral, sociocultural, and environmental variables in the etiology and prevention of health problems and in the promotion of healthy human development. The program is designed to cultivate competence in basic and applied research, in the evaluation of biobehavioral health intervention strategies, and in university teaching. Graduates are prepared for research, teaching, or policy roles in health care settings, private and public research laboratories, government agencies, and universities including medical schools.

Special resources available in the college that students may draw upon and potentially participate in for their research programs include a Health and Human Development Consultation Center, Nutrition Clinic, and Speech and Hearing Clinic; Centers for Gerontology, the Study of Child and Adolescent Development, Developmental and Health Genetics, Locomotion Studies, Worksite Health Enhancement, and Developmental and Health Research Methodology; special laboratories in Behavioral Endocrinology, Biomechanics, Human Performance, Motor Behavior, and Nutrition; and extensive computer resources. Additional resources, including elaborate mainframe and super computer capabilities, are available in other parts of the University.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from the Medical College Admission Test (MCAT), are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

College graduates with an undergraduate or master's degree, or a health professions degree emphasizing biological and/or behavioral sciences, or an interdisciplinary program combining aspects of these will be considered for admission. Applicants should have a minimum grade-point average of 3.00 (A=4.00), an above-average score on the GRE or MCAT, and three supporting recommendations. At the discretion of the graduate program, exceptions may be made to these requirements for students with special backgrounds, abilities, and interests. Admission will be offered to candidates who are the best qualified, in the judgment of the faculty, taking all factors in to account.

Entering students should have a basic background in biological sciences, the behavioral sciences, or a combination of the two. In addition, they should have a basic background in quantitative methods. They should have competence in English, as reflected in a Test of English as a Foreign Language (TOEFL) score of 600 or above. In exceptional cases, superior students who do not meet these requirements may be admitted provisionally, while correcting their deficiencies. This must occur during their first two semesters in the program.

Master's Degree Requirements

M.S. degree candidates must take five core courses in biobehavioral health and 12 additional credits in methods individually designed in consultation with and with the approval of their adviser and committee. All M.S. degree candidates must complete a formal master's thesis or a master's paper. Candidates selecting the thesis option must complete an additional 6 credits of master's thesis research (BB H 600) for a total of 33 credits. Candidates selecting the paper option must complete an additional 6 credits of individual studies (BB H 596) in lieu of the 6 thesis credits. The master's thesis will typically describe original research. The master's paper may describe original research, but may also involve a substantial review of the literature, or a substantial description of a new research-related procedure. The choice of thesis or paper options will be made by the student in consultation with the adviser. The student's advisory committee judges the quality and acceptability of the paper or thesis. Additionally, the thesis must be submitted to, and accept by the Graduate School M.S. candidates' grade-point average of all course work through completion of M.S. degree requirements must be 3.0 or higher.

M.S. program course requirements: BB H core courses (15 credits: BB H 501, BB H 502, BB H 503, BB H 504, BB H 505); other methods courses (12 credits minimum: courses at the 400 or 500 level to be selected in consultation with the student's adviser); research credits (6 credits minimum or 6 thesis credits)

Doctoral Degree Requirements

Formal admission to the doctoral program depends on satisfactory completion of the candidacy examination. This exam is designed to assess the student's potential and academic preparation for doctoral study. The candidacy exam may be given after at least 18 credits have been earned in graduate courses beyond the baccalaureate and must be completed no completed no later than the end of the third semester (summer sessions do not count).

Communication and Language Requirement. Doctoral students must demonstrate competency in spoken English as judged by the faculty and in technical writing as demonstrated in research papers and/or publications. In addition, they must demonstrate competence in one of the following areas: (1) a foreign language; (2) computer science; (3) college teaching; (4) logic or philosophy of science.

Other Requirements. All students must take five core courses in Biobehavioral Health and 12 additional credits in research methods individually designed in consultation with and with the approval of the student's adviser and committee to develop doctoral-level competence in biobehavioral health and one or more related specialized areas.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BIOBEHAVIORAL HEALTH (BB H) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/21/04

Last updated by Publications: 10/06/09

Biochemistry and Molecular Biology (BCHEM)

Program Home Page (Opens New Window)

JUDITH S. BOND, *Distinguished Professor and Chair of Biochemistry and Molecular Biology*
College of Medicine, Penn State Milton S. Hershey Medical Center
Hershey, PA 17033
717-531-8585
Bchem-grad-hmc@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Maria C. Bewley, Ph.D. (U of Leeds, UK) Associate Professor of Biochemistry and Molecular Biology
- Judith S. Bond, Ph.D. (Rutgers) Distinguished Professor and Chair of Biochemistry and Molecular Biology
- Telih Boyiri, Ph.D. (Virginia Commonwealth U) Associate Professor of Biochemistry and Molecular Biology
- Laura Carrel, Ph.D. (Stanford) Associate Professor of Biochemistry and Molecular Biology
- Keith C. Cheng, M.D., Ph.D. (NYU; Washington) Professor of Pathology, and Biochemistry and Molecular Biology
- Gary A. Clawson, M.D., Ph.D. (Miami; Michigan State) Professor of Pathology and Biochemistry and Molecular Biology
- Arunangshu Das, Ph.D. (Jadavpur, India) Assistant Professor of Biochemistry and Molecular Biology
- Kristin A. Eckert, Ph.D. (Wisconsin) Professor of Pathology, and Biochemistry and Molecular Biology
- Karam El-Bayoumy, Ph.D. (NYU) Professor of Biochemistry and Molecular Biology; Associate Director of Basic Research, Penn State Cancer Institute
- John M. Flanagan, Ph.D. (Tennessee) Professor of Biochemistry and Molecular Biology
- D. Channe Gowda, Ph.D. (Mysore, India) Professor of Biochemistry and Molecular Biology
- Sergei A. Gregoryev, Ph.D. (Lomonosov Moscow State University) Associate Professor of Biochemistry and Molecular Biology
- Ralph L. Keil, Ph.D. (Cornell) Associate Professor of Biochemistry and Molecular Biology
- Gail L. Matters, Ph.D. (North Carolina) Assistant Professor of Biochemistry and Molecular Biology
- David Mu, Ph.D. (California, Berkeley) Associate Professor of Pathology, and Biochemistry and Molecular Biology
- Kathleen M. Mulder, Ph.D. (SUNY, Buffalo) Professor of Biochemistry and Molecular Biology
- Christopher Niyibizi, Ph.D. (McGill, Canada) Associate Professor of Orthopaedics and Rehabilitation
- Barbara A. Miller, M.D. (Penn State) Professor of Pediatrics
- W. Brian Reeves, M.D. (Jefferson) Professor of Medicine
- Ira J. Ropson, Ph.D. (Johns Hopkins) Associate Professor of Biochemistry and Molecular Biology
- Cara-Lynne Schengrund, Ph.D. (Seton Hall) Professor of Biochemistry and Molecular Biology
- Raghu Sinha, Ph.D. (Chandigarh, India) Associate Professor of Biochemistry and Molecular Biology
- Thomas Spratt, Ph.D. (U of Chicago) Associate Professor of Biochemistry and Molecular Biology
- Fang Tian, Ph.D. (Florida State) Assistant Professor of Biochemistry and Molecular Biology

Opportunities for research in the department include investigations of the structure and function of macromolecules and macromolecular complexes, and regulation of gene expression and post-transcriptional events using the approaches of biochemistry and biophysics, molecular and cell biology, and molecular genetics. Areas of specialization focus on cell surface components and membrane enzymes, protein folding and oligomerization, proteases, regulation of gene expression, silencing and organization, chromatin remodeling, post-translational modifications of proteins, trafficking of cellular proteins, regulation of proteolysis, enzyme biochemistry, glycoconjugates, and neurotoxins. These areas relate to the control of growth and cancer, cancer prevention, malaria, mechanisms of anesthesia actions, medicinal chemistry, neuropathology, kidney and intestinal diseases, and diabetes.

The program is offered only through the College of Medicine at Penn State's Milton S. Hershey Medical Center.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Students with a 3.00 junior/senior grade-point average and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 average may be made for students with special backgrounds, abilities, and interests. Interested students should contact the department chair.

Degree Requirements

The options for the M.S. degree are thesis or published manuscript.

Doctoral Degree Requirements

During the first year of study, Ph.D. candidates take The College of Medicine Core Curriculum (BMS 501 Regulation of Cellular and Systemic Energy Metabolism, BMS 502 Cell and Systems Biology, and BMS 503 Flow of Cellular Information) in the Fall semester to provide a strong foundation. In the Spring semester, students take the Biochemistry Core consisting of the Enzymology selective (BCHEM 581 Enzymology - A: Structure, BCHEM 582 Enzymology - B: Energetics, and BCHEM 583 Enzymology - C: Function). In addition, students are required to take a total of 6 credits chosen from the College of Medicine list of selectives, plus two elective credits. At the end of the first year, admission to Ph.D. candidacy is determined by performance in course work, laboratory rotations, and the departmental candidacy examination. Ph.D. candidates prepare a written comprehensive examination in the format of a grant application prior to the end of the fifth semester of enrollment. As part of this examination, the candidate also gives an oral presentation of this proposal to their thesis committee. Each candidate for the Ph.D. degree must fulfill written and spoken English communication requirements established by the department. It is expected that a student will have at least one paper accepted for publication in a major peer-reviewed scientific journal prior to the thesis defense. A thesis must be prepared and defended by each Ph.D. candidate.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BIOCHEMISTRY, MICROBIOLOGY, and MOLECULAR BIOLOGY (BMMB) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/26/04

DATE LAST REVIEWED BY SENATE OFFICE: 10/18/05

Date last updated by Publications: 7/27/09

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-427

Review Date: 6/12/07

Biochemistry, Microbiology, and Molecular Biology (BMMB)

Program Home Page (Opens New Window)

RONALD D. PORTER, *Director of Graduate Studies*
455 North Frear
814-863-4903
ljk4@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Sarah E. Ades, Ph.D. (MIT) Associate Professor of Biochemistry and Molecular Biology
- Avery August, Ph.D. (Cornell) Professor of Immunology
- Paul Babitzke, Ph.D. (Georgia) Professor of Biochemistry and Molecular Biology
- J. Martin Bollinger, Ph.D. (MIT) Professor of Biochemistry and Molecular Biology; Professor of Chemistry
- Squire Booker, Ph.D. (MIT) Associate Professor of Biochemistry and Molecular Biology; Professor of Chemistry
- Jean E. Brenchley, Ph.D. (California, Davis) Professor of Microbiology and Biotechnology
- Don A. Bryant, Ph.D. (UCLA) Ernest C. Pollard Professor in Biotechnology; Professor of Biochemistry and Molecular Biology
- Craig E. Cameron, Ph.D. (Case Western) Paul Berg Professor of Biochemistry and Molecular Biology
- Nina V. Fedoroff, Ph.D. (Rockefeller) Willaman Professor of Life Sciences and Director, Biotechnology Institute
- James G. Ferry, Ph.D. (Illinois) Stanley Person Professor and Director, Center for Microbial Structural Biology
- Richard J. Frisque, Ph.D. (Wisconsin) Professor of Molecular Virology
- David S. Gilmour, Ph.D. (Cornell) Professor of Molecular and Cell Biology
- John H. Golbeck, Ph.D. (Indiana U) Professor of Biochemistry and Biophysics; Professor of Chemistry
- Ying Gu, Ph.D. (California, Riverside) Assistant Professor of Biochemistry and Molecular Biology
- Wendy Hanna-Rose, Ph.D. (Harvard) Associate Professor of Biochemistry and Molecular Biology
- Ross C. Hardison, Ph.D. (Iowa) T. Ming Chu Professor of Biochemistry and Molecular Biology
- Eric T. Harvill, Ph.D. (California, Los Angeles) Associate Professor of Microbiology and Infectious Diseases
- Teh-Hui Kao, Ph.D. (Yale) Professor of Biochemistry and Molecular Biology
- Kenneth C. Keiler, Ph.D. (MIT) Associate Professor of Biochemistry and Molecular Biology
- Emine Koc, Ph.D. (New Mexico State) Assistant Professor of Biochemistry and Molecular Biology
- Hasan Koc, Ph.D. (New Mexico State) Research Assistant Professor, Biochemistry and Molecular Biology
- Kouacou Konan, Ph.D. (Indiana) Assistant Professor of Biochemistry and Molecular Biology
- Andrey Krasilnikov, Ph.D. (Russian Academy of Science) Assistant Professor of Biochemistry and Molecular Biology
- Maria Krasilnikov, Ph.D. (Moscow Inst of Physics and Tech) Research Assistant Professor, Biochemistry and Molecular Biology
- Carsten Krebs, Ph.D. (MPI for Radiation Chem, Germany) Associate Professor of Biochemistry and Molecular Biology; Associate Professor of Chemistry
- Zhi-Chun Lai, Ph.D. (Albert Einstein College of Medicine) Professor of Biology and Biochemistry and Molecular Biology
- Arthur Lesk, Ph.D. (Princeton) Professor of Biochemistry and Molecular Biology
- Bernhard Luscher, Ph.D. (Zürich) Associate Professor of Biochemistry and Molecular Biology
- Andrea M. Mastro, Ph.D. (Penn State) Professor of Microbiology and Cell Biology
- Pamela Mitchell, Ph.D. (Columbia) Associate Professor of Biochemistry and Molecular Biology
- Katsuhiko Murakami, Ph.D. (National Inst of Genetics, Japan) Associate Professor of Biochemistry and Molecular Biology
- Anton Nekrutenko, Ph.D. (Texas Tech) Associate Professor of Biochemistry and Molecular Biology
- B. Tracy Nixon, Ph.D. (MIT) Professor of Biochemistry and Molecular Biology
- Randen Patterson, Ph.D. (Maryland) Assistant Professor of Biology
- Robert F. Paulson, Ph.D. (California, San Francisco) Associate Professor of Veterinary and Biomedical Sciences
- Gary H. Perdew, Ph.D. (Oregon State) John T. and Paige S. Smith Professor in Agricultural Sciences
- Jeffrey M. Peters, Ph.D. (California, Davis) Professor of Environmental Toxicology
- Ronald D. Porter, Ph.D. (Duke) Associate Professor of Microbiology and Molecular Genetics
- Kathleen Postle, Ph.D. (Wisconsin, Madison) Professor of Biochemistry and Molecular Biology
- B. Franklin Pugh, Ph.D. (Wisconsin) Willaman Professor of Biochemistry and Molecular Biology
- Joseph Reese, Ph.D. (Illinois at Urbana-Champaign) Associate Professor of Biochemistry and Molecular Biology
- Melissa Rolls, Ph.D. (Harvard) Assistant Professor of Biochemistry and Molecular Biology
- Lorraine Santy, Ph.D. (Harvard) Assistant Professor (Research), Biochemistry and Molecular Biology
- Stephan Schuster, Ph.D. (Munich [LMU], Germany) Professor of Biochemistry and Molecular Biology
- Scott Selleck, M.D., Ph.D. (Washington U School of Medicine) Professor of Biochemistry and Molecular Biology
- Song Tan, Ph.D. (Univ. of Cambridge) Associate Professor of Biochemistry and Molecular Biology
- Ming Tien, Ph.D. (Michigan State) Professor of Biochemistry
- Graham H. Thomas, Ph.D. (Edinburgh, Scotland) Associate Professor of Biology, and Biochemistry and Molecular Biology
- Chen-Pei David Tu, Ph.D. (Cornell) Professor of Biochemistry and Molecular Biology
- Yanming Wang, Ph.D. (Iowa State) Assistant Professor of Biochemistry and Molecular Biology

The major goal of the program in Biochemistry, Microbiology, and Molecular Biology is to train students for independent research and teaching in the principal areas of those scientific disciplines. Students may enter the program from a variety of backgrounds such as biochemistry, biology, biophysics, cell biology, chemistry, genetics, microbiology, molecular biology, physics, and other related disciplines. The student's research may begin during the first year. Research areas of faculty include bacterial growth regulation and differentiation, biophysics and biochemistry and molecular biology of photosynthesis, calcium metabolism in skeletal tissues, cell cycle regulation, chromosome organization and structure, control of gene expression, DNA-binding proteins, electron paramagnetic resonance spectroscopy, enzyme kinetics and mechanisms of DNA-acting enzymes, functional genomics, membrane structure and function, metallobiochemistry of iron-sulfur proteins, mobile genetic elements, molecular biology of development, molecular biology of xenobiotic metabolism, prokaryotic sensory transduction, regulation of amino acid metabolism, RNA-binding proteins, RNA structure, self-incompatibility in plants, spermatogenesis and spermatozoan maturation, structure and function of enzymes, virology, and X-ray crystallography.

Admission Requirements

Scores on the Graduate Record Examination (GRE) Aptitude Test (verbal, quantitative, and analytical) are normally required for admission. Only under exceptional circumstances will an applicant be considered without those scores. It is also recommended that applicants take the Subject Test in Biochemistry, Cell and Molecular Biology, or Chemistry or Biology. Entering students should have taken courses in biology, organic chemistry, calculus, general physics, genetics, microbiology, and preferably physical chemistry. Any deficiencies may be made up concurrently with graduate studies. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION of the *Graduate Bulletin*.

Admission to the program is based on prior course records and grades, GRE scores, letters of recommendation and interviews. Virtually all students are admitted with the intent of obtaining a Ph.D. degree although a master's degree is obtained in some cases on the way to the Ph.D., or as a final degree.

Master's Degree Requirements

Students must meet the M.S. degree requirements specified by the Graduate School in the *Graduate Bulletin*. In addition, a research thesis must be submitted and defended before a committee of the faculty. In general, the master's program is expected to take about two years beyond a bachelor's degree.

Doctoral Degree Requirements

Admission to Ph.D. candidacy is decided on the basis of the student's performance in courses, research and teaching. In addition, an oral candidacy examination is taken during the fall semester of the second year. This examination tests the student's ability to utilize what s/he has learned in solving problems based on the scientific method. A comprehensive oral examination is taken before the student's Ph.D. thesis committee within approximately three semesters after the student has been admitted to candidacy. The student is expected to present a written proposal concerning his or her research problem in terms of the relevant current literature, the data that has been gathered and the future directions of the experimentation. Questioning may involve, but is not limited to, that research proposal.

The faculty requires that each student demonstrate the ability to collect, organize and present the results of their research in a professional manner before graduation. This is accomplished by preparing a manuscript based on the Ph.D. thesis research. The manuscript must be written primarily by the student and submitted for publication in a refereed journal. The final Ph.D. thesis defense is taken before the student's thesis committee at the end of the program. The student must also present a public seminar on the thesis research within the two-week period preceding the thesis defense. Generally the Ph.D. degree takes about five years beyond a bachelor's degree.

Biogeochemistry Dual-Title Degree Program

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree Program. Students in the Biogeochemistry Dual Title program are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. Additional coursework from an approved list of courses is required. All students must pass a candidacy examination that includes an assessment of their potential in the field of biogeochemistry. A single candidacy examination that includes biogeochemistry will be administered for admission into the student's Ph.D. program, as well as the biogeochemistry dual-title. The structure and timing of this exam will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise in biogeochemistry. The field of biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of biogeochemistry is required.

Other Relevant Information

The director of graduate studies is in charge of advising students about academic and related matters until they have chosen a thesis adviser. Beginning students carry out a series of rotation projects in at least three different faculty laboratories before deciding on a research area. Students generally decide on their thesis research adviser at the end of their first fall semester. Each student must take a total of 18 credits in 400- and 500-level courses, required and elective, from a list approved by the program faculty.

Further course work and research are individually planned by the student and the research adviser in consultation with the Ph.D. thesis committee. The thesis committee is established according to the rules of the Graduate School once Ph.D. candidacy has been attained.

All students are required to participate as teaching assistants in undergraduate laboratory courses as part of their training. Students are required to register for BMMB 602 (Supervised Experience in College Teaching) for two semesters.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. Under normal circumstances, all students admitted and continuing in good standing are provided with graduate assistantship support from University sources and research grants.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BIOCHEMISTRY, MICROBIOLOGY, and MOLECULAR BIOLOGY (BMMB) course list

MICROBIOLOGY (MICRB) course list

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Bioengineering (BIOE)

Program Home Page (Opens New Window)

HERBERT H. LIPOWSKY, *Head of the Department*
205 Hallowell Building
814-865-1407
814-863-0490 (Fax)

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Harry R. Allcock, Ph.D. (London) Evan Pugh Professor of Chemistry
- Abdellaziz Ben-Jebria, Ph.D. (Paris VI) Professor of Chemical Engineering
- James G. Brasseur, Ph.D. (Stanford) Professor of Mechanical Engineering
- Paul W. Brown, Ph.D. (Wisconsin) Professor of Ceramic Science and Engineering
- Peter J. Butler, Ph.D. (CUNY) Associate Professor of Bioengineering
- Wenwu Cao, Ph.D. (Penn State) Professor of Mathematics and Materials Science
- Christopher M. Collins, Ph.D. (Pennsylvania) Associate Professor of Radiology
- Wayne Curtis, Ph.D. (Purdue) Professor of Chemical Engineering and Biotechnology
- Steven Deutsch, Ph.D. (Penn State) Senior Scientist in Applied Research and Professor Emeritus of Bioengineering
- Henry Donahue, Ph.D. (California, Santa Barbara) Michael and Myrtle Baker Professor of Orthopaedics and Rehabilitation, and Cellular and Molecular Physiology
- Cheng Dong, Ph.D. (Columbia) Professor of Bioengineering
- George C. Engelmayr, Ph.D. (Pittsburgh) Assistant Professor of Bioengineering
- Arnold A. Fontaine, Ph.D. (Penn State) Senior Scientist in Applied Research Laboratory; Associate Professor of Bioengineering
- Andris Freivalds, Ph.D. (Michigan) Professor of Industrial Management Systems Engineering
- David B. Geselowitz, Ph.D. (Pennsylvania) Distinguished Professor Emeritus of Bioengineering and Medicine
- William O. Hancock, Ph.D. (Washington, Seattle) Associate Professor of Bioengineering
- William E. Higgins, Ph.D. (Illinois, Urbana-Champaign) Professor of Electrical Engineering
- Kane M. High, M.D. (Penn State) Associate Professor of Anesthesiology
- Tony Jun Huang, Ph.D. (UCLA) Assistant Professor of Engineering Science and Mechanics
- Robert F. Kunz, Ph.D. (Penn State) Adjunct Assistant Professor of Aerospace Engineering
- Herbert H. Lipowsky, Ph.D. (California, San Diego) Professor of Bioengineering
- Lyle N. Long, Ph.D. (George Washington) Distinguished Professor of Aerospace Engineering
- Keefe B. Manning, Ph.D. (Virginia Commonwealth) Assistant Professor of Bioengineering
- Richard S. Meyer, Ph.D. (Penn State) Research Associate in Applied Research
- Stephen J. Piazza, Ph.D. (Northwestern) Associate Professor of Kinesiology
- William S. Pierce, M.D. (Pennsylvania) Evan Pugh Professor Emeritus of Surgery
- Joseph L. Rose, Ph.D. (Drexel) Paul Morrow Professor of Engineering Science and Mechanics in Design and Manufacturing
- Gerson Rosenberg, Ph.D. (Penn State) Professor of Surgery and Bioengineering
- James Runt, Ph.D. (Penn State) Professor of Polymer Science
- Robert Sainburg, Ph.D. (Rutgers) Associate Professor of Kinesiology
- Jeffrey L. Schiano, Ph.D. (Illinois) Associate Professor of Electrical Engineering
- Christopher Siedlecki, Ph.D. (Case Western Reserve) Associate Professor of Surgery and Bioengineering
- Neil A. Sharkey, Ph.D. (California, Davis) Professor of Kinesiology, Orthopaedics, and Rehabilitation
- Margaret Slattery, Ph.D. (Penn State) Assistant Professor of Bioengineering
- Alan J. Snyder, Ph.D. (Penn State) Professor of Surgery and Bioengineering
- James S. Ultman, Ph.D. (Delaware) Distinguished Professor Emeritus of Chemical Engineering and Bioengineering
- Akif Undar, Ph.D. (Texas, Austin) Associate Professor of Pediatrics, Surgery, and Bioengineering
- Erwin A. Vogler, Ph.D. (Indiana) Professor of Materials Science and Engineering, and Bioengineering
- Andrew Webb, Ph.D. (Cambridge, UK) Professor of Bioengineering
- William J. Weiss, Ph.D. (Penn State) Professor of Surgery and Bioengineering
- Qing X. Yang, Ph.D. (Georgia Tech) Professor of Radiology
- Jun You, Ph.D. (Penn State) Assistant Professor of Orthopaedics and Rehabilitation
- Siyang Zheng, Ph.D. (Cal Tech) Assistant Professor of Bioengineering

This intercollege program is designed to provide students with graduate level training in engineering and the life sciences by the application of engineering principles and techniques to the solution of problems in medicine and biology. Graduate instruction in bioengineering is under the direction of a program committee composed of graduate faculty representing several departments in the Colleges of Engineering, Health and Human Development, Science, and Medicine.

Opportunities for specialized research revolve around a delineation of the electrical, mechanical, and biophysical properties of biological materials at the cellular, tissue, and organ levels. Specific applications include: development of artificial organs, with an emphasis on the artificial heart and heart assist devices; cardiovascular hemodynamics, with an emphasis on the structure and function of the capillary network, and blood behavior in contact with the walls of blood vessels and artificial surfaces; cardiac and auditory electrophysiology; lung mechanics and pulmonary function; and non-invasive diagnostic techniques, with an emphasis on ultrasound and X-ray devices and medical imaging. Extensive computer facilities and specialized equipment are available to support a combination of studies that employ experimental observations and their analysis through mathematical modeling and computer simulations.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. However, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Students with a degree in engineering, physics, or the life sciences will be eligible for admission. All students must have a strong background in physics and mathematics. This background should include 6 credits in chemistry, 9 credits in calculus-based physics, and

mathematics through calculus and differential equations. Students who lack one or two courses may still be considered for admission but will have to make up any deficiency early in their graduate program. Students with a 3.0 junior/senior grade-point average and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces available. Exceptions to the minimum average may be made for students with special backgrounds, abilities, and interests.

Master's Degree Requirements

The particular course of study depends on the student's background and area of research specialization. Courses are selected from the life sciences, engineering, and bioengineering. Course requirements include BIOE 401, BIOE 402, and BIOE 403 plus two 500-level courses in bioengineering, 6 credits in the life sciences (including BIOL 472), and 6 credits in technically oriented courses outside bioengineering and the life sciences. In addition, students without a previous degree in engineering or physics are required to complete up to 24 additional credits in engineering. Most of this additional course work will be at the undergraduate level and typically includes statics and dynamics, electric circuits and fields, electronic devices, fluid mechanics, and linear systems.

A thesis is required for the M.S. degree. Students must continue to register at appropriate times until the thesis is approved.

Doctoral Degree Requirements

Candidates for the Ph.D. degree generally are expected to complete PHSIO 571 (BIOL 571) and PHSIO 572 (BIOL 572) plus several additional courses in the life sciences, five courses in bioengineering, and five graduate-level courses in engineering, mathematics, and physics. Supporting courses are available at University Park and the Penn State Milton S. Hershey Medical Center in anatomy, biochemistry, biology, biophysics, chemistry, laboratory animal medicine, materials science, mathematics, physics, physiology, and the engineering departments.

The communication and foreign language requirement for the Ph.D. degree may be satisfied by demonstrating intermediate knowledge of an acceptable foreign language, or by taking an advanced technical writing course and presenting a formal proposal for thesis research to the doctoral committee.

Students must continue to register at appropriate times until the thesis is approved.

Biomolecular Transport Dynamics Option

The Biomolecular Transport Dynamics option requires the following courses in addition to the doctoral dissertation, candidacy, and comprehensive examinations:

- three Biotransport courses (9 credits)
- two Life Science courses (6)
- five Engineering or Life Science courses (15)
- IBIOS 590. COLLOQUIUM (twice) (2)
- IBIOS 591. ETHICS IN LIFE SCIENCES (1)
- IBIOS 595. INTERNSHIP (optional) (1)
- IBIOS 596. LABORATORY ROTATIONS (1)
- IBIOS 602. TEACHING EXPERIENCE (twice) (2)

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BIOENGINEERING (BIOE) course list

Last reviewed by Graduate School: 5/24/04

Last updated by Publications: 6/22/10

Dual-Title Graduate Degree in Biogeochemistry

JENNIFER L. MACALADY, *Program Coordinator*
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Degree Conferred:

Students electing this degree program through participating programs earn a degree with a dual title in the Ph.D., e.g., Ph.D. in (graduate program name) and Biogeochemistry.

The following graduate programs offer dual degrees in Biogeochemistry: Biochemistry, Microbiology, and Molecular Biology; Civil Engineering; Chemistry; Ecology; Environmental Engineering; Geosciences; Materials Science and Engineering; and Soil Science.

The Graduate Faculty

Michael A. Arthur, Ph.D. (Princeton) Professor of Geosciences
Elizabeth W. Boyer, Ph.D. (Virginia) Associate Professor of Water Resources
Susan L. Brantley, Ph.D. (Princeton) Professor of Geosciences
Jean E. Brenchley, Ph.D. (California, Davis) Professor of Microbiology and Biotechnology
Mary Ann Bruns, Ph.D. (Michigan State) Associate Professor of Agronomy/Soil Microbiology
William Burgos, Ph.D. (Virginia Tech) Professor of Environmental Engineering
Hunter J. Carrick, Ph.D. (Michigan) Associate Professor of Aquatic Ecology
Brian A. Dempsey, Ph.D. (North Carolina) Professor of Environmental Engineering
David M. Eissenstat, Ph.D. (Utah State) Professor of Woody Plant Physiology
Matthew Fantle, Ph.D. (California, Berkeley) Assistant Professor of Geosciences
James G. Ferry, Ph.D. (Illinois) Stanley Person Professor of Biochemistry and Molecular Biology
Katherine H. Freeman, Ph.D. (Indiana) Professor of Geosciences
Peter Heaney, Ph.D. (Johns Hopkins) Professor of Mineral Sciences
Christopher House, Ph.D. (California) Assistant Professor of Geosciences
Jason Kay, Ph.D. (Colorado State) Assistant Professor of Soil Biogeochemistry
Roger Koide, Ph.D. (California, Berkeley) Professor of Horticultural Ecology
James D. Kubicki, Ph.D. (Yale) Associate Professor of Geochemistry
Lee Kump, Ph.D. (South Florida) Professor of Geosciences
Bruce E. Logan, Ph.D. (California, Berkeley) Kappe Professor of Environmental Engineering
Jennifer L. Macalady, Ph.D. (California, Davis) Assistant Professor of Geosciences
Carmen Enid Martinez, Ph.D. (Rutgers) Associate Professor of Environmental Soil Chemistry
Karl T. Mueller, Ph.D. (California, Berkeley) Professor of Chemistry
Kwadwo Osseo-Asare, Ph.D. (California, Berkeley) Distinguished Professor of Metallurgy, and Energy and Geo-environmental Engineering
John M. Regan, Ph.D. (Wisconsin) Associate Professor of Environmental Engineering
Erica A. H. Smithwick, Ph.D. (Oregon State) Assistant Professor of Geography
Ming Tien, Ph.D. (Michigan State) Professor of Biochemistry
Denice H. Wardrop, Ph.D. (Penn State) Associate Professor of Geography and Ecology

The Biogeochemistry Dual-Title Degree Program will be administered by the Department of Geosciences for the participating graduate programs. A program committee with representatives from each participating department maintains program definition, identifies courses appropriate to the program, and recommends policy and procedures for the program's operation to the dean of the Graduate School and to the deans of the participating colleges.The dual-title degree program is offered through participating programs in the College of Earth and Mineral Sciences, College of Agricultural Sciences, College of Engineering, Eberly College of Science, and the Intercollege Graduate Degree Programs.The program enables students from several graduate programs to gain the perspectives, techniques, and methodologies of Biogeochemistry, while maintaining a close association with major program areas of study. For admission to pursue a dual-title degree under this program, a student must apply to (1) the Graduate School and (2) one of the participating major graduate programs; and then subsequently to (3) the Biogeochemistry program committee. Students may only apply to the dual-title program once they have been accepted into a major program. Once a student has been accepted to a major program, application to the dual-title degree program can occur immediately or at a later time, such as upon matriculation. The application to the dual-title degree program, however, should be completed before the candidacy examination in the major program is scheduled.

Admission Requirements

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree Program. Candidates must submit transcripts of their undergraduate and graduate coursework, a written personal statement indicating their interests in the interdisciplinary arena of Biogeochemistry and their career goals they hope to serve by attaining a Biogeochemistry dual-title, and a statement of support from their dissertation advisor, if assigned. A strong undergraduate preparation in the basic sciences is expected, with evidence of an interest in multiple disciplines.

Degree Requirements

To qualify for a dual-title degree, students must satisfy the requirements of the major graduate program in which they are enrolled, in addition to the minimum requirements of the Biogeochemistry program. Students are required to have two advisors from separate disciplines: one individual serving as a primary advisor in their major degree program (i.e., Soil Science, BMMB, Material Science & Engineering, Chemistry, Ecology, Environmental Engineering or Geosciences) and a secondary advisor in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. The major program advisor normally will also be a member of the Biogeochemistry faculty. The two faculty advisors can represent different academic programs, but this is not required, as faculty from a scientifically diverse department could represent very different areas of expertise.

To fulfill the course requirements for the dual-title in Biogeochemistry, students must complete a total of 15 graduate credits chosen in consultation with the advisor from an approved list of courses in the areas of biochemistry and microbiology, environmental chemistry, environmental engineering, geochemistry, materials science and engineering, and soil science.All students must pass a candidacy

examination that includes an assessment of their potential in the field of biogeochemistry. In all cases, the result of a single candidacy exam for both entrance to the student's major Ph.D. program and this dual-title program will be reported to the graduate school. When possible, the candidacy exam will involve a single examination that includes biogeochemistry. However, in some cases, such as with the Chemistry Department, existing candidacy procedures preclude use for the Biogeochemistry dual-title program. In these instances that require a major program's existing candidacy procedure to be augmented by a biogeochemistry examination, the structure and timing of this exam will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise within Biogeochemistry. The field of Biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of Biogeochemistry is required. A public oral presentation of the dissertation is required, which may be part of the final defense within the major degree program.

Financial Aid

Graduate assistantships and other forms of student aid are described in the Student Aid section of the Graduate Bulletin. A limited number of Research Assistantships are also available through the Biogeochemistry Dual-Title Degree Program.

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Biology (BIOL)

Program Home Page (Opens New Window)

DOUGLAS R. CAVENER, *Head of the Department*
208 Erwin W. Mueller Building
814-865-4562
gradinfo@email.bio.psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Hiroshi Akashi, Ph.D. (Chicago) Assistant Professor of Biology
- Sarah M. Assmann, Ph.D. (Stanford) Waller Professor of Biology
- Ottar Bjørnstad, Ph.D. (Oslo) Assisant Professor of Biology and Entymology
- David M. Braun, Ph.D. (Missouri) Assistant Professor of Biology
- Douglas R. Cavener, Ph.D. (Georgia) Professor of Biology
- Gong Chen, Ph.D. (Shanghai) Assistant Professor of Biology
- Daniel J. Cosgrove, Ph.D. (Stanford) Eberly Chair and Professor of Biology
- Richard J. Cyr, Ph.D. (California, Irvine) Professor of Biology
- Claude W. dePamphilis, Ph.D. (Georgia) Associate Professor of Biology
- Alan D. Ealy, Ph.D. (Florida) Assistant Professor of Biology and Molecular Endocrinology
- Bertrand D. Eardly, Ph.D. (Oregon State) Associate Professor of Biology (Berks-Lehigh Valley)
- Nina V. Fedoroff, Ph.D. (Rockefeller) Evan Pugh Professor; Willaman Professor of Life Sciences
- Charles R. Fisher, Ph.D. (California, Santa Barbara) Professor of Biology
- Michael Gannon, Ph.D. (Texas Tech) Associate Professor of Biology (Altoona)
- Simon G. Gilroy, Ph.D. (Edinburgh) Associate Professor of Biology
- Mark J. Guiltinan, Ph.D. (California, Irvine) Professor of Biology and Plant Molecular Biology
- Kyung-An Han, Ph.D. (SUNY, Buffalo) Assistant Professor of Biology
- Lauraine Hawkins, Ph.D. (New Mexico) Assistant Professor of Biology (Mont Alto)
- S. Blair Hedges, Ph.D. (Maryland) Professor of Biology
- Rod M. Heisey, Ph.D. (California, Davis) Professor of Biology (Schuylkill)
- Dale Holen, Ph.D. (Wisconsin, Milwaukee) Associate Professor of Biology (Worthington Scranton)
- Peter Hudson, Ph.D. (Oxford) Willaman Professor of Biology
- Zhi-Chun Lai, Ph.D. (Albert Einstein College of Medicine) Associate Professor of Biology
- Bernhard LÜscher, Ph.D. (ZÜrich) Associate Professor of Biology, and Biochemistry and Molecular Biology
- Hong Ma, Ph.D. (MIT) Professor of Biology
- Wojciech Makalowski, Ph.D. (Poznan) Associate Professor of Biology
- Kateryna Makova, Ph.D. (Texas Tech) Assistant Professor of Biology
- James H. Marden, Ph.D. (Vermont) Professor of Biology
- Paula C. McSteen, Ph.D. (East Anglia) Assistant Professor of Biology
- Webb C. Miller, Ph.D. (Washington) Professor of Biology, and Computer Science and Engineering
- Robert B. Mitchell, Ph.D. (Penn State) Professor of Biology
- Masatoshi Nei, Ph.D. (Kyoto) Evan Pugh Professor; Director, Institute of Molecular and Evolutionary Genetics
- Richard W. Ordway, Ph.D. (Mass Medical Inst) Associate Professor of Biology
- Eric S. Post, Ph.D. (Alaska) Assistant Professor of Biology
- Steven W. Schaeffer, Ph.D. (Georgia) Associate Professor of Biology
- Katriona Shea, Ph.D. (London) Assistant Professor of Biology
- Sharon P. Shriver, Ph.D. (Case Western Reserve) Assistant Professor of Biology
- Andrew G. Stephenson, Ph.D. (Michigan) Professor of Biology
- Graham H. Thomas, Ph.D. (Edinburgh) Associate Professor of Biology, and Biochemistry and Molecular Biology
- Christopher F. Uhl, Ph.D. (Michigan State) Professor of Biology
- Nandini Vasudevan, Ph.D. (Indian Inst Science, Bangalore) Assistant Professor of Biology
- Alan Walker, Ph.D. (London) Evan Professor of Biology and Anthropology
- Kenneth M. Weiss, Ph.D. (Michigan) Evan Pugh Professor of Anthropology and Genetics
- Matthew Whim, Ph.D. (Cambridge) Assistant Professor of Biology
- James A. Winsor, Ph.D. (Michigan) Professor of Biology (Altoona)

The department directs graduate programs in a broad spectrum of research areas, including bioinformatics, cell biology, developmental biology, ecology, evolution, genetics, neuroscience, phylogenetics, and physiology. The department houses the Institute of Molecular Evolutionary Genetics. The Ph.D. in Biology may be taken with an option in Molecular Evolutionary Biology, Plant Biology, or one of the Integrative Biosciences options adopted by the department (Molecular Medicine, Cell and Developmental Biology, Chemical Biology, Ecological and Molecular Plant Physiology, or Neuroscience). The courses of study are planned individually by the student and an adviser.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Admission is restricted to students who have the baccalaureate degree in a biological science and who present a cumulative undergraduate average of at least 3.00 on a scale of 4.00. Each applicant must provide a personal statement of interests and objectives and letters from three persons verifying the applicant's academic competence.

Master's Degree Requirements

Students obtaining an M.S. degree in Biology must complete course work as described in the General Information section of this bulletin,

with guidance from their academic adviser. A thesis is usually required and must be defended before a faculty committee. The research must represent an original contribution, and the time allotted to it is about one year.

Doctoral Degree Requirements

The only courses required across the department are Biology 592, Critical Evaluation of Biological Literature, and Biology 590, a colloquium covering the Biology Seminar Series. Course work specific to individual plans of study are decided upon by the student in consultation with their graduate adviser and Ph.D. committee. All doctoral degree students must pass a written and oral candidacy examination that is usually administered during their third semester of study. After a student has completed all of their course work and made substantial progress on the design and execution of their thesis research, a comprehensive examination is administered by their Ph.D. committee. The Ph.D. thesis must represent a significant original contribution suitable for publication, and will usually require between two and four years of laboratory or field research. When complete the thesis must be defended before the student's graduate committee. The thesis defense is normally immediately preceded by a public presentation of the thesis research by the student.

The department awards Ph.D. degrees in Biology covering the full spectrum of subjects represented by our diverse faculty. If desired, a student may elect to pursue one of the following options as part of his/her program of study.

Molecular Evolutionary Biology option: (1) The student must meet the criteria for the M.S. or Ph.D. in Biology. (2) The student's research adviser must be a member of the Biology program and/or a full member of the Institute of Molecular Evolutionary Genetics. Other committee members may be chosen as needed providing that a majority of the committee is associated with the IMEG. (3) In addition to the normal Biology program requirements, the student must take (for both an M.S. or Ph.D. in Biology) 3 credits of course work in BIOL 591; 9 credits from among the following courses (to be selected in consultation with the student's committee): BIOL 405, BIOL 410, BIOL 422, BIOL 427, BIOL 428, BIOL 501, BIOL 504, BIOL 514, BIOL 524, BIOL 533, BIOL 542, BIOL 590. (4) Any other course work or training deemed appropriate by the student's committee.

Plant Biology option: (1) The student must meet the criteria for the M.S. or Ph.D. in Biology. (2) The student's research adviser must be a member of the Biology program. Other committee members may be chosen as needed to assure that a well-rounded graduate advisory committee is established. (3) In addition to the normal Biology program requirements, the student must take the required colloquia in the field of specialization and (for both an M.S. or Ph.D. in Biology) a minimum of 6 credits from among the following courses (to be selected in consultation with the student's committee): BIOL 410, BIOL 414, BIOL 422, BIOL 427, BIOL 441, BIOL 448, BIOL 513, BIOL 514, BIOL 515, BIOL 516, BIOL 544, BIOL 591, BIOL 597, B M B 514, HORT 444. (4) Any other course work or training deemed appropriate by the student's committee.

Integrative Biosciences options are available in Molecular Medicine, Cell and Developmental Biology, Ecological and Molecular Plant Physiology, Chemical Biology, and Neuroscience. Requirements for these options that are in addition to the basic criteria for a Ph.D. in Biology are described under Integrative Graduate Program in Biosciences in this bulletin.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BIOLOGY (BIOL) course list

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DATE LAST REVIEWED BY PUBLICATIONS: 6/30/05

Biotechnology (BIO T)

Program Home Page (Opens New Window)

ROBERT A. SCHLEGEL, *Department Head, Biochemistry and Molecular Biology*

RONALD D. PORTER, *Director*

LOIDA J. ESCOTE-CARLSON, *Co-Director*
519 Wartik Laboratory
814-863-5751

Degree Conferred:

- Master of Biotechnology
- Integrated B.S. in Biotechnology - Master of Biotechnology in Biotechnology Program
- Integrated B.S. in Animal Sciences - Master of Biotechnology in Biotechnology

The Graduate Faculty

- Jean E. Brenchley, Ph.D. (California, Davis) Professor of Microbiology and Biotechnology
- John E. Carlson, Ph.D. (Illinois) Associate Professor of Molecular Genetics
- Barbara J. Christ, Ph.D. (British Columbia) Professor of Plant Pathology
- Diana Cox-Foster, Ph.D. (Illinois) Professor of Entomology
- Wayne R. Curtis, Ph.D. (Purdue) Professor of Chemical Engineering and Biotechnology
- Ali Demirci, Ph.D. (Iowa) Assistant Professor of Agricultural and Biological Engineering
- Richard F. Devon (California, Berkeley) Associate Professor of Engineering Design and Graphics
- Min Ding, Ph.D. (Pennsylvania, Wharton School) Assistant Professor of Marketing
- Stephanie Doores, Ph.D. (Maryland) Associate Professor of Food Science
- J. Larry Duda, Ph.D. (Delaware) Professor of Chemical Engineering
- Nina V. Fedoroff, Ph.D. (Rockefeller U) Willaman Professor of Life Sciences
- Henry C. Foley, Ph.D. (Penn State) Professor of Chemical Engineering
- Majid R. Foolad, Ph.D. (California, Davis) Professor of Plant Genetics
- Richard J. Frisque, Ph.D. (Wisconsin) Professor of Molecular Virology
- Frederick E. Gildow, Ph.D. (Cornell) Professor of Plant Pathology
- Simon G. Gilroy, Ph.D. (Edinburgh) Associate Professor of Biology
- Mark J. Guiltinan, Ph.D. (California, Irvine) Associate Professor of Plant Molecular Biology
- Roy H. Hammerstedt, Ph.D. (Minnesota) Professor Emeritus of Biochemistry
- Ross C. Hardison, Ph.D. (Iowa) Professor of Biochemistry
- Kelli Hoover, Ph.D. (California, Davis) Assistant Professor of Entomology
- Bhushan M. Jayarao, Ph.D. (Hungary) Associate Professor of Veterinary Science
- Seogchan Kang, Ph.D. (Wisconsin) Associate Professor of Plant Pathology
- Lynn Kozlowski, Ph.D. (Columbia) Professor of Biobehavioral Health
- Gretchen A. Kuldau, Ph.D. (California, Berkeley) Assistant Professor of Plant Pathology
- Hong Ma, Ph.D. (Mass Med Inst) Professor of Biology
- Wojciech Makalowski, Ph.D. (Poznan U, Poland) Associate Professor of Biology
- Bruce A. McPheron, Ph.D. (Illinois) Associate Professor of Entomology
- Webb Miller, Ph.D. (Washington) Professor of Computer Science and Engineering
- Christopher A. Mullin, Ph.D. (Cornell) Professor of Entomology
- Michael V. Pishko, Ph.D. (Texas) Associate Professor of Chemical Engineering
- B. Franklin Pugh, Ph.D. (Wisconsin) Associate Professor of Biochemistry and Molecular Biology
- C. Channa Reddy, Ph.D. (India) Distinguished Professor of Veterinary Science
- Robert A. Schlegel, Ph.D. (Harvard) Professor of Biochemistry and Molecular Biology
- Cooduvalli Shashikant, Ph.D. (India) Associate Professor of Molecular and Developmental Biology
- David T. Wilson, Ph.D. (Western Ontario) Professor of Marketing; Alvin H. Clemens Professor of Entrepreneurial Studies
- Andrew L. Zydney, Ph.D. (MIT) Professor of Chemical Engineering

The Master of Biotechnology degree program is offered through a collaboration of the Life Sciences Consortium with the Department of Biochemistry and Molecular Biology and the Department of Chemical Engineering. It is a multidisciplinary program involving at least thirty-two regular faculty members from fourteen different academic departments in Penn State University as well as ad hoc mentors from the academic faculty and from industry. The Master of Biotechnology curriculum is designed to give students broad knowledge and training in the scientific and practical aspects of biotechnology. It involves innovative, hands-on, and multidisciplinary learning approaches to educate and train students in the science behind biotechnology, its business and legal aspects, and the ethical and social issues that it brings about. In addition, the courses and the activities required of all students in this program intend to develop team working and communication skills, which are very important in industry in particular. Graduates of this program are expected to have the knowledge and training for diverse career options: as academic educators, as scientists in both academic and industry settings, as members of decision-making business and management teams in government and biotechnology industries, as bioentrepreneurs, and as members and leaders of governmental, public, and private organizations that deal with social, ethical and legal issues in biotechnology. Furthermore, because of their broad knowledge in biotechnology, graduates of this program are expected to fill a niche in industry where knowledge and ability to interphase and communicate with various functional groups within the organization are required.

Admission Requirements

Applications will be considered in accordance with the requirements of the Graduate School as described in the GENERAL INFORMATION section of the *Graduate Bulletin*. The program is appropriate for students with a baccalaureate degree in biological sciences, chemistry, or engineering or other baccalaureate degrees that include sufficient credits from relevant courses in the life sciences. Applicants must have a minimum junior/senior grade point average of 3.00 (on a 4.00 scale). Graduate Record Examinations (GRE) scores are required with a combined total of at least 1700 points for the verbal, quantitative, and analytical tests. Typically, students are admitted as part of a cohort to commence studies in the fall. The best-qualified applicants will be accepted up to the number of spaces available for new students.

Degree Requirements

A minimum of 30 graduate credits is required for completion of the program, 18 credits of which must be from courses in the 500 level. Students are required to take 16 to 19 credits from core courses described below. Additional credits are from industry internship and elective courses which are determined based on the interest and career track the student decides to pursue: agriculture, medical applications, or diversified. All Master of Biotechnology candidates are required to write a research paper based on a research project conducted in an academic research laboratory or in industry. A student whose research project is conducted in an academic laboratory will be required to do an internship in industry.

Core Courses

AGRICULTURAL AND BIOLOGICAL ENGINEERING (A B E)

- 468. MICROBIOLOGICAL ENGINEERING

BIOCHEMISTRY AND MOLECULAR BIOLOGY (B M B)

- 400. MOLECULAR BIOLOGY OF THE GENE (3)

BIOTECHNOLOGY (BIOTC)

- 479. METHODS IN BIOFERMENTATIONS (3)

INTEGRATIVE BIOSCIENCES (IBIOS)

- 571. CURRENT ISSUES IN BIOTECHNOLOGY (2)
- 590. LSC COLLOQUIUM SEMINAR SERIES (1)
- 591. ETHICS IN THE LIFE SCIENCES (1)
- 593. MOLECULAR BIOLOGY LABORATORY (3)
- 594. RESEARCH PROJECT IN BIOTECHNOLOGY (3-6)

Electives

These courses are chosen from offerings in various academic departments based on students' interest or track and career objectives. These include IBIOS 595 (Industry Internship), which is required unless a student already opted to do IBIOS 594 (Research Project) in industry, and IBIOS 597C (Special Topics: Advanced Laboratory Techniques in the Life Sciences), another elective course that is virtually required of students who intend to pursue research and development careers in industry. This is a modular laboratory course dealing with specialized techniques currently used in life sciences research: mammalian cell culture and monoclonal antibody production, quantitative cell analysis by flow cytometry and digital microscopy, nucleic acid sequence analysis, high-throughput analysis of nucleic acids using microarrays, protein analysis by mass spectrometry, techniques in animal transgenics, and other specialized techniques a student may arrange to work on with a research laboratory on campus.

Integrated B.S. in Biotechnology - Master of Biotechnology in Biotechnology Program

The integrated B.S. in Biotechnology-Master of Biotechnology degree program is designed to enable qualified undergraduate students in the B.S. Biotechnology program to graduate in five years with the Master of Biotechnology degree. The requirements of the Master of Biotechnology degree are designed to prepare students for diverse career opportunities in the burgeoning biotechnology industry. The integrated B.S. Biotechnology-Master of Biotechnology program will enhance the preparation and qualifications of B.S. Biotechnology students seeking entry-level positions in biotechnology and related industries. At the same time, students develop a practical knowledge of the laboratory techniques that underlie current research in the life sciences that will serve as excellent preparation for those students in the Master of Biotechnology program who later decide to pursue further graduate degrees.

A maximum of 12 credits will be cross-counted towards the B.S. and Masters degrees, from the following courses:

- B M B 400(2-3)
- BIOTC 479(3)
- IBIOS 571(2)
- IBIOS 591(1)
- IBIOS 593(3)

B.S. Biotechnology Requirements:

Total credits required: 125
GENERAL EDUCATION: 46 credits (15 of these are included in the REQUIREMENTS FOR THE MAJOR)
REQUIREMENTS FOR THE MAJOR: 94-95 credits

- Prescribed courses: 67 credits
- Additional courses: 6-9 credits
- Supporting courses and related areas: 18-21 credits

Master of Biotechnology Requirements:

Total credits required: 30 (18 of which must be from 500-level courses)

- Required courses: 16-19 credits
- Electives: 11-14 credits

Integrated B.S. in Animal Sciences - Master of Biotechnology in Biotechnology

The integrated B.S. in Animal Sciences Master of Biotechnology in Biotechnology degree program is designed to enable qualified undergraduate students in the B.S. Animal Sciences program to graduate in five years with the Master of Biotechnology degree. The requirements of the Master of Biotechnology degree are designed prepare students for diverse career opportunities in the burgeoning

biotechnology industry. The integrated B.S. in Animal Sciences Master of Biotechnology in Biotechnology program will enhance the preparation and qualifications of B.S. Animal Sciences students seeking entry-level positions in biotechnology and related industries. At the same time, students develop a practical knowledge of the laboratory techniques that underlie current research in the life sciences that will serve as excellent preparation for those students in the Master of Biotechnology program who later decide to pursuer further graduate degrees.

A maximum of 12 credits will be cross-counted towards the B.S. and Masters degrees*.

Year	Semester	B.S. Animal Sciences (125 credits required) credits completed
I	Fall	15
	Spring	16
II	Fall	15.5
	Spring	16
III	Fall	15
	Spring	15.5
IV	Fall	15*
	Spring	17*
Total credits for B.S.		**125**

* The following courses to be taken in these semesters will be cross-counted towards the B.S. and Master of Biotechnology. degrees:

- BIOTC 479. Methods in Biofermentation OR CH E 409 (3 credits)
- B M B 400. Molecular Biology of the Gene (2-3 credits)
- IBIOS 571. Current Issues in Biotechnology (2 credits)
- IBIOS 591. Ethics in the Life Sciences (1 credit)
- IBIOS 593. Molecular Biology Laboratory (3 credits)

Total credits cross-counted in B.S. and Master of Biotechnology degrees	**12 credits, 6 of which are 500-level credits**

Master of Biotechnology in Biotechnology (30 credits required, 18 of which must be 500-level)

IV	Summer	IBIOS 595 or equivalent in AN SC (2 credits) Internship
V	Fall	IBIOS 594. Research Project (3-6 credits)
	Spring	IBIOS 590. Colloquium (1 credit) Electives, 500-level (3-6 credits) Other graduate level electives (6 credits)
Minimum total credits earned for Summer and 5th year		**18 credits, at least 12 of which are 500-level credits**

Admission Requirements

Students must have a GPA of 3.5 at the time of application to the integrated degree program when they have completed at least 75 credits of their B.S. curriculum. The GRE scores normally required in the Master of Biotechnology in Biotechnology program will be waived for applicants to the integrated B.S.-Master of Biotechnology degree.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

AGRICULTURAL AND BIOLOGICAL ENGINEERING (A B E) course list

BIOCHEMISTRY, MICROBIOLOGY, and MOLECULAR BIOLOGY (BMMB) course list

BIOTECHNOLOGY (BIOTC) course list

INTEGRATIVE BIOSCIENCES (IBIOS) course list

Last Revised by the Department: Summer Session 2006

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Review Date: 4/11/06

DATE LAST REVIEWED BY PUBLICATIONS: 6/30/05

Business Administration (B A)

WILLIAM T. ROSS, *Director of Ph.D. and M.S. Programs*
351 Business Building
814-865-7669; Program Home Page (Opens New Window)

DENNIS SHEEHAN, *Director of MBA Program and Benzak Professor of Finance*
220 Business Building
814-863-0474; Program Home Page (Opens New Window)

Degrees Conferred:

Ph.D., M.S., M.B.A.

The Graduate Faculty

- Brent W. Ambrose, Ph.D. (Georgia) Professor of Real Estate
- Orie E. Barron, Ph.D. (Univ. of Oregon) Professor of Accounting
- Russell Barton, Ph.D. (Cornell) Professor of Supply Chain and Information Systems
- Hans Baumgartner, Ph.D. (Stanford) Chair, Department of Marketing; Professor of Marketing
- Haidong (Henry) Bi, Ph.D. (Arizona) Assistant Professor of Supply Chain and Information Systems
- Gary E. Bolton, Ph.D. (Carnegie Mellon) Professor of Business Economics
- Daniel R. Cahoy, JD (Franklin) Associate Professor of Business Law
- Quanwei (Charles) Cao, Ph.D. (Chicago) Professor of Finance
- Jennifer Coupland Chang, Ph.D. (Northwestern) Clinical Associate Professor in Marketing
- John J. Coyle, Jr., D.B.A. (Indiana) Professor Emeritus of Business Administration
- Keith Crocker, Ph.D. (Carnegie Mellon) The William Elliott Professor of Insurance and Risk Management
- Robert P. Crum, D.B.A. (Kentucky) Associate Professor of Accounting
- Wayne DeSarbo, Ph.D. (Pennsylvania) The Mary Jean and Frank P. Smeal Distinguished Chaired Professor of Marketing
- Min Ding, Ph.D. (Pennsylvania) Associate Professor of Marketing
- Mark W. Dirsmith, Ph.D. (Northwestern) Deloitte & Touche Professor of Accounting
- Peter Ebbes, Ph.D. (Groningen) Assistant Professor of Marketing
- Charles R. Enis, D.B.A. (Maryland) Associate Professor of Accounting
- Deborah Ettington, Ph.D. (Michigan) Clinical Professor of Management
- Laura Field, Ph.D. (California, Los Angeles) Associate Professor of Finance
- Paul E. Fischer, Ph.D. (Rochester) Professor of Accounting
- Duncan Fong, Ph.D. (Purdue) Professor of Marketing
- Raghu Garud, Ph.D. (Minnesota) Professor of Management and Organization
- Fariborz Ghadar, D.B.A. (Harvard) Professor of Finance and William A. Shreyer Chair of Global Management, Policies, and Planning
- Dennis A. Gioia, Ph.D. (Florida State) Chair, Department of Management and Organization; Professor of Organizational Behavior
- Dan Givoly, Ph.D. (NYU) Chair, Department of Accounting; Ernst & Young Professor of Accounting
- Edward J. Glantz, Ph.D. (Wharton) Clinical Assistant Professor of Information Systems
- Marvin Goldberg, Ph.D. (Illinois) Irving and Irene Bard Professor of Marketing
- Guojin Gong, Ph.D. (Iowa) Assistant Professor of Accounting
- Barbara L. Gray, Ph.D. (Case Western Reserve) Professor of Organizational Behavior
- Rajdeep Grewal, Ph.D. (Cincinnati) Professor of Marketing
- Olesya Grishchenko, Ph.D. (New York) Assistant Professor of Accounting
- V. Daniel Guide, Jr., Ph.D. (Georgia) Associate Professor of Operations and Supply Chain Management
- Donald Hambrick, Ph.D. (Penn State) Smeal Chaired Professor of Management
- David A. Harrison, Ph.D. (Illinois) Smeal Professor of Organizational Behavior and Human Resource Management
- Terry P. Harrison Ph.D. (Tennessee) Professor of Supply Chain and Information Systems
- David Haushalter, Ph.D. (Purdue) Clinical Assistant Professor of Finance
- Jean Helwege, Ph.D. (UCLA) Associate Professor of Finance
- Jingzhi (Jay) Huang, Ph.D. (Northwestern) Associate Professor of Finance
- Steven J. Huddart, Ph.D. (Yale) Professor of Accounting
- Stephen F. Jablonsky, Ph.D. (Illinois) Associate Professor Emeritus of Accounting
- Austin J. Jaffe, Ph.D. (Illinois) Chair, Department of Insurance and Real Estate; Philip H. Sieg Professor of Business Administration
- Elena Katok, Ph.D. (Penn State) Associate Professor of Supply Chain and Information Systems
- Bin Ke, Ph.D. (Michigan State) Associate Professor of Accounting
- J. Edward Ketz, Ph.D. (Virginia Tech) Associate Professor of Accounting
- William Kracaw, Ph.D. (Utah) Chair, Department of Finance; Sykes Professor of Finance
- Akhil Kumar, Ph.D. (California, Berkeley) Professor of Management Information Systems
- Anthony Kwasnica, Ph.D. (Cal Tech) Associate Professor of Business Economics
- John Liechty, Ph.D. (Cambridge) Associate Professor of Marketing
- Gary L. Lilien, D.E.S. (Columbia) Distinguished Research Professor of Management Science
- Dennis K. J. Lin (Wisconsin) Professor of Statistics and Supply Chain Management
- Michelle Liu, Ph.D. (MIT Sloan) Assistant Professor of Accounting
- Henock Louis, Ph.D. (Ohio State) Associate Professor of Accounting
- Michelle B. Lowry, Ph.D. (Rochester) Associate Professor of Finance
- Kenneth M. Lusht, Ph.D. (Georgia State) Professor Emeritus of Business Administration
- James McKeown, Ph.D. (Michigan State) Mary Jean and Frank P. Smeal Professor of Accounting
- Margaret Meloy, Ph.D. (Cornell) Associate Professor of Marketing
- James A. Miles, Ph.D. (Penn State) Professor of Finance; Joseph F. Bradley Fellow of Finance
- Karl Muller, Ph.D. (Illinois) Associate Professor of Accounting
- Chris J. Muscarella, Ph.D. (Purdue) Professor of Finance; L. W. 'Roy' and Mary Lois Clark Teaching Fellow
- Robert A. Novack, Ph.D. (Tennessee) Associate Professor of Supply Chain Management
- Ralph Oliva, Ph.D. (Rensselaer) Professor of Marketing
- Timothy Pollock, Ph.D. (Illinois) Associate Professor of Management
- Lisa L. Posey, Ph.D. (Pennsylvania) Associate Professor of Business Administration
- Arvind Rangaswamy, Ph.D. (Northwestern) Senior Associate Dean; Jonas H. Anchel Professor of Business Administration; Professor of Marketing

- Edward T. Reutzel, Ph.D. (Penn State) Associate Professor of Management Science
- William T. Ross, Ph.D. (Duke) Professor of Marketing; Director of Ph.D./M.S. Programs
- Dawn M. Russell, Ph.D. (Northwestern) Assistant Professor of Supply Chain Management and Information Systems
- Arnold F. Shapiro, Ph.D. (Pennsylvania) Professor of Business Administration and Robert G. Schwartz University Endowed Fellow
- Jeffery M. Sharp, J.D. (Oklahoma) Associate Professor of Business Law
- Dennis P. Sheehan, Ph.D. (California) Professor of Finance; The Virginia and Louis Benzak Professor of Finance; Associate Dean of MBA Programs
- Jun Shu, Ph.D. (California, Berkeley) Assistant Professor of Supply Chain and Information Systems
- Timothy Simin, Ph.D. (Washington) Assistant Professor of Finance
- Charles H. Smith, Ph.D. (Penn State) KPMG Professor Emeritus of Accounting
- Charles C. Snow, Ph.D. (California) Professor of Business Administration
- John C. Spychalski, D.B.A. (Indiana) Professor Emeritus of Supply Chain Management
- Alan J. Stenger, Ph.D. (Minnesota) Professor of Supply Chain Management
- John Stevens, Ph.D. (SUNY) Professor of Management and Organization
- Amy Xue Sun, Ph.D. (Carnegie Mellon) Assistant Professor of Accounting
- Gerald I. Susman, Ph.D. (UCLA) Robert and Judith Klein Professor of Management; Associate Dean for Research
- Douglas J. Thomas, Ph.D. (Georgia Tech) Associate Professor of Supply Chain Management
- James B. Thomas, Ph.D. (Texas) Dean, Professor of Information Sciences and Management
- Evelyn A. Thomchick, Ph.D. (Clemson) Associate Professor of Supply Chain Management
- Linda K. Treviño, Ph.D. (Texas A&M) Professor of Organizational Behavior
- Wenpin Tsai, Ph.D. (London) Associate Professor of International Management
- John E. Tyworth, Ph.D. (Oregon) Chair, Department of Supply Chain Management and Information Systems; Professor of Supply Chain Management
- Albert A. Vicere, D.Ed. (Penn State) Professor of Business Administration
- Qiong Wang, Ph.D. (Florida) Assistant Professor of Marketing
- Xiaotong Wang, Ph.D. (Yale) Assistant Professor of Finance
- J. Randall Woolridge, Ph.D. (Iowa) Professor of Finance and The Goldman, Sachs & Co. and Frank P. Smeal Endowed University Fellow
- Susan H. Xu, Ph.D. (Rensselaer) Professor of Management Science and Supply Chain Management

The Master of Business Administration program is a professional degree designed to prepare individuals for managerial positions in business, government, and nonprofit institutions. The M.B.A. curriculum blends technical rigor, managerial theory, and integrative learning experiences through case studies and other teaching methods. A managerial communications course is fully integrated into the program.

The Master of Science in Business Administration program is highly flexible and designed for advanced study in a specialized field. The M.S. program is directed toward the development of competency within a defined area of management. Fields such as accounting and management science are examples of career opportunities requiring specialized knowledge and skill, including research.

The Doctor of Philosophy degree in the Business Administration program offers advanced graduate education for students focused on research careers at leading business schools. The faculty of the college views the Ph.D. as evidencing scholarship at the highest level.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Applicants to the master's programs are required to take the Graduate Management Admission Test (GMAT); whereas applications to the doctoral program are required to take either the GMAT or the Graduate Record Examination (GRE) administered by the Educational Testing Service throughout a year. For dates, locations, and other information about the test, write for the Bulletin of Information, Graduate Management Admission Test, Educational Testing Service, Princeton, NJ 08540; www.gmat.org; 800-982-6740.

Criteria for evaluating applicants include professional and academic accomplishments, GMAT scores, recommendations, and personal data from application forms that provide indications of future academic and professional accomplishment.

Work on the M.B.A. degree may be started fall semester only. M.S. and Ph.D. candidates may begin either the fall or spring semester. However, only rarely are admissions for the M.S. and Ph.D. programs granted for spring semester. Individuals from all undergraduate disciplines are encouraged to apply.

Master's Degree Requirements

The M.B.A. program consists of two distinct portions: (1) preprogram competency expectations, including accounting, economics, mathematics, and statistics; and (2) 60 credits of graduate courses. Individuals who did not have adequate preparation in accounting, economics, mathematics, and statistics in their undergraduate programs are expected to develop the required minimum level of competency before graduate study can begin. The time required to complete this graduate program, based on full-time study, is twenty-one months. The student body is divided into diverse sections of approximately forty students, with each section proceeding through the same core classes each semester. Emphasis is placed on student interaction and shared learning both inside and outside the classroom.

The M.S. program consists of two distinct portions: (1) approximately 33 acceptable undergraduate foundation credits in business administration, economics, and mathematics; and (2) 30 graduate credits in business administration or related areas, including a paper or thesis. An applicant may be admitted without foundation courses, but they must be made up without degree credit. A professional paper and 3 additional credits of graduate-level course work can be substituted for the thesis.

Doctoral Degree Requirements

Competency Expectations: Entrance into the doctoral program in business administration does not require the completion of an undergraduate degree specifically in business. While almost any major at the undergraduate level may be acceptable, graduate study in business administration does presume a minimum level of competency in mathematics, statistics, and computing. No transcript credit is required for entering doctoral candidates in these areas, except where specified by particular fields of specialization. However, it must be emphasized that lack of minimum competency in mathematics, statistics and computing could be a significant disadvantage to the candidate.

Breadth Requirement: All candidates are expected to develop a broad understanding of the functions of the business organization. To achieve breadth, all Ph.D. candidates must show competency by completing 12 credits of graduate course work in a minimum of two of the approved fields of study within the Smeal College of Business and in economics. The 12 credits in the breadth requirement must be taken in fields outside or separate from a candidate's primary, supporting, and research competency fields.

Primary Field Requirements: All candidates are required to achieve competency in a primary field of business administration. The primary field is the sphere of scholarship that commands the most extensive and intensive portion of a program and is the area in which the dissertation research and major professors are selected. Primary fields may be selected from the following: accounting; finance/insurance and real estate; management and organization; management science/operations/logistics; and marketing and distribution.

Graduate work in a selected primary field may require competency in prerequisite areas, including undergraduate work in the field itself as well as prior work in mathematics, statistics, computer science, economics, and social and behavioral sciences. The prerequisite work will be specified by each primary field.

Supporting Field Requirements: All candidates must select a supporting field of study from business administration or related outside areas. Those spheres of scholarship complement the candidate's primary field. Supporting fields from business administration include all the primary fields. Outside supporting fields include, but are not limited to, anthropology, civil engineering, computer science, economics, industrial engineering, mathematics, political science, psychology, sociology, and statistics.

Research Methods Field: All candidates must develop a broad understanding of the scientific research process and in-depth competency in the research methods used in the primary field. Each candidate's doctoral committee shall specify a minimum of three graduate-level courses (beyond the M.B.A. core courses) to constitute a supporting field in research methods. One of these courses must focus on the philosophy of science. Others should cover specific methods and tools relevant for research in the primary fields. A member of the doctoral committee shall be designated to represent the research methods field and shall be responsible for evaluating the candidate's competence in the field.

Research Paper and Presentation Requirement: To introduce students early to the research process, each Ph.D. student must complete a written research paper with two years after admission to the Ph.D. program. The student must then present the paper at an open departmental workshop or seminar within one semester after the paper is approved by the department committee and chair. The student must work under the guidance of a Research Paper Supervisor (who may or may not later be the thesis adviser). The research paper supervisor mentors the student, possibly suggesting the research topic, monitoring progress, providing ideas and feedback, and helping the student develop appropriate research, writing, and presentation skills. The paper must substantially represent the student's work, and must be written by the student. The paper must clearly define and motivate the problem being addressed, contain a comprehensive literature review, and present the research contributions and conclusions. Approval of written paper and presentation can be used as a means to the satisfy the University's English competence and communication requirement (to be completed before the comprehensive examination).

Other Degree Programs

QUALITY AND MANUFACTURING MANAGEMENT MASTER'S PROGRAM (QMM)

The QMM program is an integrated, one-year academic program requiring 30 credits and leading to a master's degree in Manufacturing Management. The Penn State College of Engineering and Smeal College of Business have jointly developed this curriculum so as to integrate the viewpoints and fundamentals of the disciplines on engineering and business as applied to quality and manufacturing management. The objective of the QMM program is to develop graduates who are prepared to assume leadership positions in manufacturing and to contribute through functional integration to the firm's competitiveness in global markets.

M.B.A./M.M.M. CONCURRENT DEGREE PROGRAM

This concurrent degree program, an intensive two-year program that combines the M.B.A. degree and M.M.M. degree, is available for students interested in both degrees. In order to complete the concurrent degree within the two-year period, the student must opt for the Supply Chain Management portfolio in the MBA program.

M.B.A./M.H.A. CONCURRENT DEGREE PROGRAM

The MBA program of Smeal College of Business and the Department of Health Policy and Administration of the College of Health and Human Development offer a concurrent degree program that will enable a student to finish in two academic years both a master's degree in Business Administration (M.B.A.) and a master's degree in Health Administration (M.H.A.). An M.B.A./M.H.A. graduate will be well-grounded in business management, health management, and the skills and expertise associated with functional areas of health services management. During the two academic years and intervening summer, the student will complete 63 credits of course work and a professional internship of 400 hours in a health care organization.

FIVE-YEAR SCIENCE B.S./M.B.A. PROGRAM

This program is the result of collaboration between the Eberly College of Science and Smeal College of Business. With the accelerated nature of the program, students can earn a B.S. degree in science and an M.B.A. degree in five calendar years after graduation from high school. For the first three and one-half years, including the first semester of the M.B.A. curriculum, students are enrolled as undergraduates in the Eberly College of Science. For the remaining three semesters, participants are graduate students formally enrolled in the Smeal College of Business M.B.A. program. Successful completion of this program results in a B.S. degree in Science awarded by the Eberly College of Science during year four and an M.B.A. from the Smeal College of Business at the end of year five.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, other awards are available to graduate students in Smeal College of Business.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ACCOUNTING (ACCTG) course list

Dr. Dan Givoly, *Chair*; 814-865-0041

BUSINESS ADMINISTRATION (B A):
The following courses require matriculation into the MBA program at University Park campus and are considered part of the MBA core

curriculum:

- 500. MARKETING MANAGEMENT (1-3)
- 501. MANAGEMENT (2)
- 502. TEAM PROCESSES AND PERFORMANCE (1-3)
- 504. ETHICAL LEADERSHIP (2)
- 505. NEGOTIATION THEORY AND SKILLS (1-3)
- 510. SUPPLY CHAIN AND OPERATIONS MANAGEMENT (1-3)
- 511. FINANCIAL ACCOUNTING (1-3)
- 512. RISK & DECISION (2)
- 515. BUSINESS STATISTICS FOR CONTEMPORARY DECISION MAKING (2)
- 517. LEADERSHIP COMMUNICATIONS (1-3)
- 521. INTRODUCTION TO MANAGERIAL ACCOUNTING (2)
- 523. INFORMATION TECHNOLOGY (2)
- 531. INTRODUCTION TO FINANCE (1-3)
- 532. GLOBAL BUSINESS ENVIRONMENT (1)
- 533. ECONOMICS FOR MANAGERS (2)
- 535. GLOBAL PERSPECTIVES (1)
- 536. INTERNATIONAL IMMERSION (2)
- 571. STRATEGIC MANAGEMENT (1-3)
- 575. CAPSTONE BUSINESS CASE (4)

Courses outside the MBA core:

- 528. BUSINESS SIMULATION (1-3)
- 545. BUSINESS, GOVERNMENT & INTERNATIONAL ECONOMICS (2)
- 565. STRATEGIC LEADERSHIP (1-3)
- 574. BUSINESS RESEARCH (1-3)
- 596. INDIVIDUAL STUDIES (1-9)
- 599. FOREIGN STUDY - BUSINESS ADMINISTRATION (1-12)

BUSINESS LAW (B LAW) course list
525. BUSINESS LAW FOR INNOVATION & COMPETITION (2)

BUSINESS LOGISTICS (B LOG) course list

Dr. John E. Tyworth, *Chair*; 814-865-1866

E-BUSINESS (EBIZ) course list

ENTREPRENEURSHIP (ENTR) course list
500. INNOVATION AND ENTREPRENEURSHIP (1-3)

FINANCE (FIN) course list
515. NITTANY LION FUND MANAGER (3)
555. GLOBAL FINANCE (1-3)
570. FINANCIAL MODELING (2)

Dr. William A. Kracaw, *Chair*; 814-863-0486

INFORMATION SCIENCES AND TECHNOLOGY (IST) course list

INSURANCE (INS) course list

Dr. Austin Jaffe, *Chair*; 814-865-1190

INTERNATIONAL BUSINESS (I B) course list
555.GLOBAL FINANCE (1-3)

Dr. Fariborz Ghadar, *Director*, 814-865-0544

MANAGEMENT AND ORGANIZATION (MGMT) course list
561. GLOBAL STRATEGY AND ORGANIZATION (1-3)
565. POWER & INFLUENCE (2)

Dr. Dennis Gioia, *Chair*; 814-865-2194

MANAGEMENT INFORMATION SYSTEMS (M I S) course list

MANAGEMENT SCIENCE AND INFORMATION SYSTEMS (MS&IS) course list

John E. Tyworth, *Chair*, 814-865-1866

MARKETING (MKTG) course list

Dr. Hans Baumgartner, *Chair*; 814-863-3559

OPERATIONS AND INFORMATION SYSTEMS MANAGEMENT (OISM) course list

OPERATIONS MANAGEMENT (OPMGT) course list

REAL ESTATE (R EST) course list
515. PROPERTY RIGHTS IN A GLOBAL ECONOMY (2)

Dr. Austin Jaffe, *Chair*; 814-865-1190

SUPPLY CHAIN MANAGEMENT (SCM) course list

CONCURRENT DEGREE OFFERING WITH THE PENN STATE DICKINSON

SCHOOL OF LAW

Smeal College of Business, University Park campus
The Penn State Dickinson School of Law

Degrees Conferred:

J.D. (Dickinson) M.B.A. (The Smeal College)

Concurrent degree program. Smeal College of Business and the Penn State Dickinson School of Law offer a concurrent degree program leading to the degrees of Juris Doctor (J.D.) and Master of Business Administration (M.B.A.). We live in a global society where complex legal structures interact with dynamic and powerful market forces. Individuals with backgrounds in both business and law have a distinct advantage in understanding this interaction and are uniquely positioned for success in our modern society. The Juris Doctor/Master of Business Administration (JD/MBA) joint degree program provides outstanding, highly motivated students the opportunity to combine a Juris Doctor degree from the Penn State's Dickinson School of Law (DSL), one of America's oldest and most respected law schools, with an M.B.A. degree from Penn State's internationally ranked Smeal MBA Program (Smeal). Participants in this program earn both a Juris Doctor degree and a Master of Business Administration in four years compared to the five years required to earn the two degrees separately.

Admission to the program. In order to be admitted to the program, students may: (a) first be admitted and enrolled in either Smeal College or Dickinson and subsequently admitted to the other program; or (b) be admitted to the concurrent program prior to commencing studies at Penn State. Each program will make a separate admission decision. Students admitted to both programs will be admitted as concurrent degree candidates.

Admission Requirements

Candidates must apply to DSL and Smeal separately and must meet each school's requirements. Visit the following Web sites for additional information regarding each school's application.

For DSL: http://www.dsl.psu.edu/admissions/applyjd.cfm (Opens New Window)

For Smeal: http://www.smeal.psu.edu/mba/admission/apply

Dickinson. All applicants for the JD program must hold a bachelor's degree from a regionally accredited institution and are required to take the Law School Admissions Test (LSAT). Applicants must submit a JD application form; pay a $60 nonrefundable application fee if using electronic methods (a $70 nonrefundable application fee if using a downloaded application); submit a complete Law School Data Assembly Service (LSDAS) report; and provide two examples of written expression, an overview of your academic and professional experiences, and two letters of recommendation.

MBA program in Smeal College. All applicants for the MBA program must hold a bachelor's degree from a regionally accredited institution and are required to take the Graduate Management Admission Test (GMAT). They must also complete the online application (consisting of the application form, a professional resume, work history, and three essays); provide two copies of their prior academic transcripts; submit two letters of recommendation, and pay a $60 nonrefundable application fee.

Credit Requirements: The J.D. degree at DSL requires a minimum of 88 credits and the Smeal M.B.A. degree requires a minimum of 60 credits. For students enrolled in the JD/MBA Program, DSL accepts the transfer of twelve (12) Smeal credits which all come from Smeal's required core curriculum. Similarly, Smeal accepts the transfer of twelve (12) credits from the DSL required core curriculum with the possibility of four (4) additional credits eligible for transfer from DSL's elective courses. Twelve of these credits come from the DSL required core curriculum while the possible other four of these credits would come from DSL's elective courses. Accordingly, students must take a ***minimum*** of 76 credits from DSL and 44-48 credits from Smeal in order to complete the JD/MBA program.

Pursuant to University policy, the transfer credits may not be applied to their corresponding joint degree until a participant has completed at least one year of study in both DSL and Smeal.

Current DSL Students: Students currently enrolled at DSL in the JD program may apply to the JD/MBA program during their first or second year of study by applying for admission to Smeal.

Sequence. Students may choose to conduct their study in either of the two sequences shown below. Each "Year" refers to the traditional academic year beginning in late August and concluding in May. In addition, DSL offers a limited number of courses during the summer term. Smeal does not offer any classes over the summer term.

Option 1

Year 1: JD Foundation Course work at either the Carlisle or the University Park location
Year 2: MBA Foundation Course work at the University Park location
Year 3: Combination of JD and MBA Course work at the University Park location
Year 4: JD Upper Level Course work at either the Carlisle or the University Park location

Option 2

Year 1: JD Foundation Course work at either the Carlisle or the University Park location
Year 2: JD Upper Level Course work at either the Carlisle or the University Park location
Year 3: MBA Foundation Course work at the University park location
Year 4: Combination of JD and MBA Course work at the University Park location. Students complete at least one year at University Park campus and one year at Dickinson before being able to cross-count courses. It is anticipated that after one year at each location, a student will spend one additional semester at Smeal and three more semesters at Dickinson

Transfer of Credits: M.B.A. Twelve (12) credits from Dickinson course work may be transferred toward the M.B.A. degree at Smeal. Courses for which such credit may be applied shall be subject to approval by Smeal based on relevance to the MBA program. Students must obtain a grade satisfactory to Smeal for any J.D. course work to be credited toward the M.B.A. degree. (Up to four (4) additional DSL credits may be considered for transfer to Smeal.)

Transfer of Credits: J.D. A maximum of 12 credits for M.B.A. course work may be transferred for credit toward the J.D. degree at the Dickinson School of Law. Courses for which such credit may be applied shall be subject to approval by the Dickinson faculty. Students must obtain a grade satisfactory to Dickinson for any M.B.A. course work to be credited toward the J.D. degree.

Advising of Students. All students in the program shall have two advisers, one from Smeal and one from Dickinson. Periodic interaction between the two advisers is encouraged.

Graduation. It is anticipated that students will complete a minimum of 44 credits from the Smeal College and 76 credits from The Dickinson School of Law in order to obtain the concurrent M.B.A. and J.D. degrees from those institutions. However, a student can graduate with one degree before the other as long as he/she has completed all of the requirements for that degree.

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/17/04

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Blue Sheet Item #: 36-06-186

Review Date: 4/15/08

Business Administration (B ADM)

Program Home Page (Opens New Window)

ALFRED G. WARNER, *Director of the M.B.A. Program*
Penn State Erie, The Behrend College
5101 Jordan Road
Erie, PA 16563

Degree Conferred:

M.B.A.

Associate Members of the Graduate Faculty

- Stuart J. Allen, Ph.D. (Minnesota) Associate Professor Emeritus of Management
- S. Saad Andaleeb, Ph.D. (Illinois) Professor of Marketing
- Brian L. Boscaljon, Ph.D. (Texas Tech) Associate Professor of Finance
- Charles A. Brown, Ph.D. (Kent State) Associate Professor of Accounting
- Michael E. Brown, Ph.D. (Penn State) Associate Professor of Management
- Ashutosh V. Deshmukh, Ph.D. (Memphis State) Professor of Accounting
- David T. Doran, Ph.D. (Pittsburgh) Associate Professor of Accounting
- James F. Fairbank, Ph.D. (Penn State) Associate Professor of Management
- Michael G. Filbeck, D.B.A. (Kentucky) Professor of Finance and Samuel Patton Black III Chair in Insurance and Risk Management
- John L. Fizel, Ph.D. (Michigan State) Professor of Economics
- Eric C. Jackson, Ph.D. (Michigan State) Assistant Professor of Management
- Kerry A. King, Ph.D. (West Virginia) Assistant Professor of Economics
- James A. Kurre, Ph.D. (Wayne State) Associate Professor of Economics
- Kenneth K. T. Louie, Ph.D. (Illinois) Associate Professor of Economics
- John M. Magenau, Ph.D. (SUNY, Buffalo) Associate Professor of Management
- Phylis M. Mansfield, Ph.D. (Memphis) Associate Professor of Marketing
- Ido Millet, Ph.D. (Pennsylvania) Professor of Management Information Systems
- Todd M. Nesbit, Ph.D. (West Virginia) Assistant Professor of Economics
- Diane H. Parente, Ph.D. (SUNY, Buffalo) Professor of Management
- Jeffrey K. Pinto, Ph.D. (Pittsburgh) Professor of Management and Andrew Morrow and Elizabeth Lee Black Chair in Management Technology
- Mary Beth Pinto, Ph.D. (Pittsburgh) Professor of Marketing
- Matthew E. Swinarski, Ph.D. (SUNY, Buffalo) Assistant Professor of Management Information Systems
- Margaret A. Thoms, Ph.D. (Ohio State) Professor of Management
- Ray R. Venkataraman, Ph.D. (Illinois Inst of Tech) Associate Professor of Management
- Alfred G. Warner, Ph.D. (Ohio State) Associate Professor of Management
- Barry R. Weller, Ph.D. (Penn State) Associate Professor Emeritus of Economics
- Jessica Xin Zhao, Ph.D. (SUNY, Buffalo) Assistant Professor of Finance

The Penn State Erie M.B.A. is a general degree emphasizing development of the planning and problem-solving skills crucial in middle and upper management. Course work emphasizes the integration of business functions and the practical application of theory in the business world, using cases, simulated problems and actual situations students are experiencing at work. Many students are fully employed professionals who bring a wealth of knowledge and experience to the classroom. Both full-time and part-time study are possible and the program can be completed by attending evening and daytime classes.

Admission Requirements

Admission is granted only to candidates who demonstrate high promise of success for graduate work. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Applicants are required to take the Graduate Management Admissions Test (GMAT) administered by the Educational Testing Service, Box 966, Princeton, NJ 08541; telephone (609) 771-7330.

Admission decisions are based on the following: undergraduate grade-point average; the degree of correspondence between the applicant's objectives and those of the program; three letters of reference; and GMAT score. Favorable consideration will be given to applicants who have significant work experience. An applicant's GMAT score plus undergraduate grade-point average (multiplied by 200) must total at least 1,050 to be considered for admission. A minimum GMAT score of 450 is required. However, admission is competitive and higher scores may be required, depending on the qualifications of the applicants. Entering graduate students for whom English is not the first language are required to have a TOEFL (Test of English as a Foreign Language) score of at least 550 on the paper-based test and at least 213 on the computer-based test, or 80 points on the new Internet-based test with a minimum of 23 points on the speaking portion; or the International English Language Testing System (IELTS) with a minimum composite score of 6.5 for admission. Admission is open during the fall and spring semesters, as well as during the summer session.

Applicants must demonstrate proficiency in writing by having earned a grade of B or higher in a college English composition or writing course or by achieving a score of four or higher on the GMAT Analytical Writing Assessment. Students who fail to meet at least one of these two criteria must complete a college English composition or writing course and earn a grade of B or higher or retake the GMAT test and score four or higher on the Analytical Writing Assessment. This requirement must be satisfied during either the first semester or summer session of the student's matriculation.

All students must be computer literate and have ready and reliable access to a computer and the Internet to successfully complete the MBA program. Students must know how to use word processing software, log-on to an Internet provider, and use E-mail. Additionally, MBS students must have a working knowledge of Microsoft Office programs including Word, Excel, PowerPoint, and Access.

Master's Degree Requirements

The Master of Business Administration degree program consists of three parts:

Foundation Core Courses (18 credits): These courses introduce students to the ethical, legal, social, political, technological, and societal environment of business, accounting, economics, finance, management, marketing, operations management, and the application of quantitative methods to the analysis of business problems. Completion of the foundation core, consisting of B ADM 500, B ADM 501, and B ADM 503, prepares students for the program's advanced required courses and electives. The foundation core is required of all applicants who have not completed an undergraduate degree in business or previous undergraduate or graduate course work relevant to the foundation core requirements.

Applicants who have, within seven years prior to the date of their admission to degree candidacy, completed a baccalaureate degree in business from a regionally accredited institution that includes course content equivalent to the foundation core courses may be exempted from part or all of this requirement as long as the previously completed courses carry grades of B or higher. An applicant who, within seven years prior to his or her admission to degree candidacy, completed a baccalaureate degree in a non-business field from a regionally accredited institution that includes equivalent undergraduate or graduate courses carrying a grade of B or higher also may be exempted from relevant portions of the foundation core courses. Applicants who have maintained currency of knowledge through relevant business experience and continuing professional education in one or more of the areas within the foundation core courses and who completed relevant course work more than seven years prior to admission to degree status may also be exempted from relevant portions of foundation core requirements. Exemption from foundation core requirements is granted in accordance with the course exemption guidelines for the MBA program.

Advanced Required Courses (18 credits): These courses build on the knowledge base established in the foundation core and provide greater depth of knowledge in the subject areas included. This component of the MBA program consists of five 3-credit courses that cover advanced topics in cost management, finance, information systems management, managing a diverse workforce, global operations and supply chain management, and strategic management and business policy.

All students are required to complete this requirement which includes B ADM 510, B ADM 511, B ADM 512, B ADM 513, B ADM 514, and B ADM 532 unless they can demonstrate advanced knowledge of the course subject matter through prior course work, extensive experience and/or advanced professional education. Students who believe they have knowledge of an advanced required course must submit a written request and documentation describing their knowledge of the course subject matter. If approved, the student will substitute an additional elective course for the advanced required course.

Elective Courses (12 credits): All students are required to take 12 credits of elective courses covering advanced topics of their choice. Elective courses allow students to pursue a particular area in depth, choose particular subjects of interest, and gain an appreciation of more complex issues facing managers. Electives must include at least 3 credits of internationally focused course work from the program approved list of courses. MBA students may also apply a maximum of 6 credits of approved 400-level course work toward elective requirements. Course work at the 400 level must be approved by the director of the MBA program and cannot have been used for another degree.

Transfer Credits: Students may transfer a maximum of 9 credit hours from another accredited graduate program to fulfill elective or advanced required courses. Application of transfer credits to the student's academic program must be approved by the director of the MBA program and be in compliance with Graduate School requirements described in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

***Foundation Core Courses*:**

BUSINESS ADMINISTRATION (B ADM)

- 500. Business, Government, and Society (3)
- 501. Costs, Competition, and Market Performance (6)
- 502. Demand, Operations, and Firm Performance (6)
- 503. Integrated Business Analysis (3)

***Advanced Required Courses*:**

BUSINESS ADMINISTRATION (B ADM)

- 510. Cost Management for Decision Making and Control (3)
- 511. Information Systems Management and Strategy (3)
- 512. Managing a Diverse Workforce (3)
- 513. Global Operations and Supply Chain Management (3)
- 514. Strategic Planning and Business Policy (3)
- 532. Corporate Finance (3)

Elective Courses:

BUSINESS ADMINISTRATION (B ADM)

- 520. Entrepreneurial Ventures (3)
- 521. Leadership Seminar (3)
- 522. Business Solutions (3)
- 523. International Business (3)
- 524. Operations Strategy (3)
- 525. Innovation and Change Management (3)
- 526. Leadership and Ethics (3)
- 530. Investment Theory (3)
- 531. Business Forecasting (3)
- 532. Corporate Finance (3)
- 533. Derivatives (3)
- 550. Global Marketing (3)
- 551. Marketing Research (3)
- 552. Service Marketing (3)
- 553. Consumer Behavior (3)
- 554. Marketing Strategy (3)

- 562. Financial Statement Analysis (3)
- 563. Financial Electronic Commerce (3)
- 590. Colloquium (1-3)
- 595. Internship (1-18)
- 596. Independent Studies (1-9)
- 597. Special Topics (1-9)
- 598. Special Topics (1-9)
- 599. Foreign Studies (1-12)

ECONOMICS (ECNS)

- 410. Economics of Labor Markets (3)
- 420. Money, Banking, and Economic Activity (3)
- 430. Regional Economic Analysis (3)
- 440. Industrial Organization (3)
- 450. Managerial Economics (3)
- 460. Business Forecasting Techniques (3)
- 462. Advanced Business Forecasting Techniques (3)
- 470. International Trade and Finance (3)
- 485. Econometric Techniques (3)
- 497. Special Topics (1-9)

FINANCE (FNC)

- 400. Problems in Financial Management (3)
- 410. Introduction to Investments (3)
- 430. Estate Planning (3)
- 450. Retirement Planning (3)
- 460. Investment Analysis (3)
- 470. International Financial Management (3)
- 480. Advanced Financial Analysis (3)
- 497. Special Topics (1-9)

INTERNATIONAL BUSINESS (INT B)

- 411. International Business (3)
- 497. Special Topics (1-9)

MANAGEMENT (MANGT)

- 420. Conflict Management (3)
- 440. Advanced Human Resource Management (3)
- 480. International Management (3)
- 497. Special Topics (1-9)
- 510. Project Management (3)
- 515. Cost and Value Management (3)
- 520. Planning and Resource Management (3)
- 525. Commercial Law and Project Procurement (3)
- 531. Organizations (3)
- 535. Interpersonal and Group Behavior (3)
- 540. Strategy: Corporate, Business, and Project (3)
- 575. Management of Projects (3)

MANAGEMENT INFORMATION SYSTEMS (MIS)

- 430. Systems Analysis (3)
- 435. Systems Design and Implementation (3)
- 440. Expert Systems (3)
- 445. Management Reporting Sytems (3)
- 470. Advanced Applications Development (3)
- 497. Special Topics (1-9)

MARKETING (MRKTG)

- 400. Retailing (3)
- 410. Personal Selling (3)
- 420. Sales Management (3)
- 470. Global Marketing (3)
- 497 special Topics (1-9)

SUPPLY CHAIN MANAGEMENT (SCM)

- 445. Operations Planning and Control (3)
- 455. Logistics Systems Analysis and Design (3)
- 460. Purchasing and Materials Management (3)

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BUSINESS ADMINISTRATION (B ADM):

ECONOMICS (ECNS) course list

FINANCE (FNC) course list

INTERNATIONAL BUSINESS (INT B) course list

MANAGEMENT (MANGT) course list

MANAGEMENT INFORMATION SYSTEMS (MIS) course list

MARKETING (MRKTG) course list

SUPPLY CHAIN MANAGEMENT (SCM) course list

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Business Administration (BADMN)

Program Home Page (Opens New Window)

RICHARD YOUNG, *Graduate Program Director*
Penn State Harrisburg, School of Business Administration
777 West Harrisburg Pike
E-355 Olmsted Building
Middletown, PA 17057-4898
717-948-6140; mbahbg@psu.edu

Degree Conferred:

M.B.A.

The Graduate Faculty

- Thomas Amlie, Ph.D. (Maryland) *Assistant Professor of Accounting*
- Nihal Bayraktar, Ph.D. (Maryland) *Associate Professor of Economics*
- Melvin Blumberg, Ph.D. (Penn State) *Professor of Management*
- Stephan Brady, Ph.D. (Penn State) *Assistant Professor of Operations and Supply Chain Management*
- Terence A. Brown, D.B.A. (Maryland) *Associate Professor of Transportation and Marketing*
- Qiang Bu, Ph.D. (Massachusetts) *Assistant Professor of Finance*
- Thomas Buttross, Ph.D. (Mississippi) *Associate Professor of Professional Accountancy*
- Keunsuk Chung, Ph.D. (Washington) *Assistant Professor of Economics*
- Refik Culpan, Ph.D. (NYU) *Professor of Management and International Business*
- Patrick Cusatis, Ph.D. (Penn State) *Assistant Professor of Finance*
- Douglas C. Friedman, Ph.D. (Michigan) *Assistant Professor of Marketing*
- Raymond Gibney Jr., Ph.D. (Pittsburgh) *Assistant Professor of Management*
- Jean E. Harris, Ph.D. (Virginia Tech) *Associate Professor of Accounting*
- Rhoda Joseph, Ph.D. (Baruch) *Assistant Professor of Information Systems*
- Erdener Kaynak, Ph.D. (Cranfield, Bedford, England) *Professor of Marketing*
- Roderick Lee, Ph.D. (Penn State) *Assistant Professor of Information Systems*
- David A. Morand, Ph.D. (Cornell) *Professor of Management*
- Kurt H. Parkum, Ph.D. (Wisconsin) *Associate Professor Emeritus of Management*
- Parag C. Pendharkar, D.B.A. (Southern Illinois) *Professor of Information Systems*
- Robert D. Russell, Ph.D. (Pittsburgh) *Assistant Professor of Management*
- Stephen P. Schappe, Ph.D. (Ohio State) *Director, School of Business Administration; Associate Professor of Management*
- Girish Subramanian, Ph.D. (Temple) *Professor of Information Systems*
- Peter Swan, Ph.D. (Michigan) *Assistant Professor of Logistics and Operations Management*
- Oranee Tawatnuntachai, Ph.D. (New Orleans) *Associate Professor of Finance*
- Premal P. Vora, Ph.D. (Penn State) *Associate Professor of Finance*
- Gayle J. Yaverbaum, Ph.D. (Temple) *Professor Emerita of Information Systems*
- Richard Young, Ph.D. (Penn State) Professor of Supply Chain Management
- Ugur Yucelt, Ph.D. (New School) *Associate Professor of Marketing*

The Program

Students served by the M.B.A. program are, primarily, nontraditional and reside in south-central Pennsylvania. With the exception of a small percentage of students who are full-time, they are employees of area businesses, state and local governments, and not-for-profit organizations, who study on a part-time basis. In order to accommodate both full- and part-time students, courses are offered primarily in the late afternoon and evening--with occasional offerings on weekends.

The program is intended not only to satisfy current individual needs for professional growth, but also to foster lifelong learning. As an outcome of the program, students may expect to gain participative strengths, problem solving and critical thinking skills, technical expertise, and desirable attitudes and values, particularly ethical values needed in the conduct of business.

To strengthen the educational experience, the Program places high priority on teaching and currency of curriculum, with an emphasis on oral and written communication, research, and cross-functional integration of concepts.

Admission Requirements

Applicants to the program must hold a baccalaureate degree in any field from a regionally accredited, college-level institution. Decisions are based primarily on undergraduate junior/senior grade-point average and the Graduate Management Admission Test (GMAT) scores. (Please visit http://www.mba.com/(Opens New Window) for more information about the GMAT). Post baccalaureate course work, professional experience, and the statements provided in the application are also taken into account.

Students are also required to submit:

- --a completed online application form with application fee
- --two copies of official transcripts from all colleges or universities attended
- --GMAT test scores (the test must have been taken within the past five years)
- --two letters of recommendation

For complete admission information, on-line application, and the latest updates on admission requirements and procedures, please consult the College Web page at http://www.hbg.psu.edu/ (Opens New Window).

International Students

Applicants whose first language is not English or who have not received a baccalaureate degree from an institution in which the language of instruction is English, must take the Test of English as a Foreign Language (TOEFL), http://www.toefl.org/. The test must be passed

with a score of 550 (paper based test) or 213 (computer based test) or higher.

All students with international credentials must submit transcripts to Educational Credential Evaluators, Inc. (ECE) for a "course by course" academic evaluation of transcripts and degree. An ECE application can be obtained on the Web at: http://www.ece.org (Opens New Window).

Application Dates

Candidates may enter the program at the beginning of the fall or spring semester, or the summer session. To allow time for applications to be processed, all information, including the GMAT score, should be received by the admissions office no later than July 18 for admission to the fall semester, November 18 for the spring semester, and April 18 for admission to the summer session.

Applicants from outside the United States must follow the early-admission dates in order to allow the necessary clearances and paperwork to be processed in time. International application deadline dates are:

- Fall Semester--May 31
- Spring Semester--September 30
- Summer Session--February 28

Preparation for the Program

Analytic Skills Requirement: Prior to enrolling in their M.B.A. course work, students must demonstrate competence in analytic skills. This requirement can be satisfied in one of two ways: (1) by satisfactory completion of college-level courses in calculus and statistics such as QUANT 310, or MATH 110 plus STAT 200; or (2) by successful completion of proficiency examinations in calculus and statistics approved by the M.B.A. Program. This requirement must be satisfied by the first semester or summer session of the student's matriculation, and completed with a grade of C or higher.

Credit by examination: Interested students should obtain a Credit by Examination form from Enrollment Services and consult with the MBA Program to obtain a list of suggested preparatory materials and schedule the exam.

Computer Skills Requirement: Students are required to demonstrate proficiency in the use of microcomputer applications.This requirement can be satisfied through of a college-level microcomputer applications course within the past five years with a grade of a B or higher, or by documented , significant, computer-related work experience. If this requirement has not been met prior to admission, a college-level microcomputer course such as MIS 103 or COMPSC 203 is required. Course work must be completed by the first semester or summer session of the student's matriculation with a grade of B or higher.

Communications Skills Requirement: Successful completion of the M.B.A. Program requires the ability to think clearly, and to write and speak persuasively. Part of this requirement can be satisfied by achieving a score of "4" or higher on the Graduate Management Admission Test (GMAT) Analytical Writing Assessment. If this score is not achieved, students must satisfy this requirement through additional course work in writing skills such as ENGL 5013 or other work developed in consultation with the M.B.A. Program. This requirement must be satisfied by the first semester or summer session of the student's matriculation. All courses taken must be completed with a grade of B or higher. The speech component of this requirement is satisfied through individual and group presentations in BUS 500 and other courses in the M.B.A. Program.

Pre-Program Courses:
The MBA Program is grounded in the academic disciplines of accounting, finance, economics, marketing, management, and information sciences, among others, in order to provide students with the conceptual foundation required for competent pursuit of more advanced studies in business administration as well as the ethical and legal management of profit and non-profit organizations. This background can be provided by course work taken as part of a comprehensive and integrated, four-year degree program at an accredited, college-level institution, or through graduate course work. All courses must have been completed with a grade of B or higher, within seven years prior to admission to the M.B.A. Program. Course work not meeting the tests of relevancy, quality, or currency must be taken at the graduate level prior to starting the 30-credit M.B.A. Program. Time limits may be waived by the M.B.A. Program on the basis of post-graduation training or current and relevant work experience. Courses available at Penn State Harrisburg that provide the necessary foundation for graduate business study include: ACCT 501, BUS 500, BUS 505, BUSEC 502, BUSEC 503, MNGMT 511; Either MNGMT 522 or MNGMT 523; and MRKT 513.

Degree Requirements

The M.B.A. degree requires 30 credits of course work at the graduate level (500-level or higher). These credits are distributed over two clusters of courses: Prescribed Courses and Elective Courses/Tracks.

Prescribed Courses: 18 credits, aimed at developing general competence for overall management. ACCT 540, BUS 515, BUS 588, BUS 589, FINAN 521, INFSY 540, MNGMT 514, MKTG 514.

Elective Courses/Tracks: 12 credits. Students may elect courses in clusters of "Tracks" organized around a common theme designed to be integrative and cohesive. The Tracks provide competencies and skill sets for decision making in four areas: (1) the E-business Track is intended to provide competencies enabling managers to develop and implement a global marketing strategy using Internet-based technology; (2) the Human Resources Track is intended to provide competencies enabling managers to organize and operate high performing work organizations that are both efficient and human; (3) the Financial Analysis Track provides competencies needed to control competitive performance, and to develop improvement and innovation in all parts of the organization; (4) the General Business Track is provided for students who wish to develop a broad generalist program, or who have a particular personal or professional goals not met by one of the other tracks.

Tracks:
E-business: The objective of this Track is to examine and apply concepts, models, and techniques from the fields of business and information technology for value chain management and support of the domestic and global strategy of the business enterprise. Internet technologies that enable opportunities in marketing, sales, research and development, promotion, procurement, inventory control, manufacturing, supply chain management, order status checking, and payment systems are examined.

- INFSY 543 Foundations of E-business (3)
- MRKT 586 Internet Marketing (3)

Select 6 credits:
Select 6 credits from INFSY 544(3); MRKT 587(3); or, in consultation with an advisor, from courses in such areas as supply chain management; research and development; promotion; inventory control; procurement; international finance; and international management to meet the objectives of the Track.

Human Resources Management: The objective of this Track is to examine and apply models and techniques from human resources management, labor relations, and behavioral science for the planning and organization of work and work systems to promote cooperation and collaboration, individual and group initiative, innovation, motivation, and flexibility. Also examined are techniques and mechanisms used to develop and maintain a work environment and work climate supportive of performance excellence, full participation, employee well-being and satisfaction, and personal and organizational learning and growth.

- MNGMT 505 Managing Human Resources(3)
- MNGMT 515 Labor Management Relations(3)
- MNGMT 545 Employment Law for Business(3)

Select 3 credits:
Select 3 credits from MNGMT 520(3); MNGMT 570(3); or, in consultation with an advisor, from courses in such areas as human resources management; labor relations; behavioral science; and international management to meet the objectives of the Track.

Financial Analysis: The objective of this Track is to examine and apply models and techniques from finance and accounting for the planning, analysis, control, and improvement of competitive performance, organizational health, ethical business practices, performance capabilities, and progress toward key business results, strategic objectives, and changing organizational goals. Particular emphasis is placed on approaches for translating those analyses into priorities for improvement and opportunities for innovation at all levels, and in all parts of the organization.

- FINAN 531 Managing Financial Operations(3)
- ACCT 561 Financial Statement Analysis II(3)

Select 6 credits:
Select 6 graduate credits in Accounting and/or Finance, in consultation with an advisor, to meet the objectives of the Track.

General Business: The objective of this Track is to allow students to select graduate courses that meet their personal and professional goals.

Select 12 credits:
Select 12 graduate credits, in consultation with an advisor, to meet the objectives of the Track. With Program approval, a maximum of 6 graduate credits may be selected in courses outside the School of Business Administration.

Transfer Credit and Course Substitutions

Transfer Credits: Up to 10 transfer credits may be applied toward the degree. However, credits used to complete a previous degree may not be applied. Transfer credits must have been completed within the past five years, appear on a graduate transcript, and have been passed with a B grade or higher and been earned in an equivalent graduate-level program at an accredited, college-level institution. It must be the opinion of the reviewing faculty that these courses are equivalent in quality to those offered at Penn State Harrisburg.

Course substitutions: Some students enter the Program with advanced coursework in one or more subject areas (e.g., a degree in accounting plus a C.P.A.) making some prescribed coursework redundant. Except for BUS 588, which must be taken at Penn State Harrisburg, students may petition or be advised by the Program to replace up to six credits in Prescribed Courses with an equivalent number of credits of more advanced graduate courses in the same subject area. The advanced course(s) taken must have the replaced courses as an important foundation or prerequisite. Courses must have been completed within the past five years and have earned a grade of B or higher.

Grade-point Average and Time Limit

A 3.00 (out of 4.00) minimum grade-point average is required for the M.B.A. degree. All course work must be completed within six years, or seven consecutive summers of matriculation.

Financial aid

There are a limited number of scholarships, fellowships, and research grants available, as well as several graduate assistantships. For more information on these, contact the School of Business Administration.

Many students work full-time and take classes part-time. In many cases, employers have a tuition-reimbursement plan paying for partial or full tuition. To find other options available to you, contact the Financial Aid Office, 717-948-6307.

Graduate School Assistantships

Full-time graduate students who are interested in an assistantship should contact the graduate program coordinator. Students must be nominated for an assistantship by their program coordinator.

Students applying for an assistantship should submit scores from the Graduate Management Admissions test, or similar examinations by January 30.

Concurrent Degree Offering with the Penn State Dickinson School of Law

Penn State Harrisburg, the Capital College, School of Business Administration
The Penn State Dickinson School of Law

Degrees Conferred: J.D. (Dickinson)
M.B.A. (The Capital College)
M.S.I.S. (The Capital College)

Concurrent Degree Programs

The Dickinson School of Law and the School of Business Administration of Penn State Harrisburg offer cooperative programs leading to the degrees of Juris Doctor (J.D.) to be granted by the Dickinson School of Law, and either the Master of Business Administration (M.B.A.) or Master of Science in Information Systems (M.S.I.S.) to be granted by Penn State Harrisburg, The Capital College. These concurrent degree opportunities facilitate the completion of both a law degree, and a professional degree in business or information systems.

Admission Requirements

The concurrent programs require that the student first be admitted to The Dickinson School of Law. Subsequently, the student is *recommended* for and *applies* for admission to the Graduate School for the Penn State Harrisburg M.B.A. Program or M.S.I.S. Program.

The following are required for applicants:

The Dickinson School of Law: Completed Law School application; Law School Admission Test (LSAT) score; Law School Data Assembly Service (LSDAS) report; one page personal statement; employment record since high school; two letters of recommendation.

M.B.A. and M.S.I.S. Programs: Completed Graduate School application; Graduate Management Admission Test (GMAT); letter of recommendation from the Associate Dean of the Dickinson School of Law; evidence of proficiency in analytic skills through college-level calculus and statistics demonstrated either by completion of courses or successful completion of proficiency examinations approved by the M.B.A. Program; evidence of proficiency in microcomputer applications skills; proficiency in writing evidenced by a score of "4" or higher on the Analytical Writing Assessment portion of the GMAT; evidence of proficiency in the academic disciplines of accounting, finance, economics, marketing, management and information sciences equivalent to that provided by completion of an integrated four-year business program, or completion of additional course work at the graduate level. Each course must have been completed with a grade of B or higher within seven years prior to admission to the M.B.A. or M.S.I.S. program. The School of Business Administration will review the applicant's transcripts for acceptability of the courses.

No courses from the M.B.A. or M.S.I.S. program may count toward the J.D. program until the student is matriculated at The Dickinson School of Law. However, graduate-level courses taken in either the M.B.A. or M.S.I.S. program at Penn State Harrisburg, or at another graduate-level institution may be applied to the M.B.A.or M.S.I.S. in accordance with the transfer policies of the Graduate School.

Transfer of Credits

Nine credits of course work at The Dickinson School of Law may be transferred toward the M.B.A. or the M.S.I.S. degrees, subject to Program approval. Students must obtain a grade satisfactory to the M.B.A. and M.S.I.S. program in order for the credits to be transferable. Nine credits of M.B.A. or M.S.I.S. courses may be transferred for credit toward the J.D. degree at The Dickinson School of Law, subject to the approval of the School of Law.

Advising of Students

All students in the concurrent program have two advisors, on in the School of Business Administration and one from the faculty at The Dickinson School of Law. Because the concurrent program is designed to be taken in synchrony with the objective that both degrees will be earned simultaneously, students who do not demonstrate progress toward completion of both degrees may be denied continuation in the concurrent program. Such a decision will rest jointly with the faculties of the M.B.A. or M.S.I.S. program and the J.D. program.

Tuition

The Dickinson School of Law and Penn State Harrisburg will each charge their own tuition to students in the concurrent programs.

Additional Information

For more information and the latest updates on the concurrent programs, call the Law school at 717-240-5207 or 800-840-1122, or visit the web sites at:
http://www.dsl.psu.edu/ (Opens New Window)
http://www.hbg.psu.edu/ (Opens New Window)

Concurrent Degree Offering with the Milton S. Hershey Medical Center, The Department of Pharmacology

Penn State Harrisburg, The Capital College, School of Business Administration
The Penn State Milton S. Hershey Medical Center, the Department of Pharmacology

Degrees Conferred:
Ph.D. (Hershey)
M.B.A. (The Capital College)

Concurrent Degree Programs

The Milton S. Hershey Medical Center, Department of Pharmacology, and the School of Business Administration of Penn State Harrisburg, The Capital College offer cooperative programs leading to the degrees of doctor of philosophy (Ph.D.) to be granted by the Hershey Medical Center, and either the Master of Business Administration (M.B.A.) or Master of Science in Information Systems (M.S.I.S.) to be granted by the Capital College. These concurrent degree opportunities facilitate the completion of both a pharmacology doctorate and a professional degree in business administration or informations systems. The programs are designed primarily for students interested in pursuing a career involving high-quality independent research and positions of management responsibility within the pharmacological community.

Admission Requirements:
The concurrent programs require that the student first be admitted to The Pharmacology Program. Subsequently, the student is *recommended* for and *applies* for admission to the Graduate School for the Penn State Harrisburg M.B.A. or M.S.I.S. program.

The following are required for applicants:

Pharmacology: Completed application; Graduate Record Examination (GRE) score; a bachelor's degree reflecting a reasonable background in zoology or biology, mathematics and chemistry; a minimum junior/senior grade point average of 3.00 and with appropriate course backgrounds; two letters of recommendation; a curriculum vitae; a description of career goals. Reading knowledge of one or two foreign

languages is recommended.

M.B.A. and M.S.I.S. Programs: Completed Graduate School application; Graduate Management Admission test (GMAT) score; letter of recommendation from the department chair of the pharmacology department; evidence of proficiency in analytic skills through college-level calculus and statistics demonstrated either by completion of course or successful completion of a mathematics proficiency examination approved by the program; evidence of proficiency in microcomputer applications skills; proficiency in writing evidenced by a score of "4" or higher on the Writing Assessment portion of the GMAT; evidence of proficiency in the academic disciplines of accounting, finance, economics, marketing, management and information sciences equivalent to that provided by completion of an integrated four-year business program, or completion of additional course work at the graduate level. Each course must have been completed with a grade of B or higher within seven years prior to admission to the M.B.A. or M.S.I.S. program. The School of Business Administration will review the applicant's transcripts for acceptability of the courses.

No courses from the M.B.A. or M.S.I.S. program may count toward the Ph.D. until the student is admitted to the pharmacology program. However, graduate-level courses taken in the M.B.A. or M.S.I.S. program at Penn State Harrisburg, or at another graduate-level institution, may be applied to the M.B.A. or M.S.I.S. in accordance with the transfer policies of the Graduate School.

Transfer of Credits

Nine credits of course work in pharmacology may be transferred toward the M.B.A. or M.S.I.S., subject to Program approval. Students must obtain a grade satisfactory to the M.B.A. or M.S.I.S. Program in order for the credits to be transferable. Nine credits of M.B.A. or M.S.I.S. coursework may be transferred for credit toward the Ph.D. degree, subject to the approval of the Department of Pharmacology.

Advising of Students

All students in the concurrent program have two advisors, one in the School of Business Administration, and one from the faculty in the Department of Pharmacology. Because the concurrent program is designed to be taken in synchrony with the objective that both degrees will be earned simultaneously, students who do not demonstrate progress toward completion of both degrees may be denied continuation in the concurrent program. Such a decision will rest jointly with the faculties of the M.B.A. or M.S.I.S. and the Ph.D. programs.

The Course Matrix

For more information and the latest updates on the concurrent programs, call the Department of Pharmacology at 717-531-8285 or visit the Web sites at:
http://www.hmc.psu.edu/pharmacology.program.index.html (Opens New Window)
http://www.hbg.psu.edu/ (Opens New Window)

ACCOUNTING (ACCT) course list

BUSINESS (BUS) course list

ECONOMICS (ECNMS) course list

FINANCIAL ANALYSIS (FINAN) course list

INFORMATION SYSTEMS (INFSY) course list

MANAGEMENT (MNGMT) course list

MARKETING (MRKT) course list

Last Revised by the Department: Spring Semester 2005

Blue Sheet Item #: 33-04-268

Review Date: 01/18/05

Date last updated by Publications: 8/11/09

Business Administration (BUSAD)

DANIEL C. INDROS, *Academic Division Head*
School of Graduate Professional Studies
Penn State Great Valley
30 East Swedesford Road
Malvern, PA 19355-1443
610-648-3229
On the Web: www.sgps.psu.edu (Opens New Window)

Degree Conferred:

M.B.A.

The Graduate Faculty

- Janice L. Dreachslin, Ph.D. (Wayne State) *Professor of Health Policy and Administration*
- Janet M. Duck, Ph.D. (Penn State) *Assistant Professor Management and Organization*
- Karen Duhala, Ph.D. (Penn State) *Assistant Professor of Finance and Accounting*
- Andrew Felo, Ph.D. (SUNY, Binghamton) *Associate Professor of Accounting*
- Carlos Ferran, D.B.A. (Boston) *Assistant Professor of Management Science and Information Systems*
- Daniel C. Indro, Ph.D. (Indiana) *Associate Professor of Finance*
- Pornsit Jiraporn, Ph.D. (Southern Illinois, Carbondale) *Assistant Professor of Finance*
- Philip A. Laplante, Ph.D., P.E. (Stevens Institute of Technology) *Professor of Software Engineering*
- Barrie E. Litzky, Ph.D. (Drexel) *Associate Professor of Management and Organization*
- James Lyttle, Ph.D. (York U) *Assistant Professor of Management and Organization*
- John Mason, Ph.D. (Michigan State) *Associate Professor of Management and Organization*
- John I. McCool, Ph.D. (Temple University) *Professor of Systems Engineering*
- Kimberly K. Merriman, Ph.D. (Temple) *Assistant Professor of Management and Organization*
- Colin J. Neill, Ph.D. (University of Wales, UK) *Associate Professor of Software Engineering*
- Simon J. Pak, Ph.D. (California, Berkeley) *Associate Professor of Finance*
- Michael J. Piovoso, Ph.D. (University of Delaware) *Professor of Electrical Engineering*
- Denise Potosky, Ph.D. (Rutgers) *Associate Professor of Management and Organization*
- Robin G. Qiu, Ph.D. (Penn State) *Assistant Professor of Information Science*
- Raghvinder Sangwan, Ph.D. (Temple University) *Assistant Professor of Information Science*
- Kailasam Satyamurthy, Ph.D. (Clemson) *Senior Lecturer in Engineering and Management*
- John Sosik, Ph.D. (SUNY Binghamton) *Associate Professor of Management and Organization*
- Eric W. Stein, Ph.D. (Pennsylvania) *Associate Professor of Management Science and Information Systems*
- G. Walter Wang, Ph.D. (Louisiana State) *Associate Professor of Marketing*

The Penn State Great Valley M.B.A. is a general degree program emphasizing development of the planning and problem-solving skills crucial in middle and upper management in the public, private, and nonprofit sectors. Nearly all students are working professionals who bring a wealth of experience and knowledge to the classroom. Program options are offered in Biotechnology and Health Industry Management, New Ventures and Entrepreneurial Studies, and Management of Information Technology. Required research in these areas of specialization may be conducted in Penn State Great Valley's Library and Computer Center, which provide local research support as well as access to the library and computer resources of the entire Penn State system.

The M.B.A. program is geared toward the needs of part-time students who are employed full-time. Courses in the program, which are offered at Great Valley, are scheduled for the convenience of adult learners, in the evening or on Saturday.

Admission Requirements

Requirements listed here are in addition to the Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Graduate Bulletin*. Scores from the Graduate Management Admission Test (GMAT) are required for admission. Scores from the Test of English as a Foreign Language (TOEFL) are required of international applicants and must be submitted at the time of application. Exception: The TOEFL is not required of natives of an English-speaking country or applicants who hold a baccalaureate or master's degree from an institution of an English-speaking country. Applicants should have had at least one year of quantitative analysis or statistics.

Admission decisions are based on the quality of the applicant's credentials in relation to those of other applicants. Evaluation criteria include professional and academic accomplishments, GMAT scores, two recommendations, and a personal statement that provides indications of future academic and professional potential. Application filing dates: Penn State Great Valley's M.B.A. program has a rolling admission policy. New students may start classes in early September, late October, early January, early March, or late April.

Degree Requirements

Normally 45 credits will be required to complete the M.B.A. degree.

Prior to enrolling in M.B.A. program requirements, students entering the program are expected to meet preprogram requirements that build a foundation for effective communication skills and quantitative analysis as described below.

Quantitative Skills Requirement: Prior to enrolling in their M.B.A. course work, students must demonstrate competence in quantitative skills. This requirement must be satisfied in one of two ways:

1. Completion of two sequential undergraduate courses in applied statistics or one graduate introductory course in applied statistics at a regionally accredited institution of higher education with a minimum grade of B, within the past seven years prior to being enrolled at Penn State Great Valley. Syllabi for such courses must be provided.

OR

1. Satisfactory completion of BUSAD 501 (formerly MS&IS 510): Statistical Analysis for Managerial Decision Making at Penn State Great Valley. This requirement must be satisfied by the first semester or summer session of the student's matriculation prior to enrolling in M.B.A. degree courses, and completed with a grade of B or higher. Successful completion of this course will result in 3 credits of

graduate credit, but will not count toward the completion of program requirements for the M.B.A. degree.

Communications Skills Requirement: Successful completion of the M.B.A. Program requires the ability to think clearly, and to write and speak persuasively. Students must satisfy this requirement in one of two ways:

1. Completion of two undergraduate courses or one graduate-level course in managerial communication from a regionally accredited institution of higher education with a minimum grade of B, within the past seven years prior to being enrolled at Penn State Great Valley. Syllabi for such courses must be provided.

OR

1. Satisfactory completion of BA 517: Communication Skills for Management at Penn State Great Valley. This requirement must be satisfied by the first semester or summer session of the student's matriculation prior to enrolling in M.B.A. degree courses, and completed with a grade of B or higher. Successful completion of this course will result in 3 credits of graduate credit, but will not count toward the completion requirements of the M.B.A. degree.

To facilitate successful fulfillment of preprogram requirements, students needing to take BA 517 or BUSAD 501 will be admitted on a one-year provisional basis.

Core Courses (18 credits)
Core Courses provide a foundation for business studies. They include MGMT 501(3), ACCTG 512(3), BUSAD 523(3), MKTG 500(3), FIN 531(3), and OPMGT 510(3).

Exemption from up to 15 credits from the core courses may be granted in accordance with the course exemption guidelines for the M.B.A. program. Normally students will need to have completed at least two undergraduate courses with a grade of B or higher, no more than seven years prior to admission to the M.B.A. program, to be eligible for exemption from a single core course. At the Management Division Head's discretion, a competency exam may be required to receive certain course exemptions. Course work not meeting the tests of relevancy, quality, or currency must be taken at the graduate level prior to starting advanced coursework. Time limits may be waived by the M.B.A. program on the basis of post-graduate training or current and relevant work experience.

All entering students are required to take MGMT 501.

All students must complete advanced course work consisting of 9 credits of required courses (ACCTG 524, BUSAD 537, and BUSAD 551 or BUSAD 534), 15 credits of elective courses and a 3-credit capstone course. For specialized options in New Ventures and Entrepreneurial Studies and Biotechnology and Health Industry Management, the capstone course and 9 credits of electives are restricted to more specialized study.

For the Business Administration option, these courses include BUSAD 551, BUSAD 537, ACCTG 524, a Managing and Leading People elective, a Managing Technology and Innovation elective, 9 credits of free electives, and the 3-credit capstone course MGMT 571.

For the option in New Ventures and Entrepreneurial Studies, students fulfill their advanced course requirements with BUSAD 551, BUSAD 537, ACCTG 524, a Managing and Leading People elective, a Managing Technology and Innovation elective, and 12 credits of New Ventures courses, including a choice of capstone course: BUSAD 581 (Entrepreneurship track), MGMT 571 (Intrapreneurship track), or LEAD 582 (Social Entrepreneurship track).

For the Biotechnology and Health Industry Management option, students take BUSAD 530, BUSAD 537, ACCTG 524, a Managing and Leading People elective, a Managing Technology and Innovation elective, BUSAD 534, the capstone course BUSAD 583, and two courses from a suggested list of courses in health care, product development, or bioinformatics.

For the option in Management of Information Technology, students fulfill their advanced course requirement with ACCTG 524, BUSAD 537, BUSAD 576, Managing and Leading People elective, Managing Technology & Innovation course (MIS 539), three elective courses in Management of Information Technology, and the capstone course MGMT 571.

Students should consult the professor in charge of each option for specific curriculum requirements.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. Additional information is available from the financial aid office at Penn State Great Valley.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ACCOUNTING (ACCTG) course list

BUSINESS ADMINISTRATION (B A) course list

BUSINESS ADMINISTRATION (BUSAD) course list

BUSINESS LAW (B LAW) course list

FINANCE (FIN) course list

HEALTH POLICY AND ADMINISTRATION (H P A) course list

INTERNATIONAL BUSINESS (I B) course list

MANAGEMENT (MGMT) course list

MANAGEMENT INFORMATION SYSTEMS (M I S) course list

MARKETING (MKTG) course list

OPERATIONS MANAGEMENT (OPMGT) course list

Last Revised by the Department: Summer Session 2007
Blue Sheet Item #: 35-07-428
Review Date: 6/12/07
Date last updated by Publications: 8/20/09

Business Administration, Executive Master of (exMBA)

The Executive MBA program is a cohort program with a class of approximately forty students moving in lockstep through the program. Classes are taught primarily on the weekends in the Philadelphia area, complemented with several residence weeks on the University Park campus. The time required to complete the program is twenty-two months.

Admission Requirements

Please refer to the requirements listed in the *Admission Requirements* section of the full-time MBA program at University Park. Applicants to the Executive MBA program should have considerable work experience, typically ten years or more.

Master's Degree Requirements

Please refer to the requirements listed in the *Master's Degree Requirements* section of the full-time MBA program at University Park.

Business Administration, Master of (iMBA)

Program Home Page (Opens New Window)

ASHUTOSH (ASH) DESHMUKH, *Chair iMBA Program*
imba@psu.edu
814-898-6712

Degree Conferred:

M.B.A.

The Graduate Faculty -- Penn State Erie, The Behrend College

- S. Saad Andaleeb, Ph.D. (Illinois at Urbana-Champaign) Professor of Marketing
- Brian L. Boscaljon, Ph.D. (Texas Tech) Associate Professor of Finance
- Ashutosh V. Deshmukh, Ph.D. (Memphis) Professor of Accounting and Management Information Systems
- David T. Doran, Ph.D. (Pittsburgh) Associate Professor of Accounting
- John L. Fizel, Ph.D. (Michigan State) Professor of Economics
- James A. Kurre, Ph.D. (Wayne State) Associate Professor of Economics
- Kenneth K. T. Louie, Ph.D. (Illinois) Associate Professor of Economics
- John M. Magenau, Ph.D. (SUNY at Buffalo) Associate Professor of Management
- Ido Millet, Ph.D. (Pennsylvania) Professor of Management Information Systems
- Diane H. Parente, Ph.D. (SUNY, Buffalo) Professor of Management
- Jeffrey K. Pinto, Ph.D. (Pittsburgh) Professor of Management
- Mary Beth Pinto, Ph.D. (Pittsburgh) Professor of Marketing
- Ray Venkataraman, Ph.D. (Illinois Inst of Tech) Professor of Management

The Graduate Faculty -- Penn State Great Valley, School of Graduate Professional Studies

- Janet Duck, Ph.D. (Penn State) Assistant Professor of Management
- John Mason, Ph.D. (Michigan State) Associate Professor of Management
- Kimberly K. Merriman, Ph.D. (Temple) Assistant Professor of Management
- Denise Potosky, Ph.D. (Rutgers) Associate Professor of Management and Organization
- Matthew Sarkees, Ph.D. (Pittsburgh) Assistant Professor of Marketing

The Graduate Faculty -- Penn State Harrisburg, The Capital College

- Melvin Blumberg, Ph.D. (Penn State) Professor of Management
- Terence A. Brown, D.B.A. (Maryland) Associate Professor of Transportation and Marketing
- Thomas Buttross, Ph.D. (Mississippi) Associate Professor of Professional Accountancy
- Refik Culpan, Ph.D. (NYU) Professor of Management and International Business
- Jacob De Rooy, Ph.D. (Rutgers) Associate Professor of Managerial Economics and Statistics
- Robert D'Intino, Ph.D. (Virginia Tech) Assistant Professor of Management
- Krishna S. Dhir, Ph.D. (Colorado) Professor of Business Administration
- Jean Harris, Ph.D. (Virginia Tech) Associate Professor of Professional Accountancy
- Erdener Kaynak, Ph.D. (Cranfield) Professor of Marketing
- Mukund S. Kulkarni, Ph.D. (Kentucky) Professor of Finance
- David A. Morand, Ph.D. (Cornell) Professor of Management
- Vedula N. Murti, Ph.D. (Pennsylvania) Assistant Professor of Economics and Statistics
- Kurt H. Parkum, Ph.D. (Wisconsin) Associate Professor of Management
- Parag C. Pendharkar, D.B.A. (Southern Illinois) Professor of Information Systems
- Robert D. Russell, Ph.D. (Pittsburgh) Assistant Professor of Management
- Stephen P. Schappe, Ph.D. (Ohio State) Associate Professor of Management
- John A. Sinisi, Ph.D. (Massachusetts) Assistant Professor of Economics
- Girish Subramanian, Ph.D. (Temple) Associate Professor of Information Systems
- Oranee Tawatnuntachai, Ph.D. (New Orleans) Associate Professor of Finance
- John M. Trussel, Ph.D. (George Washington) Associate Professor of Professional Accountancy
- Ugur Yucelt, Ph.D. (New School) Associate Professor of Marketing

The Graduate Faculty -- The Smeal College of Business

- Robert P. Crum, D.B.A. (Kentucky) Associate Professor of Accounting
- Edward Ketz, Ph.D., Associate Professor of Accounting

The Penn State Intercollege Master of Business Administration (iMBA) is an online degree program of Penn State Erie, The Behrend College; Penn State Great Valley, The School of Graduate Professional Studies; Penn State Harrisburg; and Smeal College of Business, Penn State University Park. The iMBA curriculum emphasizes cross-functional organizational thinking; focuses on business planning and strategy; closely follows the quality guidelines for accreditation of AACSB (American Assembly of Collegiate Schools of Business), the accrediting body affiliated with The International Association for Management Education; and uses cutting-edge instructional technology to transcend issues of time and space, and to support effective teaching and learning.

Within the context of these goals, the iMBA curriculum was developed around four core business areas and six themes. The core business areas include: Financial Reporting, Analysis, and Markets; Domestic and Global Economic Environments; Human Behavior in Organizations; Creation and Distribution of Goods and Services.

The themes were derived from values and concepts found in high performing organizations: Leadership; Strategic Planning; Customer and Market; Information and Analysis; Human Resources; Process Management.

These business areas and themes are integrated at the course level. Students apply knowledge developed in these areas to multidimensional problems and issues throughout the program, which includes two required one-week culminating or capstone

residential experiences.

Admission Requirements

Admission is granted only to candidates who demonstrate high promise of success for graduate work. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Applicants are required to take the Graduate Management Admission Test (GMAT). Applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English, must take the TOEFL (Test of English as a Foreign Language).

Admissions decisions are based on a review of a complete admission portfolio, including an application, a statement of intent, a current resume, official transcripts from each undergraduate and graduate institution attended, two letters of recommendation, and GMAT scores. An applicant's credentials are compared to the standards set by other candidates in the current application pool. Please see http://www.worldcampus.psu.edu/iMBA (Opens New Window) for additional program information.

Applicants must have completed the following prerequisites or the equivalent before they may matriculate: Quantitative Analysis (e.g., QUANT 310), Business Statistics (e.g., STAT 200 or MSIS 200), Accounting (e.g., ACCTG 211), Microeconomics (e.g., ECON 002) and Macroeconomics (e.g., ECON 004). Applicants who have developed relevant knowledge and skills in one or more of these areas through work experiences may demonstrate their proficiency through the application portfolio. A working knowledge of the Microsoft Office suite is required.

Master's Degree Requirements

The iMBA degree requires 48 credits distributed across the following courses: IMBA 501, IMBA 502, IMBA 513, IMBA 515, IMBA 516, IMBA 517, IMBA 521, IMBA 522, IMBA 523, IMBA 530, IMBA 531, IMBA 543, IMBA 544, IMBA 550, IMBA 560, IMBA 561, IMBA 562, IMBA 573, and IMBA 574. Attendance at the two one-week Residency Experiences is mandatory. Following the iMBA course schedule, which involves completing credits over eight consecutive terms, a part-time student can complete the program in two years (see http://www.worldcampus.psu.edu/pub/imba/afs_sched.shtml (Opens New Window)).

Other Relevant Information

The iMBA is an online graduate degree program delivered via World Campus (http://www.worldcampus.psu.edu/ (Opens New Window)). Students progress through the program in cohorts. They must be computer literate and have immediate, ready, and reliable access to a computer and the Internet. Although not all aspects of the course are delivered via electronic media, Internet access is required to successfully complete the course of instruction, as well as participate in online discussion groups. See (http://www.worldcampus.psu.edu/pub/imba/afs_equip.shtml (Opens New Window)) for the most current technical requirements. Students are required to complete the two one-week residency experiences. No alternatives and substitutions are possible.

Courses

Term One

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (iMBA)
501. Markets, Industry Analysis, and Business Strategy (3)
502. Financial and Accounting Tools (3)

Term Two

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (iMBA)
513. Data Analysis Resource Module (2)
515. Accounting for External Reporting (2)
516. Organizational Behavior and Performance(2)

Term Three

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (iMBA)
521. Strategic Analysis (2)
522. Financial Management (2)
523. Organizational Development, Intervention and Change (2)

Residency Experience I (required)

Term Four

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (iMBA)
517. Corporate Governance (2)
531. Project Management (2)
543. Accounting for Internal Decision Making (2)

Term Five

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (iMBA)
530. Marketing in a Global Environment (3)
544. Managing Human Resources(3)

Term Six

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (iMBA)
550. Corporate Information Strategy(3)
560. Corporate Innovative Strategies (3)

Term Seven

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (iMBA)
561. Global Operations and Supply Chain Management (3)
562. Global Business Management (3)

Term Eight

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (iMBA)
573. Strategic Planning (3)
574. Strategic Financial Decisions (3)

Residency Experience II (required)

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

INTERCOLLEGE MASTER OF BUSINESS ADMINISTRATION (IMBA) course list

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-07-007

Review Date: 6/17/08

Last updated by Publications: 9/18/09

Cell and Developmental Biology (CDB)

Current (Co-)Chair(s):
Hong Ma, Department of Biology, University Park campus
To be appointed, College of Medicine, Penn State Milton S. Hershey Medical Center

Program Home Page

Degrees Conferred

Ph. D., M.S.

The Graduate Faculty

- Sarah Ades, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Sarah Assmann, Ph.D., (Biology, Eberly College of Science)
- Avery August, Ph.D., (Veterinary and Biomedical Sciences, College of Agricultural Sciences)
- Michael Axtell, Ph.D., (Biology, Eberly College of Science)
- Craig Baumrucker,Ph.D., (Dairy and Animal Sciences, College of Agricultural Sciences)
- Douglas Cavener, Ph.D., (Biology, Eberly College of Science)
- Gong Chen, Ph.D., (Biology, Eberly College of Science)
- James Conner, Ph.D., (Neurosurgery, College of Medicine)
- Dan Cosgrove, Ph.D.,(Biology, Eberly College of Science)
- Diana Cox-Foster, Ph.D., (Entomology, College of Agricultural Sciences)
- Liwang Cui, Ph.D., (Entomology, College of Agricultural Sciences)
- Richard Cyr, Ph.D., (Biology, Eberly College of Science)
- Nina Fedoroff, Ph.D., (Biology, Eberly College of Science)
- Simon Gilroy, Ph.D., (Biology, Eberly College of Science)
- Will Hancock, Ph.D., (Bioengineering, College of Engineering)
- Wendy Hanna-Rose, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Ross Hardison, Ph.D.,(Biochemistry and Molecular Biology, Eberly College of Science)
- Eric Harvill, Ph.D., (Veterinary and Biomedical Sciences, College of Agricultural Sciences)
- Biao He, Ph.D., (Veterinary and Biomedical Sciences, College of Agricultural Sciences)
- Ahmed Heikal, Ph.D., (Bioengineering, College of Engineering)
- Andrew Henderson, Ph.D., (Veterinary and Biomedical Sciences, College of Agricultural Sciences)
- Kenneth Keiler, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Kouacou Konan, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Zhi-Chun Lai, Ph.D.,(Biology and BMB, Eberly College of Science)
- Aimin Liu, Ph.D., (Biology, Eberly College of Science)
- Bernhard Luscher, Ph.D., (Biology and BMB, Eberly College of Science)
- Hong Ma, Ph.D., (Biology, Eberly College of Science)
- Christian Malone, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Patricia McLaughlin, Ph.D., (Neural and Behavioral Sciences, College of Medicine)
- Pamela Mitchell, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- B. Tracy Nixon, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Curt Omiecinski, Ph.D., (Veterinary and Biomedical Sciences, College of Agricultural Sciences)
- Richard Ordway, Ph.D.,(Biology, Eberly College of Science)
- Randen Paterson, Ph.D.,(Biology, Eberly College of Science)
- Robert Paulson, Ph.D., (Veterinary and Biomedical Sciences, College of Agricultural Sciences)
- B. Franklin Pugh, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Joseph Reese, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Lorraine Santy, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Robert A. Schlegel, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Anthony Schmitt, Ph.D., (Veterinary and Biomedical Sciences, College of Agricultural Sciences)
- Erin Sheets, Ph.D., (Chemistry, Eberly College of Science)
- Song Tan, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Graham Thomas, Ph.D., (Biology and BMB, Eberly College of Science)
- Yanming Wang, Ph.D., (Biochemistry and Molecular Biology, Eberly College of Science)
- Kenneth Weiss, Ph.D.,(Biology, ECoS; Anthropology, College of Liberal Arts)
- Matthew Whim, Ph.D., (Biology, Eberly College of Science)
- Na Xiong, Ph.D., (Veterinary and Biomedical Sciences, College of Agricultural Sciences)
- Yinong Yang, Ph.D., (Plant Pathology, College of Agricultural Sciences)
- Ian Zagon, Ph.D., (Neural and Behavioral Sciences, College of Medicine)

The Intercollege Graduate Degree Program in Cell and Developmental Biology (IGDP in CDB) prepares graduates for diverse opportunities in academic institutions, pharmaceutical companies, private research foundations, governmental research and regulatory programs. The program includes faculty from 10 departments in the College of Agricultural Sciences, Engineering, Liberal Arts, and Eberly College of Science at the University Park campus and the College of Medicine at the Penn State Milton S. Hershey Medical Center. The IGDP in CDB is also supported by the Huck Institutes of Life Sciences which provides modern telecommunications facilities and sophisticated equipment for state-of-the-art research applications. Doctoral students not only receive education and training new principles and experimental approaches, but also practice communication skills in group discussions and informal seminars and explore various potential career opportunities before graduation. Two unique aspects are (1) optional dual mentors will provide students with a interdisciplinary and multidisciplinary training, stimulate scientific thinking using different perspectives, and prepare for a wide range of future career options; and (2) an optional internship will provide a mechanism for students to obtain practical experience in future professional settings or gain specialized training off campus.

General Admission Requirements

M.S. or Ph.D. degrees

Application deadline is January 10 for priority consideration.

1. Completed official Penn State Graduate School application
2. Paid nonrefundable application fee
3. Two official transcripts from each institution attended
4. Completed Integrative Biosciences Graduate Degree Program application
5. Application for a U.S. visa (International applicants only)
6. Graduate Record Examinations (GRE) general test scores
7. Three letters of recommendation
8. Statement of goals that pertains to the life sciences
9. All international applicants whose first language is not English or who have not received baccalaureate or masters degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test, a score of 213 on the computer-based test, or 80 points on the new Internet-based test with a minimum of 23 points on the new speaking portion is required for admission. The International English Language Testing System (IELTS) module provides an exam to test four mandatory skill areas: listening, reading, writing and speaking. All four modules are equally weighted in the evaluation process. The International English Language Testing System has been approved by the Graduate Council as an alternative exam to the TOEFL for international students applying to Penn State. A minimum composite score of 6.5 on the IELTS test is required for admission.
10. Students must have completed a bachelor's degree at an accredited college or university and have a minimum of a 3.0/4.0 junior/senior undergraduate grade-point average.

Program Requirements

M.S. or Ph.D. degrees

1. Foundation of basic knowledge in cell biology, developmental biology, biochemistry, and molecular biology. The IGDP in CDB requires at least 9 credits in one or more of these disciplines, taken either as an undergraduate or as a part of the graduate curriculum. The following courses serve to fulfill this requirement.
    - IBIOS 590. COLLOQUIUM (2 credits) All students are required to enroll for 4 credits of Colloquium. Students receive A-F quality grades.
    - IBIOS 592. CURRENT RESEARCH SEMINARS (2 credits) Students are required to enroll for 4 credits. Students receive A-F quality grades.
    - BMMB 501 (*). CORE CONCEPTS IN BIOMOLECULAR SCIENCES (5 credits) Students receive A-F quality grades.
    - IBIOS 572 (*). BENCHMARK PAPERS (2 credits) Students are required to enroll for 2 credits. Students receive A-F quality grades.
    - BMMB 541 (*). MOLECULAR BIOLOGY OF ANIMAL DEVELOPMENT (3 credits) Students receive A-F quality grades.
    - * The paperwork has been filed to seek approval of each of these as a standing course.
2. IBIOS 596. INDEPENDENT STUDIES: LABORATORY ROTATIONS (1-3 credits per semester) Students receive an R (satisfactory/passing) or F (unsatisfactory/failing). Only R credits are counted for credit totals.
3. IBIOS 595. INTERNSHIP (1 credit, optional) Students receive an R (satisfactory/passing) or U (unsatisfactory/failing). Only R credits are counted for credit totals.
4. IBIOS 591. ETHICS IN THE LIFE SCIENCES (1 credit) Students receive A-F quality grades.
5. IBIOS 600 THESIS RESEARCH (variable credits)
6. IBIOS 601 Ph.D. DISSERTATION FULL-TIME (0 credits)
7. IBIOS/VSC 602 SUPERVISED EXPERIENCE IN COLLEGE TEACHING (optional, 1 credit), one semester is encouraged after the first year in residence. International Fellows must pass an English proficiency exam before teaching.
8. The Graduate School requires all graduate students to maintain a 3.0 grade-point average.

English Requirement for International Students

The English Requirement for International students in IBIOS is that prescribed by the Graduate School. All entering international students, whose first language is not English, will be required to take a Test of Spoken English (TSE) which is administered by the University's Center for English as a Second Language (ESL). Exceptions may be made if the entering applicant received a baccalaureate or Master's from an institution which instructs in English.

Students with teaching responsibilities are required to take the American English Oral Communicative Proficiency Test (AEOCPT) prior to entering the classroom. The AEOCPT is given at the beginning of fall and spring semesters. All international students are required to pre-register for this test. The test scores from the AEOCPT (American English Oral Communicative Proficiency Test) are posted on the University's Administrative Information System (AIS) computer. Below is the course of action or the various TSE (Test of Spoken English) score ranges.

>250 approved for teaching and the ESL (English as a Second Language) requirement will be satisfied.

230-249 required to schedule and pass ESL 118G.

200-229 required to pass ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

<200 required to schedule and pass with the grade of A in ESL 115G, before ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

* At the end of this course, students are re-tested. Based upon these test results, students are either approved for teaching, placed in a subsequent ESL course, or asked to retake the course.

For students who enroll at the Hershey Medical School who need to take one or more of the above English courses can fulfill the requirements on one of the following ways. First, take the course at UP. If the student needs to commute between the two campuses but does not have a car, the UP-HY shuttle service can potentially be used. Secondly, a student may take a similar course at Hershey or an area college, approved by the CDB program curriculum committee.

Students, who are required to enroll in ESL courses, must complete the ESL requirement by the end of the second semester of residency. Students who fail to satisfy this requirement may be terminated from the IBIOS program, at the discretion of the Co-Chairs.

M.S. Degree Requirements

For all master's degrees, a minimum of 30 graduate credits and a 3.0 overall GPA are required. At least 18 credits at the 500-level or above, combined, (with at least 6 credits of 500-level in professional master's programs) must be included in the program. If pursuing a Masters thesis option, up to 6 IBIOS 600 credits may be A-F graded and 12 credits need to be in the major at the 500 level (excluding IBIOS 600). IBIOS 595 (Internship) and 596 (Rotations) credits all count toward the 30 credits. All CDB graduate students must successfully complete required courses and/or electives (see below) during the first two years of their graduate education. If all course credits and requirements are met, students do not have to be registered for classes while writing and/or defending his/her work. The student selects a thesis committee (upon consultation with faculty advisor), writes a thesis, and defends his/her work. If pursuing a Masters non-thesis option, the student must have a first authored manuscript (based on his/her research) that has been either accepted and/or published in a peer reviewed journal. The manuscript is given to at least the faculty advisor and the IGDP Chair for evaluation.

Students must present their thesis in accordance with the Penn State guidelines as described in the *THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses*. Current copies may be obtained from website: http://www.gradsch.psu.edu/current/thesis/guide.html (Opens New Window), or from the Thesis Office, 115 Kern Building, University Park, PA 16802; 814-865-5448.

Ph.D. Degree Requirements

Ph.D. students must have a minimum of 30 credits and a 3.0 overall GPA through out the program. The course requirements are essentially the same as that required for the M.S. degree listed above, with some discretion left to the student and advisor.

Grade Point Average/Unsatisfactory Scholarship: Students are required to have a minimum grade-point average of 3.0 through out the course of their training. Furthermore, the student must have a 3.0 to take the doctoral candidacy, the comprehensive and final oral examinations. One or more failing grades or a cumulative grade-point average below 3.0 may be considered evidence of unsatisfactory scholarship and be grounds for dismissal from the program.

English Competence: A candidate for Ph.D. in the CDB program is required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking, as part of the language and communication requirements. The CDB program has several required courses, all of which train students to develop and improve skills in reading, writing, and speaking in English. Students are required to make oral presentations and complete written assignments. The instructors of these courses will assist in evaluating the competence in using English and those students identified as being deficient in English will be required to take remedial activities, such as additional courses, writing assignments, and tutorials. International students are advised that the submission of minimum requirements for TOEFL does not constitute the fulfillment of the English competence requirement. English competence must be demonstrated before or at the candidacy exam.

Besides coursework, research, and teaching, IGDP in CDB doctoral students participate in the following:

Candidacy Exam: This exam should be taken by the end or during the student's third semester in the CDB Program. The student will be assigned one scientific papers from the primary literature to read and analyze for approximately one week. The papers will be selected based upon the students' background and coursework. The analysis should involve exploring the relevant literature as well as the fundamental issues in Cell and Developmental Biology. Following this independent research the student will take an oral exam. The oral exam will be administered by at least three members of the graduate program. The overall goal of the exam is to assure that the student has an intellectual foundation in Cell and Developmental Biology. The exam is designed to evaluate basic knowledge in Cell and Developmental Biology and related disciplines as well as the students' ability to integrate this understanding to effectively evaluate experimental design, results, and the conclusions drawn. In the event that the student does not pass this exam, the student's committee will make a recommendation as to whether to offer another opportunity or to terminate the student's enrollment in the program.

Comprehensive Examination: Evaluation via the Doctoral Committee to determine the feasibility of proposed research and the preparedness of the student. Students must be registered for classes (typically IBIOS 600) the semester they take this exam.

Doctoral Committee: Upon successful completion of the Candidacy Examination, the student in consultation with the mentors will, as soon as possible, select a doctoral committee. The committee will consist of three members of the IGDP in CDB and one faculty member who is not a member of the IGDP in CDB. One members of the committee must be from a different department from the home department(s) of the mentor(s). This committee is responsible for supervising the academic program and monitoring the progress of the student towards his/her degree. Doctoral Thesis Committee Composition is based on the Graduate Degree Programs Bulletin (http://bulletins.psu.edu/bulletins/whitebook/degree_requirements.cfm?section=degreeReq1) published by the Graduate School regarding Doctoral Committees and requires:

- 4 person minimum of approved PSU Graduate Faculty.
- 2 members must be inside the major and 1 member must be outside the major. Note - the outside member must be member of the approved PSU Graduate Faculty. The outside member for intercollege graduate programs may be inside the major but committee membership must have representation from more than one department.
- For students with dual mentors, both mentors may serve on the committee. One of the mentors should be designated as the primary mentor. The outside member must not be in the same department as the primary mentor.
- A person not affiliated with PSU may be added as a special member (beyond the 4 members of the approved PSU Graduate Faculty) upon recommendation of the head of the program and approval of the graduate dean.
- Have committee chair or one of the co-chairs be a member of the approved PSU Graduate Faculty. Typically it's the faculty advisor.
- The doctoral candidate and three committee members must be physically present for the comprehensive exam and defense. No more than one person may be present via telephone. Telephone or video conference arrangements must be approved by the Dean of the Graduate School.
- Need approval of 2/3 of the committee members for passing comprehensive exam and defense dissertation.

Ph.D. Defense: Evaluation via the Doctoral Committee of the thesis research.

Students must present their thesis in accordance with the Penn State guidelines as described in the *THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses*. Current copies may be obtained from website: http://www.gradsch.psu.edu/current/thesis/guide.html (Opens New Window), or from the Thesis Office, 115 Kern Building, University Park, PA 16802; 814-865-5448.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Last Revised by the Department: Spring Semester 2007
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Last updated by Publications: 8/19/09

Cell and Molecular Biology (CMBIO)

Program Home Page (Opens New Window)

HENRY J. DONAHUE, *Director of the Cell and Molecular Biology Graduate Program*
College of Medicine, Penn State Milton S. Hershey Medical Center
Hershey, PA 17033
717-531-1045

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- David A. Antonetti, Ph.D. (Penn State) Associate Professor of Cellular and Molecular Physiology, and Ophthalmology
- Alistair J. Barber, Ph.D. Associate Professor of Ophthalmology, and Cellular and Molecular Physiology
- Colin Barnstable, Ph.D., Professor and Chair of Neurology, Neural and Behavioral Sciences
- Melvin L. Billingsley, Ph.D. (George Washington) Professor of Pharmacology
- Judith S. Bond, Ph.D. (Rutgers) Professor and Chair of Biochemistry and Molecular Biology
- Robert H. Bonneau, Ph.D. (Penn State) Professor of Microbiology and Immunology
- Sarah K. Bronson, Ph.D. (Washington) Associate Professor of Cellular and Molecular Physiology
- Laura Carrel, Ph.D., Associate Professor, Department of Biochemistry and Molecular Biology
- Vincent Chau, Ph.D. (Virginia) Professor of Cellular and Molecular Physiology
- Hua Cheng, Ph.D., Assistant Professor, Department of Medicine, Microbiology and Immunology
- Keith C. Cheng, M.D., Ph.D. (NYU/Washington) Associate Professor of Pathology, and Biochemistry and Molecular Biology
- Hui-Ling Chiang, Ph.D. (Harvard) Professor of Cellular and Molecular Physiology
- Neil D. Christensen, Ph.D. (Auckland, New Zealand) Associate Professor of Pathology, and Microbiology and Immunology
- Gary A. Clawson, M.D., Ph.D. (Miami/Michigan State) Professor of Pathology, and Biochemistry and Molecular Biology
- James R. Connor, Ph.D. (California, Berkeley) Distinguished Professor and Vice Chair, Department of Neurosurgery
- Richard J. Courtney, Ph.D. (Syracuse) Professor and Chair of Microbiology and Immunology
- Rebecca C. Craven, Ph.D. (Tennessee) Associate Professor of Microbiology and Immunology
- Henry J. Donahue, Ph.D. (California, Santa Barbara) Baker Professor and Vice Chair, Department of Orthopaedics and Rehabilitation; Professor of Cellular and Molecular Biology
- Kristin A. Eckert, Ph.D. (Wisconsin) Associate Professor of Pathology, and Biochemistry and Molecular Biology
- James M. Flanagan, Ph.D. Professor of Biochemistry and molecular Biology
- Joanna Floros, Ph.D.(Temple) Evan Pugh Professor of Cellular and Molecular Physiology, Pediatrics, and Obstetrics and Gynecology
- Thomas W. Gardner, M.D., M.S. (Jefferson Medical College) Professor of Ophthalmology, and Cellular and Molecular Physiology
- Channe D. Gowda, Ph.D. (U of Mysore, India) Professor of Biochemistry and Molecular Biology
- Sergei A. Grigoryev, Ph.D. (Moscow State U) Assistant Professor of Biochemistry and Molecular Biology
- Edward J. Gunther, Ph.D. (Yale) Assistant Professor of Medicine
- James M. Hammond, M.D. (Washington, St. Louis) Professor of Medicine, and Cellular and Molecular Physiology
- Jianming Hu, M.D., Associate Professor of Micriobiology and Immunology
- Rosalyn B. Irby, Ph.D. Assistant Professor of Medicine
- Harriet C. Isom, Ph.D. (Illinois) Distinguished Professor of Microbiology and Immunology; Professor of Pathology
- Leonard S. Jefferson, Jr., Ph.D. (Vanderbilt) Evan Pugh Professor and Chair of Cellular and Molecular Physiology
- Michael Katzman, M.D. (Columbia) Associate Professor of Medicine, and Microbiology and Immunology
- Ralph L. Keil, Ph.D. (Cornell) Associate Professor of Biochemistry and Molecular Biology
- Mark Kester, Ph.D. (SUNY, Buffalo) Professor of Pharmacology
- Charles H. Lang, Ph.D. (Hahnemann) Professor of Cellular and Molecular Physiology, and Surgery
- Kathryn F. LaNoue, Ph.D. (Yale) Professor of Cellular and Molecular Physiology
- Philip Lazarus, Ph.D. (McGill, Montreal) Professor of Pharmacology and Health Evaluation Sciences
- Robert Levenson, Ph.D. (SUNY, Stony Brook) Professor of Pharmacology
- Thomas P. Loughran, Jr., M.D. Professor of Medicine
- Christopher J. Lynch, Ph.D. (Northeastern) Associate Professor of Cellular and Molecular Physiology
- Jan M. McAllister, Ph.D. (California, San Diego) Associate Professor of Cellular and Molecular Physiology
- Patricia J. McLaughlin, D.Ed. (Penn State) Professor of Neural and Behavioral Sciences
- Craig M. Meyers, Ph.D. (California, Los Angeles) Professor of Microbiology and Immunology
- David Mu, Ph.D., Associate Professor of Pathology, and Biochemistry and Molecular Biology
- Kathleen M. Mulder, Ph.D. (SUNY, Buffalo) Professor of Pharmacology
- Yuk-Chow Ng, Ph.D. (Michigan) Associate Professor of Pharmacology
- Christopher Niyibizi, Ph.D. (McGill, Montreal) Associate Professor of Orthopaedics and Rehabilitation
- Christopher Norbury, Ph.D. (U Dundee, Scotland) Assistant Professor of Microbiology and Immunology
- Leslie Parent, M.D. (Duke) Associate Professor of Medicine, and Microbiology and Immunology
- Anthony E. Pegg, Ph.D. (Cambridge) Evan Pugh Professor of Cellular and Molecular Physiology, and Pharmacology; J. Lloyd Huck Professor of Cell and Molecular Biology
- Blaise Z. Peterson, Ph.D. (Washington) Associate Professor of Cellular and Molecular Physiology
- David S. Phelps, Ph.D. (Temple) Professor of Pediatrics
- Maricamen D. Planas-Silva (Baylor College of Medicine) Assistant Professor of Pharmacology
- John P. Richie, Jr., Ph.D. Professor of Health Evaluation Sciences
- Timothy M. Ritty, Ph.D. Assistant Professor of Orthopaedics and Rehabilitation
- Gavin P. Robertson, Ph.D. (California, Riverside) Assistant Professor of Pharmacology, Pathology, and Dermatology
- Ira J. Ropson, Ph.D. (Johns Hopkins) Associate Professor of Biochemistry and Molecular Biology
- Jeffery Sample, Ph.D., Professor of Microbiology and Immunology
- Todd Schell, Ph.D., Assistant Professor of Microbiology and Immunology
- Cara-Lynne Schengrund, Ph.D. (Seton Hall) Professor of Biochemistry and Molecular Biology
- Ian A. Simpson, Ph.D. (University College, London) Professor of Neural and Behavioral Sciences
- Lawrence II Sinoway, M.D. Professor of Medicine
- Jill P. Smith, Ph.D. (Florida) Professor of Medicine
- David J. Spector, Ph.D. (Pennsylvania) Associate Professor of Microbiology and Immunology
- Thomas C. Vary, Ph.D. (Penn State) Professor of Cellular and Molecular Physiology

- Michael F. Verderame, Ph.D. (Columbia) Associate Professor of Medicine; Assistant Professor of Microbiology and Immunology
- Kent E. Vrana, Ph.D. Elliot S. Vesell Professor and Chair of Pharmacology
- Hong-Gang Wang, PhD., Lois H. Berstler Professor of Pharmacology
- John W. Wills, Ph.D. (Tennessee) Professor of Microbiology and Immunology
- Jun You, Ph.D. Assistant Professor of Orthopaedics and Rehabilitation
- Ian S. Zagon, Ph.D. (Colorado) Distinguished Professor of Neural and Behavioral Sciences
- Jiyue Zhu, Ph.D. (Dartmouth) Assistant Professor of Cellular and Molecular Physiology

The graduate program in Cell and Molecular Biology (CMBIO) is designed to prepare students for careers in basic or applied research. Two hallmarks of the program are its interdisciplinary nature and the close contact that is maintained between faculty and students. The seventy-plus members of the program represent a cross-section of research from twelve departments: Biochemistry and Molecular Biology, Cellular and Molecular Physiology, Health Evaluation Sciences, Medicine, Microbiology and Immunology, Medicine, Neural and Behavioral Sciences, Ophthalmology, Orthopaedics and Rehabilitation, Pathology, Pediatrics, Pharmacology, and Surgery. Graduate students benefit from the diverse base of training and research opportunities provided by the faculty. All courses are available at the College of Medicine(Opens New Window).

Research carried out by participating faculty encompasses all subfields of cell and molecular biology, including membrane structure, receptors, and modulators; the role of extracellular matrix in cellular function; organelle assembly, structure, and function; cell division, differentiation, adhesion, communication, and movement; recombination, organization, and expression of genes; gene mapping and recombinant DNA; and regulation of gene expression. Modern, well-equipped laboratories are available for graduate students from the molecular to tissue level.

Admission Requirements

Qualified students with undergraduate preparation in the biological, biochemical, or physical sciences and an overall grade-point average of 3.00 or better will be considered for admission. The best-qualified applicants will be accepted on a space-available basis. Applications must include transcripts, three letters of recommendation, Graduate Record Examination scores (or scores from a comparable examination accepted by the graduate program, e.g., MCAT exam), and a brief personal essay summarizing the background and professional goals of the applicant.

Doctoral Degree Requirements

Ph.D. candidates in the Cell and Molecular Biology Graduate program take The College of Medicine Core Curriculum (BMS 501 Regulation of Cellular and Systemic Energy Metabolism, BMS 502 Cell and Systems Biology, and BMS 503 Flow of Cellular Information) in the Fall semester to provide a strong foundation. Additional required courses include the complete Anatomy Selective (ANAT/PHARM 584 Human Anatomy and Development A: Human Development, ANAT/PHARM 585 Human Anatomy and Development B: general Human Anatomy, ANAT/PHARM 586 Human Anatomy and Development C: Stem Cell Biology and Regenerative Medicine for a total of 3 credits), as well as CMBIO (MICRO) 554 Principles of Immunology, HES 515 Biostatistics, and IBIOS 591 Ethics in the Life Sciences. An additional 7 credits of electives will be chosen based upon the individual student's career goals. Each student will be required to complete the following successfully: (1) A candidacy examination covering the general course material that will consist of a written portion and an oral portion designed to explore in depth an area of research in cell and molecular biology. The examination will be given after completion of the spring semester of the first year. (2) A comprehensive examination consisting of a written research proposal and an oral defense of that proposal will be required after completion of the spring semester of the second year. (3) An original research project under the supervision of a Cell and Molecular Biology faculty adviser. (4) A thesis. (5) A final oral defense of the thesis. The program is designed for completion within four years, but this can vary depending on the individual progress of the student.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. Graduate assistantships in the program are awarded by the Cell and Molecular Biology Program Committee. After the second year, Cell and Molecular Biology students are eligible for departmental teaching or research assistantships and other assistantships supported by grant funds of individual faculty members. The program encourages all Ph.D. candidates to apply for fellowships, scholarships, and stipend support from outside sources. For students obtaining outside fellowships, scholarships, and stipend support, supplementation to the level of the assistantships will be provided.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CELL AND MOLECULAR BIOLOGY (CMBIO) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/26/04

Last updated by Publications: 12/21/09

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Blue Sheet Item #: 35-07-429

Review Date: 6/12/07

Chemical Engineering (CH E)

Program Home Page (Opens New Window)

ANDREW ZYDNEY, *Head of Chemical Engineering*
160 Fenske Laboratory
814-865-2574

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Antonios Armaou, Ph.D. (UCLA) Associate Professor of Chemical Engineering
- Abdellaziz Ben-Jebria, Ph.D. (U Paris) Professor of Chemical Engineering
- Ali Borhan, Ph.D. (Stanford) Professor of Chemical Engineering
- Patrick Cirino, Ph.D. (Cal Tech) Assistant Professor of Chemical Engineering
- Wayne R. Curtis, Ph.D. (Purdue) Professor of Chemical Engineering and Biotechnology
- Ronald P. Danner, Ph.D. (Lehigh) Professor Emeritus of Chemical Engineering
- Thomas E. Daubert, Ph.D. (Penn State) Professor Emeritus of Chemical Engineering
- Kristen Fichthorn, Ph.D. (Michigan) Merrell R. Fenske Professor of Chemical Engineering
- Henry C. Foley, Ph.D. (Penn State) Dean, College of Information Sciences and Technology; Professor of Chemical Engineering
- Enrique D. Gomez, Ph.D. (California, Berkeley) Assistant Professor of Chemical Engineering
- Jong-In Hahm, Ph.D. (U of Chicago) Assistant Professor of Chemical Engineering
- Michael Janik, Ph.D. (Virginia) Assistant Professor of Chemical Engineering
- Seong Han Kim, Ph.D. (Northwestern) Associate Professor of Chemical Engineering
- Wallis Lloyd, Ph.D. (Minnesota) Adjunct Professor of Chemical Engineering
- Costas D. Maranas, Ph.D. (Princeton) Donald B. Broughton Professor of Chemical Engineering
- Janna Maranas, Ph.D. (Princeton) Associate Professor of Chemical Engineering
- Themis Matsoukas, Ph.D. (Michigan) Professor of Chemical Engineering
- Scott T. Milner, Ph.D. (Harvard) Joyce Chair Professor of Chemical Engineering
- Joseph Perez, Ph.D. (Penn State) Senior Research Scientist
- Robert Rioux, Ph.D. (California, Berkeley) Friedrich G. Helfferich Assistant Professor of Chemical Engineering
- Chunshan Song, Ph.D. (Osaka) Professor of Fuel Science
- James S. Ultman, Ph.D. (Delaware) Professor Emeritus of Chemical Engineering
- M. Albert Vannice, Ph.D. (Stanford) Professor Emeritus of Chemical Engineering
- Darrell Velegol, Ph.D. (Carnegie Mellon) Professor of Chemical Engineering
- James S. Vrentas, Ph.D. (Delaware) Professor of Chemical Engineering
- Andrew Zydney, Ph.D. (MIT) Professor of Chemical Engineering

Course offerings or research facilities are available in the following areas: applied thermodynamics, physiological transport studies, biotechnology, protein engineering, catalysis and surface science, polymer and colloid science, transport phenomena, nanotechnology, computational chemical engineering, molecular dynamics, tribology and lubrication.

Admission Requirements

Scores from the Graduate Record Examination (GRE) are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

To be admitted, a student should be a graduate of an accredited major in chemical engineering or the equivalent. Graduates of other accredited engineering or physical science majors may be admitted but will be required to make up certain undergraduate deficiencies without graduate credit. Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students.

Master's Degree Requirements

A minimum of 18 course credits is required and must include at least 12 credits in the 500-series chemical engineering courses. A thesis is required. There is no communication or language requirement.

Continuous registration is required for all graduate students until the thesis is approved.

Doctoral Degree Requirements

A minimum of 30 graduate course credits is required and must include a minimum of 15 credits of 500-series Chemical Engineering courses taken at the University. There is no communication or language requirement. The comprehensive examination consists of a written research proposal or project defended orally after it has been accepted.

Continuous registration is required for all graduate students until the thesis is approved.

Other Relevant Information

An option for specialization in Biomolecular Transport Dynamics is available to doctoral students. This option provides interdisciplinary education in biotransport phenomena, molecular and cell biology, and medical applications.

Programs leading to a minor in Chemical Engineering are available to both M.S. and Ph.D. candidates who wish to complement studies in their major fields with a broader knowledge of chemical thermodynamics, transport phenomena, and reactor design.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CHEMICAL ENGINEERING (CH E) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/03/04

Last updated by Publications: 8/11/09

Chemistry (CHEM)

Program Home Page (Opens New Window)

BARBARA GARRISON, *Head of the Department*
101 Chemistry Research Building
814-865-6553

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- David L. Allara, Ph.D. (California, Los Angeles) Professor of Polymer Science and Chemistry
- Harry R. Allcock, Ph.D. (London) Evan Pugh Professor of Chemistry
- James B. Anderson, Ph.D. (Princeton) Evan Pugh Professor of Chemistry
- Anne M. Andrews, Ph.D. (American U) Associate Professor of Molecular Toxicology
- John B. Asbury, Ph.D. (Emory) Assistant Professor of Chemistry
- John V. Badding, Ph.D. (California, Berkeley) Professor of Chemistry
- Alan J. Benesi, Ph.D. (California, Berkeley) Lecturer in Chemistry
- Stephen J. Benkovic, Ph.D. (Cornell) Evan Pugh Professor and Eberly Chair in Chemistry
- Philip C. Bevilacqua, Ph.D. (U of Rochester) Professor of Chemistry
- David D. Boehr, Ph.D. (McMaster) Assistant Professor of Chemistry
- J. Martin Bollinger, Ph.D. (MIT) Professor of Biochemistry and Molecular Biology, and Chemistry
- Squire J. Booker, Ph.D. (MIT) Associate Professor of Biochemistry and Molecular Biology, and Chemistry
- A. Welford Castleman, Ph.D. (Polytechnic Institute of Brooklyn) Evan Pugh Professor of Chemistry
- Gong Chen, Ph.D. (Columbia) Assistant Professor of Chemistry
- Andrew G. Ewing, Ph.D. (Indiana U) J. Lloyd Huck Chair in Natural Sciences and Professor of Chemistry
- Kenneth S. Feldman, Ph.D. (Stanford) Professor of Chemistry
- Raymond L. Funk, Ph.D. (California) Professor of Chemistry
- Barbara J. Garrison, Ph.D. (California, Berkeley) Shapiro Professor of Chemistry
- Michael Green, Ph.D. (Chicago) Associate Professor of Chemistry
- Sharon Hammes-Schiffer, Ph.D. (Stanford) Eberly Professor of Biotechnology and Schaffer Professor of Chemistry
- Lasse Jensen, Ph.D. (Rijksuniversiteit Groningen) Assistant Professor of Chemistry
- Christine Keating, Ph.D. (Penn State) Associate Professor of Chemistry
- Carsten D. Krebs, Ph.D. (Max Planck Institut für Strahlenchemie) Associate Professor of Biochemistry and Molecular Biology, and Chemistry
- Tae-Hee Lee, Ph.D. (Georgia Inst of Tech) Assistant Professor of Chemistry
- Thomas E. Mallouk, Ph.D. (California, Berkeley) DuPont Professor of Materials Chemistry
- Mark Maroncelli, Ph.D. (California, Berkeley) Professor of Chemistry
- Przemyslaw Maslak, Ph.D. (Kentucky) Associate Professor of Chemistry
- Bratoljub H. Milosavljevic, Ph.D. (U of Belgrade) Lecturer in Chemistry
- Karl T. Mueller, Ph.D. (California, Berkeley) Professor of Chemistry
- William G. Noid, Ph.D. (Cornell) Assistant Professor of Chemistry
- Scott Phillips, Ph.D. (California, Berkeley) Assistant Professor of Chemistry
- Raymond E. Schaak, Ph.D. (Penn State) Associate Professor of Chemistry
- Ayusman Sen, Ph.D. (Chicago) Professor of Chemistry
- Scott A. Showalter, Ph.D. (Washington U) Assistant Professor of Chemistry
- Dan G. Sykes, Ph.D. (U of Alberta) Senior Lecturer and Director
- Steven M. Weinreb, Ph.D. (Rochester) Russell and Mildred Marker Professor of Natural Products Chemistry
- Paul S. Weiss, Ph.D. (California, Berkeley) Professor of Chemistry
- Mary Beth Williams, Ph.D. (North Carolina, Chapel Hill) Associate Professor of Chemistry
- Nicholas Winograd, Ph.D. (Case Western Reserve) Evan Pugh Professor of Chemistry

The Ph.D. program in Chemistry provides students with a broad background in chemistry and intensive research experience culminating in the preparation of a formal thesis. The goal of the program is to prepare students for a variety of careers in academia, government, or industry. The exceptionally high quality of our laboratory and computer facilities enables us to provide students with outstanding research opportunities. Distinguished visiting scholars conduct informal discussions each week at a departmental colloquium.

The Chemical Biology option introduces graduate students to training with more active, multidisciplinary, and group learning experience. Students in the option will have the opportunity to participate in the Life Sciences Consortium seminars and will have dual mentorship.

Admission Requirements

Scores from the Graduate Record Examination (GRE) are required for admission. In extenuating circumstances, a student may be admitted provisionally for graduate study in the program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

For admission, at least integral calculus plus one year's work in general physics, organic chemistry, physical chemistry, and either analytical or inorganic chemistry are normally required. Students who have appropriate course backgrounds and who present a 2.50 average (on a 4.00 scale) in all undergraduate courses in chemistry, physics, and mathematics will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 2.50 grade-point average may be made for students with special backgrounds, abilities, and interests.

Master's Degree Requirements

The program of the M.S. candidate must include a total of at least 30 graduate-level course credits (CHEM 431W, CHEM 450, CHEM 452, CHEM 457, CHEM 494, and CHEM 500 may not be included in this credit count.)

Additional requirements of the M.S. program are that the candidate must write a thesis and must defend this thesis at an oral

examination. The thesis will be accomplished under the sponsorship of a faculty member, and the candidate must schedule at least 6 credits of CHEM 600 (for a thesis) or CHEM 589 (for a research report) to fulfill this requirement. The candidate's attainments under a thesis must be approved by a committee of at least three faculty members, one of whom will be the candidate's sponsor.

Qualifying examinations in analytical, biological, inorganic, organic, and physical chemistry will be given to all new students upon entrance in the fall semester. These exams cover subject matter at the level of the basic courses offered for the B.S. degree in chemistry at Penn State. For certification as an M.S. candidate, proficiency in two areas is required. These must include physical chemistry. Such proficiency may be demonstrated either by (1) passing the area examination upon entrance, or (2) obtaining a grade-point equivalent of 3.0 in at least 3 credits of graduate-level course work in the area. The courses to be used to fulfill this latter option will be designated by the graduate counseling committee. This course work must be completed successfully during the student's first two semesters of residence.

A final oral examination will be administered by a committee consisting of the student's research preceptor and two other faculty members. This examination is scheduled after the M.S. thesis has been completed.

Doctoral Degree Requirements

Candidates for the Ph.D. degree in Chemistry must meet the following requirements established by the department faculty.

A Ph.D. candidate shall be required to take a minimum of five 3-credit courses in chemistry at the 400-500 level (only CHEM 408, CHEM 430, and CHEM 448 can be used). The candidate's doctoral committee may require additional specific courses.

Qualifying examinations in analytical, biological, inorganic, organic, and physical chemistry will be given to all new students upon entrance in the fall semester. These exams cover subject matter at the level of the basic courses offered for the B.S. degree in chemistry at Penn State. As a part of the requirements for certification as a Ph.D. candidate, each student will be expected to demonstrate proficiency in three areas of chemistry, including physical chemistry. Such proficiency may be demonstrated either by (a) passing the area examination upon entrance, or (b) obtaining a grade-point equivalent of 3.0 in at least 3 credits of graduate-level course work in the area. The courses to be used to fulfill this latter option will be designated by the graduate counseling committee. This course work must be completed successfully during the student's first two semesters of residence.

In order to qualify for the oral comprehensive examination, a Ph.D. candidate must first obtain a grade of 3.0 or better on 3 credits of CHEM 500 (by writing the requisite number of seminar reports, proposals, and presenting in an area seminar).

A Ph.D. candidate shall take the oral comprehensive examination during his or her first two and one-half years of residency.

Every Ph.D. candidate shall present at least one area or department seminar during the course of residency.

A final oral examination based on a defense of the doctoral thesis is required of all candidates. This exam is given as a formal public seminar with a subsequent closed meeting with the doctoral committee.

Biogeochemistry Dual-Title Degree Program

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree Program. Students in the Biogeochemistry Dual Title program are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. Additional coursework from an approved list of courses is required. All students must pass a candidacy examination that includes an assessment of their potential in the field of biogeochemistry. Chemistry's existing candidacy procedure is to be augmented by a biogeochemistry examination, the structure and timing of this exam will be determined jointly by the dual-title and major program. A single candidacy result is to be reported to the graduate school once this process is complete. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise in biogeochemistry. The field of biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of biogeochemistry is required.

Candidacy exams must incorporate a biogeochemistry component; for Chemistry students, an oral exam in biogeochemistry will be administered. See the Biogeochemistry Dual Title listing in the Graduate Degree Programs Bulletin for further details regarding program requirements.

Other Relevant Information

All candidates for advanced degrees must schedule CHEM 602, Supervised Experience in College Teaching, for 1 to 2 credits for at least one semester. This requirement may be waived or modified for students who have attained satisfactory competence in teaching as a result of prior experience.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. It is important to note that department policy limits financial support from department funds to the first two years of graduate study of an M.S. candidate and to the first five years of graduate study of a Ph.D. candidate. Financial support beyond these periods is permitted from other than department funds, e.g., a research assistantship funded from an individual faculty member's research grant(s).

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CHEMISTRY (CHEM) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04
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Review Date: 4/15/08
UCA Revision#1: 11/8/06
Last updated by Publications: 8/26/09

Civil Engineering (C E)

Program Home Page (Opens New Window)

PEGGY A. JOHNSON, *Head of the Department of Civil and Environmental Engineering*
212 Sackett Building
814-863-3084

Degrees Conferred:

Ph.D., M.S., M.Eng.

The Graduate Faculty

- Rachel A. Brennan, Ph.D. (Illinois, Urbana-Champaign) Assistant Professor of Civil Engineering
- William D. Burgos, Ph.D. (Virginia Tech) Associate Professor of Environmental Engineering
- Fred S. Cannon, Ph.D. (Illinois, Urbana-Champaign) P.E. Professor of Environmental Engineering
- Brian A. Dempsey, Ph.D. (North Carolina) Professor of Environmental Engineering
- Eric T. Donnell, Ph.D. (Penn State) Assistant Professor of Civil Engineering
- Christopher J. Duffy, Ph.D. (New Mexico Institute of Mining and Technology) P.H. Professor of Civil Engineering
- William J. Gburek, Ph.D. (Penn State) Adjunct Associate Professor of Civil Engineering
- Michael Gooseff, Ph.D. (Colorado) Assistant Professor of Civil Engineering
- David F. Hill, Ph.D. (California, Berkeley) Associate Professor of Civil Engineering
- Peggy A. Johnson, Ph.D. (Maryland) Head; Professor of Civil Engineering
- Paul P. Jovanis, Ph.D. (California, Berkeley) Professor of Civil Engineering
- Bo Kasal, Ph.D. (Oregon State) Hankin Chair of Residential Building Construction
- Jeffrey A. Laman, Ph.D. (Michigan) P.E. Associate Professor of Civil Engineering
- Daniel G. Linzell, Ph.D. (Georgia Tech) P.E. Associate Professor of Civil Engineering
- Bruce E. Logan, Ph.D. (California, Berkeley) Kappe Professor of Environmental Engineering
- Maria M. Lopez de Murphy, Ph.D. (Michigan) Will Assistant Professor of Civil Engineering
- Jack V. Matson, Ph.D. (Rice) P.E. Professor of Environmental Engineering
- Angelica Palomino, Ph.D. Hartz Family Career Development Professor; Assistant Professor of Civil Engineering
- Martin T. Pietrucha, Ph.D. (Maryland) P.E. Associate Professor of Civil Engineering
- Patrick Reed, Ph.D. (Illinois, Urbana-Champaign) Associate Professor of Civil Engineering
- John M. Regan, Ph.D. (Wisconsin, Madison) P.E. Associate Professor of Civil Engineering
- Andrew Scanlon, Ph.D. (Alberta) S.E. Professor of Civil Engineering
- Barry Scheetz, Ph.D. Professor of Civil Engineering
- Andrea J. Schokker, Ph.D. (Texas, Austin) Adjunct Professor of Civil Engineering
- Venkataraman (Venky) N. Shankar, Ph.D. (U Washington, Seattle) Associate Professor of Civil Engineering
- Shelley M. Stoffels, D.E. (Texas A&M) P.E. Associate Professor of Civil Engineering
- H. Randolph Thomas, Jr., Ph.D. (Vanderbilt) P.E. Professor of Civil Engineering
- Mian C. Wang, Ph.D. (California, Berkeley) P.E. Professor of Civil Engineering
- Gordon Warn, Ph.D. Assistant Professor of Civil Engineering

Students may specialize in construction engineering, environmental engineering, hydrosystems engineering, structural engineering, and transportation engineering.

Admission Requirements

The requirements listed here are in addition to the general requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Candidates should possess a baccalaureate degree from a regionally accredited institution. Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and appropriate course backgrounds may be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

International applicants must submit OFFICIAL transcripts, degree, and diploma certificates in **both English and native language**. These documents must contain the “red stamp” or have the raised notary stamp. Photocopies will NOT be accepted.

All applicants must provide the department with official transcripts of all their previous course work (in duplicate), a statement of objectives, and three letters of recommendation AT THE TIME OF APPLICATION. In addition, all applicants must submit scores from the General Graduate Record Examinations Aptitude Test (verbal, quantitative, and analytical).

All international applicants whose native language is not English must present an acceptable score (560 minimum on the paper-based test; 220 minimum on the computer-based test) on the Test of English as a Foreign Language (TOEFL).

Applicants for fall admission who wish to be considered for financial aid should have COMPLETED applications on file by DECEMBER 1 of the preceding year.

Degree Requirements

The M.Eng. degree is a nonthesis professional master's degree. The program provides training for advanced professional practice. A minimum of 30 graduate credits (400 level and above) of course work and a writing portfolio are required. It should be noted that 20 credits must be earned at an established graduate campus of the University. At least 15 credits must be earned in graduate courses (500 level). Divisions may require specific core courses. Students are not permitted to count audited credits toward the minimum credits required for the degree.

The M.S. degree program is strongly oriented toward research. A minimum of 30 graduate credits (400-level and above) is required, of which 20 must be earned at an established graduate campus of the University. At least 18 credits in the 500 and 600 levels, combined, must be included in the program. A minimum of 12 credits of course work (400 and 500 level), as contrasted with research, must be completed in the major (courses prefixed C E). Division may require specific core courses. Students are not permitted to count audited credits toward the minimum credits required for the degree. A thesis is required, and at least 6 credits of thesis research (C E 600 or 610)

must be included in the candidate's academic course plan.

A candidate for the Ph.D. degree must pass the English proficiency and candidacy examinations, prepare and defend the thesis proposal as part of the oral comprehensive examination, and pass the final oral examination (thesis defense). In addition, a Ph.D. candidate must satisfy the University residency requirement by registering for two consecutive semesters as a full-time student.

Continuous registration is required for all graduate students until the thesis or writing portfolio has been approved. See also Environmental Engineering.

Biogeochemistry Dual-Title Degree Program

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree Program. Students in the Biogeochemistry Dual Title program are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. Additional coursework from an approved list of courses is required. All students must pass a candidacy examination that includes an assessment of their potential in the field of biogeochemistry. A single candidacy examination that includes biogeochemistry will be administered for admission into the student's Ph.D. program, as well as the biogeochemistry dual-title. The structure and timing of this exam will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise in biogeochemistry. The field of biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of biogeochemistry is required.

Other Relevant Information

Students in this program may elect to participate in the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. See also Environmental Engineering.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. International applicants who wish to be considered for a teaching assistantship must present an acceptable score (250-300 or 55-60) on the Test of Spoken English (TSE). The TSE can be taken in many countries, or at Penn State after arrival.

CECIL M. PEPPERMAN MEMORIAL GRADUATE FELLOWSHIP
Available to a graduate student in civil or environmental engineering specializing in one of the following fields, listed in order of priority: waste treatment and management, water pollution control, environmental engineering, or related fields.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CIVIL ENGINEERING (C E) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/3/04

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Review Date: 4/14/08

Last updated by Publications: 8/20/09

Dual-Title Graduate Degree in Classics and Ancient Mediterranean Studies (CAMS)

Program Home Page (Opens New Window)
PAUL HARVEY, *Department Head*
101 Weaver Building
814-863-0061
pbh1@psu.edu

Degrees Conferred

Students electing this program through participating departments will earn a degree with a dual-title at both the Ph.D. and the master's levels, i.e., Ph.D. in (graduate program name) and Classics and Ancient Mediterranean Studies, or master's degree in (graduate program name) and Classics and Ancient Mediterranean Studies.

The following graduate programs offer dual degrees in Classics and Mediterranean Studies: History.

The Graduate Faculty

Classics and Ancient Mediterranean Studies-affiliated faculty include individuals with budgeted appointments in Classics and Ancient Mediterranean Studies and individuals with courtesy joint appointments. The following faculty members have budgeted and courtesy joint appointments in Classics and Ancient Mediterranean Studies:

- Philip H. Baldi, Ph.D. (University of Rochester) Professor of Classics and Linguistics
- Daniel William Berman, Ph.D. (Yale University) Associate Professor of Classics and Ancient Mediterranean Studies
- Chris Brady, D. Phil. (Oxford University) Associate Professor of Classics and Ancient Mediterranean Studies
- Garrett George Fagan, Ph.D. (McMaster University) Associate Professor of Classics and Ancient Mediterranean Studies, and History
- Paul B. Harvey Jr., Ph.D. (University of Pennsylvania) Associate Professor of Classics and Ancient Mediterranean Studies, History, and Religious Studies
- Brian Hesse, Ph.D. (Columbia University) Professor of Jewish Studies and Ancient Mediterranean Studies
- Ann Eloise Killebrew, Ph.D. (Hebrew University , Jerusalem) Associate Professor of Classics and Ancient Mediterranean Studies, Jewish Studies, and Anthropology
- Gerald Neil Knoppers, Ph.D. (Harvard University) Professor of Classics and Ancient Mediterranean Studies and Jewish Studies
- Mark Munn, Ph.D. (University of Pennsylvania) Professor of Greek History and Greek Archaeology
- Donald Redford, Ph.D. (University of Toronto) Professor of Classics and Ancient Mediterranean Studies
- Aaron Rubin, Ph.D. (Harvard University) Assistant Professor of Classics and Ancient Mediterranean Studies, Jewish Studies, and Comparative Literature
- Gonzalo Rubio, Ph.D. (Johns Hopkins University) Assistant Professor of Classics and Ancient Mediterranean Studies, History, and Religious Studies
- Stephen Wheeler, Ph.D. (Princeton University) Associate Professor of Classics

Dual-title degrees grounded both in CAMS and a given discipline will acknowledge and foster interdisciplinary scholarship. This dual-title degree program will increase the intellectual rigor, breadth, and depth of graduate work in a participating program through immersion in the disciplinary fields covered by the Department of Classics and Ancient Mediterranean Studies: the philology and literature of ancient Mediterranean languages; the history and material cultures of those societies.

This dual-title program will thus provide a context in which students will learn how to synthesize knowledge within and across traditional disciplinary boundaries. In addition, this dual-title degree program will provide qualified students opportunities for instructional training encouraging an interdisciplinary approach to teaching.

The primary advantages of this dual-title program include the intellectual and academic advantages and benefits of interdisciplinary study, as well as the enhancement of the reputation of the departments concerned through an innovative program, leading to recruitment of highly qualified graduate students, and an improved placement of doctoral graduates in highly-competitive humanities fields.

This dual-title degree program does not duplicate any other degree program in the University.

Admission Requirements

Students must first be admitted to a participating program; only after admittance by a participating program, will students be admitted to graduate study in CAMS by an admissions committee of CAMS faculty and the approval of the head of CAMS. CAMS will follow the timetable and admissions requirements of the participating program. Applicants to this dual-title degree program should have a junior/senior cumulative average of at least 3.30 (on a 4.00 scale) and appropriate academic preparation. Preference will be given to those candidates whose undergraduate record demonstrates expertise in ancient Mediterranean studies (history; literature; archaeology) and proficiency to the 12 th credit level in one or more ancient languages. Where applicable, a minimum GPA of 3.5 (on a 4.00) scale is requisite for graduate work previously undertaken. Prospective students seeking admission to this dual-title degree program are required to write a statement of purpose that addresses the ways in which their research and professional goals will reflect an interest in interdisciplinary research in the participating program and the disciplines and fields included in CAMS.

Degree Requirements

This dual-title degree will have requirements in addition to those for graduate degrees in a participating program. Those requirements include additional course work in ancient languages, additional components to the comprehensive examinations at the doctoral level, and the completion of CAMS-related theses at the master's level (optional; see below) and doctoral levels (compulsory). A CAMS master's. and a doctoral . committee, chaired by faculty closely related to the student's field of interest, will supervise the graduate study of each student accepted into this dual-title program. Students will be expected to attend and participate actively in the CAMS regularly-scheduled colloquia.

Master's Degree

33 credits, including:

6 required credits (CAMS 592: CAMS Proseminar; CAMS 593: Research Seminar).
9 additional credits in 500 or 400-level work in CAMS courses.

Reading knowledge of one ancient language: proficiency to be demonstrated through 400/500 level work in that language as instructed by CAMS language faculty.

Writing requirement: completion and approval of two seminar research papers. Those research papers should be conceived, in terms of length, format, and quality, as suitable for submission to refereed journals for publication. A student has the option of filing one of those research papers with the Graduate School as a master's thesis, in the appropriate format specified by the Graduate School .

Although the Graduate School permits eight years to complete the master's degree, master's-level students who expect to enter the Ph.D. program are strongly encouraged to graduate in either spring or summer at the end of the second year. . The culminating experience leading to the master's degree will be evaluated in accord with the procedures and standards of the participating program and of CAMS.

Ph.D. Degree

6 required credits (CAMS 592: CAMS Proseminar; CAMS 593: Research Seminar).
9 additional credits in 500 or 400-level work in CAMS courses.
9 additional credits (a minimum of 6 should be at the 500-level) in CAMS courses or courses relevant to the student's research interests.

Reading knowledge of a second ancient language--proficiency to be demonstrated through 400/500 level work in that language as instructed by CAMS language faculty--or competence, demonstrated in course work or field study, as approved by the student's supervisory committee, in a research technique in a technical field relevant to CAMS: e.g., archaeology, art history, anthropology, historical linguistics, literary studies and analysis.

Dissertation on a CAMS-related topic as approved by the student's committee.

Foreign Language and English Competency Requirements

The student will fulfill the English Competency requirements specified by the participating program. Master's students will fulfill a requirement of reading knowledge of one ancient language: Ph.D. candidates will fulfill a requirement of reading knowledge of two ancient languages or of one ancient language and competence in a research technique. Language proficiency will be demonstrated through 400/500 level work in the languages concerned, as instructed by CAMS faculty.

Students will be expected to acquire and demonstrate reading proficiency in those modern foreign languages (e.g., but not exclusively, French, German, Italian) appropriate to their research interests, as identified in consultation with their CAMS graduate supervisory committee.

Dissertation

A dissertation on a CAMS topic is required of students in this dual-title degree program. The CAMS topic of the dissertation will be approved by the student's committee.

Student Aid

Graduate assistantships are available to students in this program and other forms of student aid are described in the STUDENT AID section of the Graduate Bulletin.

Courses

Graduate courses carry numbers from 500-599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate language requirements when taken by graduate students. Courses below the 400 level do not qualify. A graduate student may register for or audit these lower-level courses in order to make up deficiencies, but not to meet requirements for an advanced (graduate) degree.

CLASSICS AND ANCIENT MEDITERRANEAN (CAMS) course list

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-07-008

Review Date: 6/17/08

Last updated by Publications: 3/2/10

College Student Affairs (CSA)

ROBERT D. REASON, *in charge*
400 Rackley Building
814-863-2690
814-865-0543
psu-csa@psu.edu

Degree Conferred:

M.Ed.

The Graduate Faculty

- Kimberly A. Griffin, Ph.D. (California, Los Angeles) Assistant Professor of Education, College Student Affairs, and Higher Education
- Robert Hendrickson, Ed.D. (Indiana) Professor of Education
- Jennifer L. Crissman Ishler, D.Ed. (Penn State) Assistant Professor of Counselor Education
- Dorothy Evensen, Ph.D. (NYU) Associate Professor of Education
- Lisa Lattuca, Ph.D. (Michigan) Associate Professor of Education
- Margaret A. Lorah, D.Ed. (Penn State) Affiliate Assistant Professor of Counselor Education
- Spencer G. Niles, D.Ed. (Penn State) Professor of Counselor Education
- Susan R. Rankin, Ph.D. (Penn State) Associate Professor of College Student Affairs and Higher Education
- Robert D. Reason, Ph.D. (Iowa State) Associate Professor of Education
- Eric White, Ed.D. (Pennsylvania) Affiliate Assistant Professor of Education

The College Student Affairs program provides graduate instruction for students preparing to enter the student affairs profession on college and university campuses. Students will choose one of the two curricular options: Administration and Leadership or College Counseling. Course work for both areas includes foundational studies as well as professional studies in the areas of student development theory, student characteristics and effects of college on students, individual and group interventions, organization and administration of student affairs, and assessment, evaluation, and research. Both emphasis areas provide intentional opportunities for students to enhance their professional skills through internships in student affairs administrative and/or college counseling offices.

Admission Requirements

Graduate Record Examinations (GRE) combined verbal and quantitative scores or Miller Analogies Test (MAT) score are required, as are TOEFL scores, if applicable. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

An applicant must have received, from a regionally accredited institution, a baccalaureate degree earned under residence and credit conditions substantially equivalent to those required by Penn State. The individual's junior-senior grade-point average must be at least 3.0 on a 4.0 system. The individual's overall grade-point average must be at least 2.75 on a 4.0 system. Individuals who do not meet this requirement may request special consideration by submitting a letter indicating why they feel they deserve consideration.

If an individual has completed graduate course work prior to application, his or her grade-point average for this course work must be a 3.0 on a 4.0 system.

Three recommendation letters and a personal statement are also required as part of the application process.

Degree Requirements

The College Student Affairs degree, with an option in College Counseling, requires 48 credits. The Administration and Leadership option requires 42 credits. Both options require two 150-hour internships and the completion of a master's paper.

Joint Degree Program between The Pennsylvania State University Dickinson School of Law (J.D.) and the College Student Affairs Program (M.Ed.)

Joint Degree Program: The Dickinson School of Law (DSL) and the College Student Affairs Program (CSA) are offering a joint degree program leading to a Juris Doctor (J.D.), and Master of Education (M.Ed.). in College Student Affairs.

Admission Requirements

The number of openings in the joint degree J.D./M.Ed. program will be limited to students with an outstanding academic record who have successfully completed two semesters at the Dickinson School of Law.

Applicants to the joint degree program:

1. must have been admitted to the Dickinson School of Law
2. should have successfully completed two semesters of course work at the Dickinson School of Law with a grade-point average of 3.0
3. must submit two letters of recommendation from the Dickinson School of Law faculty
4. must submit a career statement

Note: Students are eligible to start taking courses in the CSA program after successfully completing two semesters of law school work.

College-Specific Admission Requirements

DSL: A bachelor's or equivalent degree from an accredited college is a prerequisite for admission; however, there is no standard prescribed undergraduate curriculum. An applicant should have acquired significant oral and written communication skills before entering law school. The following are required of applicants: a completed application form for DSL; submission of the results of the law school admission test (LSAT); completion of an LSDAS report; a one-page personal statement; employment records since high school; and two letters of recommendation.

CSA: The following are required of all applicants: a completed Graduate School application; submission of the results of the Graduate Record Examination (GRE), Miller Analogies Test (MAT), or LSAT; an official undergraduate transcript or transcripts; a personal statement; employment records since high school; and three letters of recommendation.

All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the Test of English as a Second Language (TOEFL) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test or a score of 213 on the computer-based test, or 80 points on the new Internet-based test with a minimum of 23 points on the new speaking portion; or the International English Language Testing System (IELTS) with a minimum composite score of 6.5 is required for admission.

An applicant must have received from a regionally accredited institution, a baccalaureate degree earned under residence and credit conditions substantially equivalent to those required by Penn State. The individual's junior-senior grade-point-average (GPA) must be at least 3.0 on a 4.0 system. The individual's overall GPA must be at least 2.75 on a 4.0 system. Individuals who do not meet this requirement may request special consideration by submitting a letter indicating why the feel they deserve consideration.

If an individual has completed graduate course work prior to applying to the CSA program, his or her grade-point-average for this course work must be at least a 3.0 on a 4.0 system.

Residency: Students will normally spend four semesters in residence at DSL and as many additional semesters in residence as needed to complete the M.Ed. requirements for the CSA degree.

Liaisons: The department and faculty liaisons for DSL shall be the Associate Dean for Academic Affairs and the student advisor shall be the Associate Dean for Academic Affairs or such other faculty member(s) as may be designated by the Dean. The liaison for CSA shall be the Professor-in-Charge (PIC) or such faculty member(s) as may be designated by the PIC.

PRESCRIBED COURSES

DSL: All students in the J.D. program are required to take the first-year curriculum in DSL. In the second or third year, students must take CORE 934 (Professional Responsibility).

The fall curriculum for the first year consists of the following courses:

CORE COURSES (CORE)

- 900. Civil Procedure (4)
- 910. Criminal Law (3)
- 912. Legal Analysis, Research & Writing I (3)
- 925. Torts (4)

The spring curriculum of the first year consists of the following courses:

One 3-credit Elective

CORE COURSES (CORE)

- 903. Constitutional Law I (3)
- 905. Contracts (4)
- 914. Legal Analysis, Research & Writing II (3)
- 920. Property (4)

CSA: *All students in the CSA program must take the following courses:*

COLLEGE STUDENT AFFAIRS (CSA)

- 501. Introduction to Student Affairs (3)
- 502. Organization and Administration in Student Affairs (3)
- 503. Student Development in College Environments (3)
- 504. Research and Assessment in Student Affairs (3)
- 505. Capstone Seminar (2)
- 506. Campus Environments
- 507. Social Justice
- 595. Internship (student must take two 3-credit internships) (1-9)
- 596. Culminating Experience, Learning Portfolio (1-9)

COUNSELOR EDUCATION (CN ED)

- 501. Counseling Theory and Methods (3)
- 506. Helping Skills for CSA Professions (3)

HIGHER EDUCATION (HI ED)

- 545. Higher Education in the U.S. (3)
- 556. Higher Education Students (3)

Two 3-credit Electives

INTERPROGRAM TRANSFER OF CREDITS

DSL: A maximum of twelve credits of CSA course work may be transferred for credit toward the J.D. degree at DSL. Students must obtain a grade satisfactory to DSL for the course work to be credited toward the J.D. degree. The following courses offered by CSA may qualify for credit in DSL: (1) CSA 501 (Introduction to College Student Affairs); (2) CSA 502 (Organization and Administration in College Affairs); (3) CSA 503 (Student Development in College Environments); and (4) CSA 504 (Research and Assessment in Student Affairs).

CSA: What courses may be credited will be determined by the student's degree program. Normally a maximum of nine credits of DSL course work will be counted for credit for the minimum requirements for a master's degree, subject to approval by the Professor-in-Charge.

Sequence: The sequence of courses will be determined by the students and their advisors.

Recommended Program of Study and Advising: All students in the program will have two advisors, one from DSL and one from CSA. Periodic interaction between the two advisors will be encouraged. A program of study will be developed for each student, taking into account the fact that some courses are offered on a rotating or intermittent basis. Many courses are offered every year but some are offered every two or three years. Advisors will have available a list of projected relevant courses or educational experiences in order to work with the student on an individualized program of study. The standard committee structure will apply to the CSA programs.

Tuition: Students will be charged the applicable DSL tuition to cover the J.D. program and the applicable graduate tuition to cover the CSA degree program. DSL tuition will be paid for the semesters in which the student is registered for DSL courses, and graduate tuition will be paid for the semesters in which the student is registered for graduate courses. A student may take up to one course (3 credit hours) per semester in the program where the student is not primarily registered without any change in tuition, but must pay additional tuition to the program that the student is not primarily registered if he or she wishes to take additional course work pursuant to that program during the semester.

Financial Aid and Assistantships: Decisions on financial aid and assistantships will be made by each school according to that school's procedures.

Fulfillment of Degree Requirements and Graduation: All courses in one program that will count toward meeting the requirements of the other program must be completed before the awarding of either degree. Students will be required to fulfill all requirements for each degree in order to be awarded that degree, subject to the interprogram transfer of credits. With respect to CSA program requirements for a learning portfolio, work done while at DSL under the supervision of a DSL faculty member may be appropriate for incorporation into the learning portfolio with the approval of the CSA degree program committee (in such cases, the committee should consider whether the credits afforded such work will be subject to the twelve credit maximum for interprogram transfers). A DSL faculty member must be a member of the committee).

If for some reason the student cannot complete the requirements of the J.D. degree, the student will still be allowed to count DSL courses already taken toward the M.Ed. in CSA, even if he or she is no longer in the joint degree program.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COLLEGE STUDENT AFFAIRS (CSA) course list

COUNSELOR EDUCATION (CN ED) course list

HIGHER EDUCATION (HI ED) course list

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-430

Review Date: 6/12/07

Last updated by Publications: 8/31/09

Communication Arts and Sciences (CAS)

Program Home Page (Opens New Window)

THOMAS W. BENSON, *Head of the Department*
234 Sparks Building
814-865-3461

Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- Deborah F. Atwater, Ph.D. (SUNY, Buffalo) Associate Professor Emerita of Communication Arts and Sciences, and African and African American Studies
- Thomas W. Benson, Ph.D. (Cornell) Edwin Erle Sparks Professor of Rhetoric
- Stephen H. Browne, Ph.D. (Wisconsin) Professor of Communication Arts and Sciences
- J. Louis Campbell III, Ph.D. (Minnesota) Associate Professor of Speech Communication
- James P. Dillard, Ph.D. (Michigan State) Professor of Communication Arts and Sciences
- Rosa Eberly, Ph.D. (Penn State) Associate Professor of Communication Arts and Sciences, and English
- Jeremy Engels, Ph.D. (Illinois, Urbana-Champaign) Assistant Professor of Communication Arts and Sciences
- Dennis S. Gouran, Ph.D. (Iowa) Professor of Communication Arts and Sciences, and Labor Studies and Industrial Relations
- Michael L. Hecht, Ph.D. (Illinois) Professor of Communication Arts and Sciences, and Crime, Law, and Justice
- J. Michael Hogan, Ph.D. (Wisconsin) Professor of Communication Arts and Sciences
- Lisa S. Hogan, Ph.D. (Indiana) Lecturer in Communication Arts and Sciences, and Women's Studies
- Christopher L. Johnstone, Ph.D. (Wisconsin) Associate Professor of Communication Arts and Sciences
- Tony M. Lentz, Ph.D. (Michigan) Assistant Professor of Communication Arts and Sciences
- Wayne J. McMullen, Ph.D. (Penn State) Associate Professor of Communication Arts and Sciences
- Michelle Miller-Day, Ph.D. (Arizona State) Associate Professor of Communication Arts and Sciences
- Mary K. Mino, Ph.D. (Penn State) Associate Professor of Communication Arts and Sciences
- Jon F. Nussbaum, Ph.D. (Purdue) Professor of Communication Arts and Sciences
- Mary Beth Oliver, Ph.D. (Wisconsin) Professor of Communications, and Communication Arts and Sciences
- Roxanne L. Parrott, Ph.D. (Arizona) Professor of Communication Arts and Sciences
- Rachel A. Smith, Ph.D. (Michigan State) Assistant Professor of Communication Arts and Sciences
- Denise Solomon, Ph.D. (Northwestern) Professor of Communication Arts and Sciences
- Judith L. Stephens, Ph.D. (Kent State) Professor of Humanities and Theatre
- S. Shyam Sundar, Ph.D. (Stanford) Distinguished Professor of Communications, and Communication Arts and Sciences
- Jane Sutton, Ph.D. (Colorado) Associate Professor of Communication Arts and Sciences
- Molly Wertheimer, Ph.D. (Penn State) Professor of Communication Arts and Sciences
- Nancy J. Wyatt, Ph.D. (Penn State) Associate Professor Emerita of Communication Arts and Sciences, and Women's Studies

Students may specialize in communication theory (communication sciences) or rhetoric (communication arts).

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

The minimum undergraduate preparation is 12 credits in communication studies/speech communication. Students who cannot meet this requirement in full may be admitted but must make up their deficiencies without credit toward the graduate degree.

Additionally, students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. A student must have completed the master's degree before being admitted as a doctoral candidate.

Master's Degree Requirements

Students pursuing the M.A. degree in Communication Arts and Sciences must schedule a review of their program of courses during the first year of residence and receive approval by a duly constituted advisory committee.

A total of 30 credits, including 6 for the master's thesis and at least 12 other 500-level credits, is required. Candidates must schedule a proposal meeting in which their research plan for their thesis is approved by their committee. They are also required to present an oral defense before their committee.

Although typically discouraged, students in unique circumstances may apply to complete a nonthesis track. Students must apply in advance for acceptance in the nonthesis track and additional course credits will be required, among other differences from the thesis track.

Doctoral Degree Requirements

The communication and foreign language requirement for the Ph.D. degree may be satisfied by options selected from designated areas including, but not restricted to, foreign languages. Doctoral candidates must schedule a candidacy evaluation during their first year. Following completion of the language requirement and all courses from the program of study, doctoral candidates must take a comprehensive examination to determine their mastery and competence in the discipline of communication. After successful completion of the written and oral component of the comprehensive exam, doctoral candidates must schedule a proposal meeting at which the research plan for their dissertation is approved by their committee. Doctoral candidates must present a final oral defense of their dissertation before their committee.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

EDWIN ERLE SPARKS FELLOWSHIPS IN THE HUMANITIES (8)
Available to beginning and continuing graduate students in one of the following graduate programs: Communication Arts and Sciences, Comparative Literature, English, French, German, History, Linguistics, Philosophy, and Spanish; stipend $15, 340 plus waiver of tuition. Apply to department before February 1.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMMUNICATION ARTS AND SCIENCES (CAS) course list

Last updated by Publications: 8/20/09

Communication Sciences and Disorders (CSD)

Program Home Page (Opens New Window)

GORDON W. BLOOD, *Head of the Department of Communication Sciences and Disorders*
308 Ford Building
814-865-3177
cyw2@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Gordon W. Blood, Ph.D. (Bowling Green) *Professor of Communication Sciences and Disorders*
- Ingrid M. Blood, Ph.D. (Bowling Green) *Professor of Communication Sciences and Disorders*
- Kathryn D. R. Drager, Ph.D. (Minnesota) *Associate Professor of Communication Sciences and Disorders*
- Janice C. Light, Ph.D. (Toronto) *Distinguished Professor of Communication Sciences and Disorders*
- Elina Mainela-Arnold, Ph.D. (Wisconsin) *Assistant Professor of Communication Sciences and Disorders*
- Carol Miller, Ph.D. (Pennsylvania) *Associate Professor of Communication Sciences and Disorders*
- Maya Misra, Ph.D. (Tufts) *Assistant Professor of Communication Sciences and Disorders*
- Robert A. Prosek, Ph.D. (Purdue) *Professor of Communication Sciences and Disorders*
- Krista Wilkinson, Ph.D. (Georgia State) *Professor of Communication Sciences and Disorders*

The goals of the program in Communication Sciences and Disorders are to train professionals to conduct research and be consumers of research in communication sciences and disorders and to prepare competent professionals to habilitate and rehabilitate individuals who have speech, language, and/or hearing problems. The program also serves to provide students in other curricula at Penn State with orientation toward and information about communication sciences and disorders.

Facilities for student training and research include in-house clinical therapy and diagnostic services, laboratories in speech science and audiology, and affiliated schools and clinics. The program enjoys academic, research, and clinical relationships with a number of related programs at Penn State and draws upon academic work from related areas as part of the graduate training in communication sciences and disorders. Preparation is given for school and professional certifications and licensure. The CSD academic program is accredited by the Council of Academic Affairs of the American Speech-Language-Hearing Association. Master's-level graduate study requires a full-time externship experience, ordinarily occurring during the final semester of study.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Approximately 35 credits are required for admission, distributed among speech pathology, audiology, speech science, education, and psychology, and including a course in statistics. Students entering without an undergraduate degree in CSD will be required to take additional make-up work.

Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Usually students earn a master's degree in communication sciences and disorders prior to being considered for doctoral study, although persons with master's degrees in other fields will be considered for a doctoral program.

Master's Degree Requirements

The master's degrees require a minimum of 50 graduate credits beyond admission standards. Students usually earn 55 to 65 credits to complete a degree, over four semesters and a summer of study.

There is a nonthesis option for the Master of Science degree, requiring a paper and additional course credits in lieu of a thesis. The master's program of study provides course work and practicum for advanced and/or professional-level licensure.

Doctoral Degree Requirements

The Doctor of Philosophy degree normally requires a master's degree in communication sciences and disorders or a related field, plus a minimum of two years of advanced study, and presentation and oral defense of a research-based dissertation.

The communication and foreign language requirement is a minimum of 6 credits of statistics beyond the first course, plus 9 credits selected from among statistics, technical writing, computer science, research design, or a foreign language.

Two research exercises, one of which is used for doctoral candidacy evaluation early in the doctoral program, are required prior to the dissertation. Comprehensive written examinations in the areas of a student's interest and an optional minor field examination, plus an oral examination prior to dissertation, are required.

Details of a student's doctoral program are determined by the doctoral committee.

Student Aid

Student Aid Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499

may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMMUNICATION SCIENCES AND DISORDERS (CSD) course list

Last Revised by the Department: Fall Semester 2003Blue Sheet Item #: 32-07-019

Review Date: 6/15/04

Last updated by Publications: 8/11/09

Community and Economic Development (CEDEV)

Program Home Page

STEPHEN M. SMITH , *Head of the Department of Agricultural Economics and Rural Sociology*
103 Armsby Building
814-865-5461; cedevinfo@psu.edu

Degree Conferred:

M.S., M.P.S.

The Graduate Faculty

- David G. Abler, Ph.D. (Chicago) Professor of Agricultural, Environmental, and Regional Economics, and Demography
- Theodore R. Alter, Ph.D. (Michigan State) Professor of Agricultural, Environmental, and Regional Economics
- John C. Becker, J.D. (Dickinson) Professor of Agricultural Economics and Law
- David Blandford, Ph.D. (Manchester) Professor of Agricultural Economics
- Jill L. Findeis, Ph.D. (Washington State) Professor of Agricultural Economics
- Stephan J. Goetz, Ph.D. (Michigan State) Professor of Agricultural and Regional Economics
- Drew W. Hyman, Ph.D. (California) Professor Emeritus of Public Policy and Community Systems
- Francis X. Higdon, Ph.D. (Pittsburgh) Senior Lecturer in Community Development
- Leif I. Jensen, Ph.D. (Wisconsin) Professor of Rural Sociology, Demography, and Sociology
- Timothy W. Kelsey, Ph.D. (Michigan) Professor of Agricultural Economics
- Janelle B. Larson, Ph.D. (Oxford) Associate Professor of Agricultural Economics
- Stanford M. Lembeck, Ph.D. (Penn State) Professor Emeritus of Rural Sociology
- A. E. Luloff, Ph.D. (Penn State) Professor of Rural Sociology
- Diane K. McLaughlin, Ph.D. (Penn State) Associate Professor of Rural Sociology
- Carolyn Sachs, Ph.D. (Kentucky) Professor of Rural Sociology
- Martin Shields, Ph.D. (Wisconsin) Associate Professor of Agricultural and Regional Economics
- James Shortle, Ph.D. (Iowa State) Professor of Agricultural and Environmental Economics
- Stephen M. Smith, Ph.D. (Wisconsin) Professor of Agricultural and Regional Economics
- C. Shannon Stokes, Ph.D. (Kentucky) Professor of Rural Sociology
- Joan S. Thomson, Ph.D. (Wisconsin) Professor of Agricultural Communications
- James E. Van Horn, Ph.D. (Ohio State) Professor of Rural Sociology
- Rex H. Warland, Ph.D. (Iowa State) Professor Emeritus of Rural Sociology
- Fern K. Willits, Ph.D. (Penn State) Professor of Rural Sociology

The graduate program in Community and Economic Development helps students prepare to confront the multidimensional challenges faced by community development practitioners. The program's main objective is educating professionals who will assume leadership roles in helping establish and maintain viable communities. Graduates become deeply involved in assisting localities with a variety of issues, including: developing new organizations and new industries, growth management, protecting the environment, revitalizing downtown areas, enhancing the local quality of life, assisting educational, social, health and human service systems, and developing vital infrastructure in short, helping communities shape their own futures.

Students in Community and Economic Development gain a broad understanding of the dynamics of communities and their social, economic, and political systems. The program emphasizes teaching the theory, skills, and tools that allow practitioners to address the important issues in development practice.

Learning is through a combination of formal classes, case studies, field experiences, field projects, and professional internships. The program is multidisciplinary, with students taking courses not only in the Community and Economic Development program, but also in such subjects as rural sociology, sociology, agricultural economics, economics, computer science, political science, public administration, real estate, geography, demography, landscape architecture, and environmental resource management.

Graduates of the Community and Economic Development program have a wide range of career opportunities, including: local and state government, planning commissions, major corporations, non-governmental organizations, and consulting firms. While the degree emphasizes practical experience, the program is flexible enough to provide students the requisite skills that will enable them to commence and make rapid progress toward advanced degrees in areas such as law, public administration, agricultural economics, rural sociology, and urban and regional planning.

Admission Requirements

Students with a 3.00 average (on a 4.00 scale) for the most recent two years of college/university education, or with an advanced degree, and with appropriate course and experiential backgrounds will be considered for admission. Applicants must submit a letter of professional introduction in which they describe their professional experiences and education, delineate their career goals, and discuss how the MS program will enable them to meet their objectives. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, experience, abilities, and interests.

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Prerequisites for the master's program include 12 credits in rural sociology, sociology, agricultural economics, or other social and behavioral sciences at the discretion of the graduate program. If the entering student does not have these prerequisites, they must be made up at the University during the early part of the master's program.

Degree Requirements

All students are required to complete a core program of community and economic development courses, statistics and research methods.

Students may also be required to complete a project, internship, or thesis. (1) The CEDEV core consists of CEDEV 500, R SOC 452, AG EC 430, CEDEV 509, and R SOC 505/R SOC597 for the M.S. (2) The statistics, methods, and techniques requirement includes at least AG 400, CEDEV 575, and CEDEV 576. There is no foreign language requirement for the degree; the student is expected to complete such statistics and research courses and instruction necessary to generate superior capabilities of inquiry into and analysis of applied community and economic development issues. The M.S. requires at least 35 credits, including a final project, internship, or thesis. Students wishing to prepare for the Ph.D. in agricultural economics or rural sociology are encouraged to include advanced economics or rural sociology courses identified by the program and to choose the thesis option. Students planning to work in multicultural or international settings are encouraged to gain competency in the appropriate language(s). Some classes are offered via the Internet, although a reading requirement must be met for the M.S.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Master of Professional Studies in Community and Economic Development (MPS CEDEV)

The Master of Professional Studies in Community and Economic Development (MPS CEDEV) is a 30-credit terminal master's degree program that emphasizes an interdisciplinary approach to community and economic development. The program balances theory and practice. Courses taught in MPS CEDEV use a blend of Web technology, print, and other media to provide an effective balance of flexibility and interaction. Individuals who currently work with, or are interested in working with communities, community organizations and stakeholders, or on a range of community and economic development issues at the state or national levels would benefit from this program. The MPS CEDEV program requires the completion of seven core courses (21 credits) in which students learn and apply sociological and economic concepts to issues in community and economic development. The courses offer examples and opportunities to apply these concepts to real issues facing communities and rural regions. Two of the core courses (6 credits) emphasize statistical methods and tools and techniques useful to practitioners in community and economic development. Students then can take from 3 to 6 credits of elective coursework to focus on their particular interests within community and economic development, or to work toward additional certifications. All students are required to complete a project, paper or internship (3 to 6 credits) that integrates theory and practice.

Instruction in the MPS CEDEV program emphasizes key themes that include economic planning and development; municipal finance, land use and population change; community structure, organization and process; leadership; tools and techniques in community development; community decision-making and capacity building. Students also may complete 12 credits in the core and a professional paper and earn a Post-baccalaureate Certificate in Community and Economic Development.

Degree Requirements

The professional Master's degree requires 30 credits including a final integrative assessment/experience. All students complete the required MPS CEDEV core program of community and economic development courses, statistics, and methods. The MPS CEDEV courses consist of CEDEV 430, CEDEV 452, CEDEV 500, CEDEV 505, and CEDEV 509. The statistics, methods, and techniques requirement includes STAT 500 (or the equivalent) and CEDEV 575. CEDEV 576 is an optional summer institute focusing on applications and practices for community and economic development. An integrative paper, project, or internship is required where the student demonstrates the capability to integrate and apply concepts, principles, analytical techniques and interpretation skills learned in the program to a real problem faced by a community or community organization. Choice of electives will be based on a plan of study worked out between the student and faculty adviser. There is no foreign language requirement for the degree, however, students planning to work in multi-cultural or international settings are encouraged to gain competency in an appropriate language(s). A total of 18 credits must be 500 level or higher, with at least 6 credits of 500-level course work. This Graduate School requirement is met through the required courses and the project, internship or paper credits.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMMUNITY AND ECONOMIC DEVELOPMENT (CEDEV) course list

Last reviewed by Graduate School: 04/12/04(CEDEV)

Last Revised by the Department: Summer Session 2007

Blue Sheet Item #: 35-06-538 (M.P.S.)

Review Date: 4/10/07

Last updated by Publications: 07/01/05

Master of Professional Studies in Community and Economic Development (MPS CEDEV)

The Master of Professional Studies in Community and Economic Development (MPS CEDEV) is a 30-credit terminal master's degree program that emphasizes an interdisciplinary approach to community and economic development. The program balances theory and practice. Courses taught in MPS CEDEV use a blend of Web technology, print, and other media to provide an effective balance of flexibility and interaction. Individuals who currently work with, or are interested in working with communities, community organizations and stakeholders, or on a range of community and economic development issues at the state or national levels would benefit from this program. The MPS CEDEV program requires the completion of seven core courses (21 credits) in which students learn and apply sociological and economic concepts to issues in community and economic development. The courses offer examples and opportunities to apply these concepts to real issues facing communities and rural regions. Two of the core courses (6 credits) emphasize statistical methods and tools and techniques useful to practitioners in community and economic development. Students then can take from 3 to 6 credits of elective coursework to focus on their particular interests within community and economic development, or to work toward additional certifications. All students are required to complete a project, paper or internship (3 to 6 credits) that integrates theory and practice.

Instruction in the MPS CEDEV program emphasizes key themes that include economic planning and development; municipal finance, land use and population change; community structure, organization and process; leadership; tools and techniques in community development; community decision-making and capacity building. Students also may complete 12 credits in the core and a professional paper and earn a Post-baccalaureate Certificate in Community and Economic Development.

Degree Requirements

The professional Master's degree requires 30 credits including a final integrative assessment/experience. All students complete the required MPS CEDEV core program of community and economic development courses, statistics, and methods. The MPS CEDEV courses consist of CEDEV 430, CEDEV 452, CEDEV 500, CEDEV 505, and CEDEV 509. The statistics, methods, and techniques requirement includes STAT 500 (or the equivalent) and CEDEV 575. CEDEV 576 is an optional summer institute focusing on applications and practices for community and economic development. An integrative paper, project, or internship is required where the student demonstrates the capability to integrate and apply concepts, principles, analytical techniques and interpretation skills learned in the program to a real problem faced by a community or community organization. Choice of electives will be based on a plan of study worked out between the student and faculty adviser. There is no foreign language requirement for the degree, however, students planning to work in multi-cultural or international settings are encouraged to gain competency in an appropriate language(s). A total of 18 credits must be 500 level or higher, with at least 6 credits of 500-level course work. This Graduate School requirement is met through the required courses and the project, internship or paper credits.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

DATE LAST REVIEWED BY PUBLICATIONS: 02/01/07

Last Revised by the Department: Summer Session 2007

Blue Sheet Item #: 35-06-538

Review Date: 4/10/07

Community Psychology and Social Change (CP&SC)

Program Home Page (Opens New Window)

HOLLY ANGELIQUE, *Coordinator*
W-157 Olmsted Building
Penn State Harrisburg
777 W. Harrisburg Pike
Middletown, PA 17057-4898
717-948-6036
E-mail: src@psu.edu
http://www.hbg.psu.edu (Opens New Window)

Degrees Conferred:

Master of Arts in Community Psychology and Social Change

The Graduate Faculty

- Holly Angelique, Ph.D. (Michigan State) *Associate Professor of Community Psychology*
- Ken Cunningham, Ph.D. (CUNY) *Assistant Professor of Sociology*
- Clemmie E. Gilpin, Ph.D. (Penn State) *Assistant Professor of Community Systems and Afro-American Studies*
- Kamini Maraj Grahame, Ph.D. (Toronto) *Assistant Professor of Community Psychology and Social Change*
- Ken Kyle, Ph.D. (Arizona State) *Associate Professor of Sociology*
- Senel Poyrazli, Ph.D. (Houston) *Assistant Professor of Counseling Psychology*

The graduate program in Community Psychology leads to a master of arts degree in Community Psychology and Social Change with concentration in Children, Youth, and Family; Environmental Issues; and Individualized Studies. The nontraditional program emphasizes planned social change, and is based on both sociology and psychology. The program equips students with skills useful in coping with the multifaceted problems facing communities. Students learn (a) to assess problems at the level of communities or organizations, (b) to plan and implement possible solutions to these problems, and (c) to evaluate the effectiveness of the solutions. Learning takes place both in courses and in a master's project that entails fieldwork and the writing of a master's paper.

To act as a change agent, the student must be aware of contemporary community needs, along with the impact of the community structure upon its individual members and the techniques best suited to initiate productive changes. After completing this interdisciplinary program, the graduate should be able to approach problems with a more integrated point of view and work cooperatively with community individuals and agencies toward practical solutions. Problems related to crime, education, child and family development, employment, the lack of effective social power, and other factors affecting psychological well being are approached from bases in community service agencies or informal community groups. The majority of students work full-time in agencies or governmental units. To accommodate these working students, 500-level graduate courses are scheduled in the evening.

Admission Requirements

Requirements listed below are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

For admission to the program, a student must have a baccalaureate degree from an accredited academic institution, earned under residence and credit conditions equivalent to those required by Penn State. The minimum grade-point average (GPA) in the junior and senior years must be 3.00 or higher (on a 4.00 scale). Students with experience in carrying out planned social change are particularly encouraged to apply. Most applicants hold degrees in psychology, sociology, or related disciplines. Ideally, applicants will have taken courses in developmental, personality, and social psychology, along with work in social change, social problems, and social conflict. Students from diverse other backgrounds are welcome to apply, particularly if they have had work or other experience effecting change in community settings. Applicants will be asked to take additional course work without graduate credit, chosen after consultation with an adviser, if they have had no psychology or sociology courses beyond the introductory level. Applicants must have received a C or better in an introductory statistics course covering parametric and non-parametric inferential statistics; they will be requested to make up any deficiency without graduate credit.

Off-campus and transfer credits from accredited institutions will be evaluated by the Program Coordinator for recentness and appropriateness to the student's course of study. Approval for up to 10 transfer credits may be given. Documented applications for credit for work experience will be evaluated by students' masters committees, made up of members of the graduate faculty. Approval for up to 6 credits may be given. If granted, approval for this credit can take the place of the fieldwork usually undertaken in CMPSY 522, Practicum. The student must register for the number of credits approved, either in CMPSY 522, or, if the student prefers, after having asked for a waiver of the CMPSY 522 requirement, in additional elective course work, chosen with help from an adviser.

Courses in the program are sequenced on the assumption that students will be entering in the fall semester. Students may apply for admission for the spring (but not the summer) semester, but they may not start taking 500-level required courses until the following fall.

Admission to the Community Psychology program is based on clear suitability for the program as evidenced by the application as a whole; it is limited to the number of spaces available for masters project supervision.

Applicants must submit the following:

1. A completed application form and application fee.
2. Two copies of official transcripts from colleges or universities previously attended (including Penn State)
3. Admission Essay: We are interested in learning something about your writing and analytical abilities, and about you as a person. Please take two to six double-spaced pages to answer the following question.

   C. Wright Mills wrote: "The sociological imagination enables its possessor to understand the larger historical scene in terms of its meaning for the inner life and the external career of a variety of individuals....The sociological imagination enables us to grasp history and biography and the relations between the two within society. That is its task and its promise. To recognize this task and this promise is the mark of the classic social analyst ... ."

   Discuss the intersection of your biography with history and society. How have the society and the times in which you live

helped to shape who you are? What do you hope to accomplish in life? How do you think our graduate program will help you to reach your goals?

- A letter of about 500 words outlining significant community or work experience, along with career and academic objectives.
- Three professional letters of recommendation, special forms provided. Please include at least two essays from academic sources.

Program Requirements

An important part of this degree is a master's project, made up a total of 9 credits, comprising from 3 to 6 credits of Practicum (CMPSY 522), and from 3 to 6 credits of Research (CMPSY 594). The project is planned in the context of the course Roles and Methods in Community Psychology (CMPSY 521); it is supervised by a master's committee of graduate faculty. The particular mix of practicum and research is worked out by the student in consultation with the faculty. The variable mix of practicum and of research credits results in the student's being able to choose course work that emphasizes study in the area in which she or he needs most skill-development. In the usual case, a student with a strong background in fieldwork would be asked to emphasize research in her or his master's project, and a student with a strong research background, but with limited fieldwork, would be asked to emphasize the practicum. The output of CMPSY 522 is a practicum; the output of the research course CMPSY 594 is a required master's paper of at least 3 credits. The master's paper may be based on the field experience. Students often choose to structure their master's paper around a specific community research problem. Again, students can apply for Practicum (522) credit, or, at their choice, ask for a waiver of the requirement, on the basis of documented prior experience. Decisions about such applications are made by the student's master's committee.

Part-time students who are able to take two courses at a time can complete the degree in seven to eight semesters. Since the processes of designing a master's project and of writing a master's paper are labor-intensive and frequently take more time than the student expects, even full-time students will often take six or more semesters to complete the degree.

The program offers three concentrations, each including all the required Community Psychology courses. The Children, Youth, and Families Concentration uses as its electives 9 approved credits from courses in psychology, education, and sociology. The Environmental Issues Concentration uses electives approved by an adviser and drawn from special courses in environmental issues and from various other programs. The Individualized Concentration uses as its elective courses chosen to meet individual needs, with the approval of an adviser.

Graduation Requirements

To qualify for the degree, 36 credits are needed, 24 of which must be at the 500 level. There is a sequence of substantive courses, starting with Theories and Issues in Community Psychology (CMPSY 500).

Required Courses (27 credits)

COMMUNITY PSYCHOLOGY (CMPSY)

- 500. Theories and Issues in Community Psychology (3)
- 510. Change Processes (3)
- 511. Social Impacts on Psychological Functioning (3)
- 519. Research Methods I (3)
- 520. Research Methods II (3)
- 521. Roles and Methods in Community Psychology (3)
- 522. Practicum (3-6)
- 594. Master's Paper (3-6)

Elective Courses (9 credits)

Concentrations

In addition to the core curriculum, students will complete the requirements of one of the three concentrations described below:

Children, Youth, and Families Concentration

Students working toward a Master of Arts degree in Community Psychology and Social Change with this concentration must complete three of the following courses. Students should check for prerequisites when deciding on which courses to take.

EDUCATION (EDUC)

- 404. Young Children's Behavior: Observation and Evaluation (3)
- 410. The Child and Social Institution. (3)

PSYCHOLOGY (PSYC)

- 405. DEVELOPMENTAL PSYCHOLOGY (3)

SOCIOLOGY (SOCIO)

- 462. Perspectives on Aging (3)
- 463. The Family (3)

Environmental Issues Concentration

Students working toward a Master of Arts degree in Community Psychology and Social Change with this concentration must complete three of the following courses. Students should check for prerequisites when deciding on which courses to take.

CIVIL ENGINEERING (C E)

- 471. Environmental Sanitation (3)
- 497. The Human Environment (1-9)

ENVIRONMENTAL ENGINEERING (ENVE)

- 487. Environmental Law (3)

PUBLIC ADMINISTRATION (P ADM)

- 531. Environmental Policy (3)

SOCIOLOGY (SOCIO)

- 470. Environmental Sociology (3)
- 471. Environmental Movements (3)
- 472. Justice and the Environment (3)

Individual Concentration

Students choose electives from a wide variety of courses offered by the Behavioral Science and other faculties. The object is to support a special interest or mix of interests, in, for instance, environmental issues, adult education, criminal justice, urban sociology, women's studies, or issues of class-ism, racism, or sexism. Students work with faculty advisers in gaining approval of electives and in choosing topics for master's projects.

Student Aid

A number of scholarships, fellowships, and graduate assistantships are available. Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CIVIL ENGINEERING (C E) course list

COMMUNITY PSYCHOLOGY (CMPSY) course list

EDUCATION (EDUC) course list

ENVIRONMENTAL ENGINEERING (ENVE) course list

PSYCHOLOGY (PSYC) course list

PUBLIC ADMINISTRATION (P ADM) course list

SOCIOLOGY (SOCIO) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/26/04

DATE LAST REVIEWED BY PUBLICATIONS: 11/21/06

Comparative and International Education (CI ED)

Program Home Page (Opens New Window)

LADISLAUS SEMALI, Program Contact; Associate Professor of Education
314 Keller Building
814-865-2246

Degrees Conferred:

Students earn a dual-title degree in this option through participating programs at either the Ph.D. (or D.Ed.) or the M.A., M.S., M.Ed. level. Students receive a degree which lists their major program and Comparative and International Education.

The following graduate programs offer dual degrees in Comparative and International Education: Adult Education, Agricultural and Extension Education, Curriculum and Instruction, Counselor Education, Counseling Psychology, College Student Affairs, Educational Leadership, Educational Psychology, Educational Theory and Policy, Entomology, Human Development and Family Studies, Higher Education, Instructional Systems, School Psychology, Special Education, and Workforce Educationi and Development.

The Graduate Faculty

- Clemente Abrokwaa, Ph.D. (Alberta) Assistant Professor of African and African American Studies
- David P. Baker, Ph.D. (Johns Hopkins) Professor of Education and Sociology
- Katerina Bodovski, Ph.D. (Penn State) Assistant Professor of Education
- Thomas Bruening, Ph.D. (Iowa) Associate Professor of Agricultural and Extension Education
- Liza Conyers, Ph.D. (Wisconsin, Madison) Associate Professor of Education
- Constance Flanagan, Ph.D. (Michigan) Professor of Agricultural and Extension Education
- Roger L. Geiger, Ph.D. (Michigan) Distinguished Professor of Education
- Dennis Jett, Ph.D. (Witwaterrand, Johannesburg, South Africa) Professor of International Affairs
- Matt Kaplan, Ph.D. (CUNY) Associate Professor of Agricultural and Extension Education
- Gerald LeTendre, Ph.D. (Stanford) Professor of Education
- Beverly Lindsay, Ph.D. (American) Professor of Education
- Sinfree Makoni, Ph.D. (Edinburgh, Scotland) Associate Professor of Applied Linguistics, and African and African American Studies
- Michael G. Moore, Ph.D. (Wisconsin, Madison) Professor of Education
- Kyle L. Peck, Ph.D. (Colorado, Boulder) Professor of Education
- Suet-ling Pong, Ph.D. (Chicago) Professor of Education and Demography
- David Post, Ph.D. (Chicago) Professor of Education
- Madhu Suri Prakash, Ph.D. (Syracuse) Professor of Education
- Esther Prins, Ph.D. (Cornell) Assistant Professor of Education
- Edwin Rajotte, Ph.D. (Rutgers) Professor of Entomology
- Kai Schafft, Ph.D. (Cornell) Assistant Professor of Education
- Ladislaus M. Semali, Ph.D. (California, Los Angeles) Associate Professor of Education

The Comparative and International Education dual-title degree program option is administered by the Committee on Comparative and International Education. The committee maintains program definition, identifies courses appropriate to the option, develops and administers the program's comprehensive examination, and recommends policy and procedures for the program's operation to the dean of the College of Education and to the dean of the Graduate School. Members of the committee also chair or co-chair the dissertation committees for students electing the dual-title doctoral degree.

The dual-title degree program is offered through participating programs in the College of Education and, where appropriate, other graduate programs in the University. The option enables students from several graduate programs to gain the perspectives, techniques, and methodologies of comparative and international education, while maintaining a close association with program areas of application. Comparative and international education is a field devoted to the systematic analysis of the operation and effects of the world's education systems. For admission to pursue a dual-title degree under this program, a student must apply to (1) the Graduate School; (2) one of the participating graduate major programs; and (3) the Committee on Comparative and International Education.

Admission Requirements

Program candidates will be required to take the Graduate Record Examination, to provide a writing sample, and, where appropriate, a satisfactory TOEFL score, and to submit a written personal statement indicating the career goals they hope to serve by attaining a Comparative and International Education degree.

Degree Requirements

To qualify for a dual-title degree, students must satisfy the requirements of the graduate major programs in which they are enrolled, in addition to the minimum requirements of the Comparative and International Education program.

For the M.A., M.S., or M.Ed. dual-title degree in Comparative and International Education, the minimum course requirements are: 3 credits in the required Proseminar in Comparative and International Education; 6 credits in advanced Comparative and International Education courses; and 3 credits in Comparative and International Education content courses. Candidates for the dual-title master's degree in Comparative and International Education will also be required to pass a written comprehensive examination based on a set of core readings established by the committee.

A master's thesis or master's paper is required, depending upon the student's graduate major program, the supervisor of which must be a member of the graduate faculty recommended by the chair of the program granting the degree and approved by the Committee on Comparative and International Education as qualified to supervise work in Comparative and International Education.

The minimum course requirements for the Ph.D. (or D.Ed.) dual-title degree in Comparative and International Education are: 3 credits in the Proseminar in Comparative and International Education; 6 credits in advanced-Comparative and International Education courses; 12 credits in Comparative and International Education content courses or courses with comparative or international content; and 6 credits in research methods. Students are expected to be fluent in reading, writing, and speaking English, and must demonstrate competency in reading a language other than English, preferably a language relevant to a country or geographic area they propose to study. (This foreign

language requirement can be satisfied by passing the appropriate ETS Language Achievement Test, or by passing the appropriate Penn State foreign language course.) A minimum of 18 credits must be 500-level course, and particular courses may satisfy both the graduate major program requirements and those in the Comparative and International Education program. Candidates for the dual-title doctoral degree in Comparative and International Education will also be required to pass a written comprehensive examination based on a set of core readings established by the committee.

A Ph.D. (or D.Ed.) minor program in Comparative and International Education is available to doctoral students who find it desirable to include the perspectives and methodologies of Comparative and International Education in their programs and have been approved to do so by their doctoral committees. To qualify for a minor in Comparative and International Education, students must satisfy the requirements of their graduate major programs, and meet the following minimum requirements: 3 credits in the Proseminar in Comparative and International Education; 3 credits in a Comparative and International Education course; and 6 credits in Comparative and International Education content courses (or advanced courses) or in courses with comparative or international content offered outside the College of Education.

The doctoral dissertation committee of a Ph.D. (or Ed.D.) dual-title degree student is recommended, in conjunction with the Comparative and International Education committee, by the graduate major program granting the degree. The chair and at least two members of a doctoral committee must be members of the graduate faculty. The chair or co-chair of the dissertation committee must be a member of the Comparative and International Education committee.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMPARATIVE AND INTERNATIONAL EDUCATION (CI ED) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/29/04

Last updated by Publications: 3/2/10

Comparative Literature (CMLIT)

Program Home Page

CAROLINE D. ECKHARDT, *Head, In Charge of Graduate Programs in Comparative Literature*
427 Burrowes Building
814-863-0589
cmlit@psu.edu

Degrees Conferred:

- Ph.D., M.A.
- Integrated B.A./M.A. Program in Comparative Literature

The Graduate Faculty

- Jonathan Abel, Ph.D. (Princeton) Associate Professor of Comparative Literature and Asian Studies
- Mary Barnard, Ph.D. (Michigan) Associate Professor of Spanish and Comparative Literature
- Thomas O. Beebee, Ph.D. (Michigan) Distinguished Professor of Comparative Literature and German
- Kevin J. H. Berland, Ph.D. (McMaster) Associate Professor of English
- Patrick G. Cheney, Ph.D. (Toronto) Distinguished Professor of English and Comparative Literature
- Jonathan P. Eburne, Ph.D. (Penn) Assistant Professor of Comparative Literature and English; Josephine Berry Weiss Early Career Professor in the Humanities
- Caroline D. Eckhardt, Ph.D. (Michigan) Professor of Comparative Literature and English
- Robert Edwards, Ph.D. (California, Riverside) Edwin Erle Sparks Professor of English and Comparative Literature
- Nergis Ertürk, Ph.D. (Columbia) Assistant Professor of Comparative Literature
- Charlotte Eubanks, Ph.D. (Colorado) Assistant Professor of Comparative Literature and Asian Studies
- Richard Frushell, Ph.D. (Duquesne) Professor Emeritus of English and Comparative Literature
- Kathryn M. Grossman, Ph.D. (Yale) Professor of French
- Thomas A. Hale, Ph.D. (Rochester) Edwin Erle Sparks Professor of African, French, and Comparative Literature
- Eric Hayot, Ph.D. (University of Wisconsin-Milwaukee) Associate Professor of Comparative Literature and Asian Studies
- Alexander C. Y. Huang, Ph.D. (Stanford) Assistant Professor of Comparative Literature, Chinese, and Asian Studies
- Linda J. Ivanits, Ph.D. (Wisconsin) Associate Professor of Russian and Comparative Literature
- Djelal Kadir, Ph.D. (New Mexico) Edwin Erle Sparks Professor of Comparative Literature
- Sophia A. McClennen, Ph.D. (Duke) Associate Professor of Comparative Literature, Spanish, and Women's Studies
- John W. Moore, Jr., Ph.D. (Stanford) Associate Professor Emeritus of English and Comparative Literature
- Philip Mosley, Ph.D. (East Anglia) Professor of English, Communications, and Comparative Literature
- John Ochoa, Ph.D. (Yale) Associate Professor of Spanish and Comparative Literature
- Steven Putzel, Ph.D. (Toronto) Associate Professor of English
- Dennis Schmidt, Ph.D. (Boston College) Liberal Arts Research Professor of Philosophy, Comparative Literature, and German
- Scott Smith, Ph.D. (Notre Dame) Assistant Professor of English and Comparative Literature
- Allan Stoekl, Ph.D. (SUNY) Professor of French and Comparative Literature
- Reiko Tachibana, Ph.D. (Penn State) Associate Professor of Comparative Literature, Japanese, and Asian Studies
- Daniel Walden, Ph.D. (NYU) Professor Emeritus of American Studies, English, and Comparative Literature
- Adrian Wanner, Ph.D. (Columbia) Professor of Russian and Comparative Literature
- Stanley Weintraub, Ph.D. (Penn State) Evan Pugh Professor Emeritus of Arts and Humanities

Graduate programs in Comparative Literature are designed to permit advanced study in several departments along with integrative courses in the Department of Comparative Literature. Both the M.A. and the Ph.D. combine a core of comparative literature requirements with courses in national literatures and further comparative courses, according to each student's interests. For example, programs of study can concentrate on such topics as genres, themes, periods, movements, folktale and oral literature, criticism, and the links between literature and related fields such as theatre or women's studies.

The M.A. is a general humanistic degree that helps prepare students for a variety of situations, including teaching in private high schools or community colleges, or further graduate work. The Ph.D. is a more specialized degree. The Ph.D. in comparative literature can be combined with a minor in a professional field such as teaching English as a second language.

Only the faculty members and courses officially associated with the Department of Comparative Literature are listed here. Faculty members and courses in other departments are also available to comparative literature students according to their preparation.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Students with appropriate course backgrounds and a 3.00 junior/senior average (on a 4.00 scale) will be considered for admission. The admission process is highly competitive and the best qualified students will be admitted subject to space availability. Scores from the Graduate Record Examination (GRE) are required for admission. Most students who do graduate work in comparative literature hold a B.A. or M.A. degree in comparative literature or in a national language and literature. Students completing degrees in such fields are welcome to apply--as are students in other humanistic fields, such as philosophy or history, if they have studied literature.

For admission to the M.A. program, students should be prepared to study at least one foreign literature in its own language. For admission to the Ph.D. program, students should be prepared to study at least two foreign literatures in their own language. Doctorate-seeking students usually complete the M.A. before being formally admitted to the Ph.D. program, but exceptional students may be admitted from the B.A. level directly to the Ph.D. Students are encouraged to plan a unified M.A./Ph.D. program if they take both degrees here; however, Ph.D. applications are welcomed from students holding or completing an M.A. elsewhere.

Master's Degree Requirements

Requirements for the M.A. in comparative literature include CMLIT 501; 12 further credits in comparative literature courses; 18 credits divided between two literatures (9 credits in each); a master's paper; and proficiency in two foreign languages (one at the level that

permits thorough literary analysis of texts, the other at the level of reading proficiency).

Doctoral Degree Requirements

Requirements for the Ph.D. in comparative literature include (1) CMLIT 501, CMLIT 502, and CMLIT 503--with substitute courses if these have been used in the M.A. program; (2) at least an additional 21 credits in literature courses, including course work in the three languages that the student selects, with emphasis on the student's primary literature--students should organize their course work, as much as possible, around a unifying principle, such as genre, period, or theme; (3) an oral candidacy examination; (4) proficiency in three foreign languages; (5) a written comprehensive examination based on a reading list; and (6) a dissertation.

On item (4), two of the foreign languages are to be prepared at a level that permits thorough literary analysis of texts in those languages; the third foreign language may be prepared at reading proficiency only. Upon approval of the department's graduate committee in consultation with an expert in the student's field, an official doctoral minor may be substituted for the reading-proficiency language.

Other Relevant Information

Students pursuing a graduate degree in comparative literature have individualized programs of study within the requirements specified above. For example, one student may emphasize drama; another, the novel. One student may concentrate on earlier literatures; another, on modern. One student may be interested primarily in the European tradition; another, in the New World (or "Inter-American") literatures. In such a program, the relationship between student and adviser is important. Each graduate student works with faculty advisers (a general adviser and a thesis or dissertation adviser) familiar with comparative studies as a whole and with the student's particular area of interest.

Student Aid

Teaching assistantships in the Department of Comparative Literature, as well as in related language and literature departments, typically have been available to students taking comparative literature degrees. In recent years, Comparative Literature students have held assistantships in Arabic, Chinese, English, French, German, Hebrew, Italian, Japanese, Polish, Slavic, Spanish, Swahili, and Women's Studies, as well as in Comparative Literature courses. There also is a graduate assistantship position for an editorial assistant to the journal Comparative Literature Studies, which is edited in the department. In addition to the fellowships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

SAMUEL P. BAYARD AWARD

Available annually to a graduate student in comparative literature, selected by the graduate committee of the Department of Comparative Literature. Amount varies.

EDWIN ERLE SPARKS FELLOWSHIPS IN THE HUMANITIES (8)

Available to beginning and continuing graduate students in the following graduate programs: Comparative Literature, English, French, German, History, Philosophy, Spanish, and Speech Communication; stipend $12,260 plus waiver of tuition. Apply to department before January 1.

FOLGER INSTITUTE FELLOWSHIPS

Penn State is a member of the Folger Institute of Renaissance and Eighteenth-Century Studies. Graduate students in Comparative Literature are eligible for Folger Institute Fellowships to study in seminars and workshops at the Folger Library, Washington, D.C.

Integrated B.A./M.A. Program in Comparative Literature (CMLIT)

The Department of Comparative Literature offers an integrated B.A./M.A. program that is designed to allow academically superior baccalaureate students to obtain both the B.A. and the M.A. degrees in Comparative Literature within five years of study. The first two years of undergraduate course work include the University General Education and Liberal Arts requirements in addition to language and literature study in the major. In the third year, students are expected to define areas of interest in two primary literatures in different languages. In addition, students in the B.A./M.A. program should begin to undertake work in a second foreign language. The fourth year includes graduate-level work in methodology and the student's selection of primary literatures, which replaces comparable 400-level senior year courses. The fifth and final year of the program typically consists of graduate work in Comparative Literature courses as well as the chosen literatures. The program culminates with an M.A. paper.

By encouraging greater depth and focus in the course of study beginning in the third undergraduate year, this program helps the student more clearly define his/her area of interest and expertise in the otherwise vast field of international literatures. As a result, long-range academic planning for exceptional students pursuing doctoral degrees after leaving Penn State, or other professional goals, will be greatly enhanced. The student may also be more competitive in applying for admission to Ph.D. programs as well as for institutional and national grant monies and scholarships.

Admission Requirements

The number of openings in the integrated B.A./M.A. program is limited. Admission is selective based on specific criteria and the unqualified recommendation of faculty. Applicants to the integrated program:

1. Must be enrolled in the Comparative Literature B.A. program**[1]**.
2. Must have completed 60 credits of the undergraduate degree program. (It is strongly suggested that students apply to the program prior to completing 100 credits.)
3. Must be accepted without reservation into the M.A. program in Comparative Literature.
4. Should have a recommended overall GPA of 3.2 (on a 4.0 scale) in undergraduate coursework and a minimum GPA of 3.5 in all coursework completed for the major.
5. Must present a departmentally approved plan of study in the application process.
6. Must be recommended by the chairs of the Department's undergraduate and graduate committees.

A typical sequence of coursework for the integrated program would appear as follows:

Year One:	6 credits:	CMLIT 010 CMLIT 100
Year Two:	6 credits:	Foreign Language (beyond the 12-credit level)
	6 credits:	Courses in Literature
Year Three:	9 credits:	400-level courses in Literature, including CMLIT 400Y
	(variable credits)	Work in foreign language (credits do not count towards the major, but reading proficiency is required for the M.A. degree)
Year Four:	3 credits:	CMLIT 501 (if offered)
	6 credits:	Comparative Literature courses
	6-9 credits:	500-level courses in two Literatures

Year Five: 3 credits: CMLIT 501 (if offered)

9-12 credits:	500-level courses in two Literatures
6 credits:	500-level Comparative Literature Courses M.A. paper

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMPARATIVE LITERATURE (CMLIT) course list

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-05-148A (Integrated)

Review Date: 02/23/2010

Last update by Publications: 8/20/09

Computer Science (COMP)

Program Home Page (Opens New Window)

LINDA NULL, *Graduate Program Coordinator*
E-256 Olmsted Building
Penn State Harrisburg
777 W. Harrisburg Pike
Middletown, PA 17057-4898
717-948-6081
E-mail: lnull@psu.edu

Degree Conferred:

M.S.

The Graduate Faculty

- Jeremy J. Blum, D.Sc. (George Washington) *Assistant Professor of Computer Science*
- Thang N. Bui, Ph.D. (MIT) *Associate Professor of Computer Science; Program Chair*
- Sukmoon Chang, Ph.D. (Rutgers) *Assistant Professor of Computer Science*
- William Deng, Ph.D. (Kansas State) *Assistant Professor of Computer Science*
- Linda M. Null, Ph.D. (Iowa State) *Associate Professor of Computer Science*
- Clifford H. Wagner, Ph.D. (SUNY, Albany) *Associate Professor of Mathematics and Computer Science*
- Seth Wolpert, Ph.D. (Rutgers) *Associate Professor of Electrical Engineering*

The program is professionally oriented and designed to prepare students for employment in industry or government. Courses emphasize practical concerns as well as the relevant theoretical background. The program will provide appropriate background for diverse tasks such as developing scientific and engineering applications, developing system software, developing safety or security critical systems, solving computationally hard problems, and developing distributed applications. While not intended as preparation for subsequent entrance to a Ph.D. program, this goal is not precluded. Once the specific course requirements are met, appropriate selection of electives will enable individual interests to be met within the program. Anticipated areas of interest include software engineering, systems programming, and artificial intelligence.

Admission Requirements

In addition to the general Graduate School requirements, applicants must present a baccalaureate degree in Computer Science or a related field from a regionally accredited institution. A minimum GPA of 2.75 (on a 4.0 scale) is required. While a bachelor's degree in Computer Science is not required, admission without deficiency requires that an applicant has completed courses in analysis of algorithms, operating systems, database, and linear algebra. If these courses are not taken before admission to the program, they may be taken at Penn State Harrisburg, but the student will receive at most 3 credits toward the MS degree for these courses.

At the discretion of the program, applicants may be required to provide scores from the Graduate Record Examinations (GRE) and/or the GRE subject test in computer science. In addition, applicants must provide three letters of reference, at least one of which is from an academic source, and a letter outlining significant work experience and academic and career objectives.

Degree Requirements

A total of 30 graduate credits (400 level or above) is required for the degree of master of science in Computer Science. Students are required to take the following courses: MA SC 505 and COMP 511, COMP 512, and COMP 519. Additionally, students are required to complete either a thesis or a paper according to one of the two options described below. Students who believe that they have completed a course substantially similar to one of the specific course requirements may apply to have their previous work evaluated for the purpose of exemption to that requirement. If the exemption is granted, another approved course shall be taken in place of that required course. The remaining 18 credits must be completed according to one of the following options:

1. *Thesis Option: Research into a specific computer science problem, development of a scholarly written paper, and an oral defense.*
   This option requires: 6 credits of COMP 600, 3 additional credits from approved 500-level electives in computer science, mathematics, engineering, and information systems courses and 9 credits from approved 400- and 500-level electives in computer science, mathematics, engineering, and information systems courses.
2. *Paper Option: In-depth study of specific computer science problems, development of a written paper or project, and an oral defense.*
   This option requires: 3 credits of COMP 594, 9 credits from approved 500-level electives in computer science, mathematics, engineering, and information systems courses and 6 credits from approved 400- and 500-level electives in computer science, mathematics, engineering, and information systems courses.

A maximum of 9 transfer credits will be allowed for course work completed as a graduate student at another institution.

Suggested Tracks

For students with interests in the areas of software engineering, systems programming, and artificial intelligence, the program suggests the following course work. These tracks are only advisory--there is no requirement that a student follow any track, and tracks will not be noted on diplomas or transcripts.

Track in Software Engineering: Students following the track in software engineering will be provided with the conceptual tools needed for designing and managing large software systems. In addition to the required core, the track in software engineering consists of the following courses: COMP 513, COMP 516, INFSY 570. In addition to these courses, CMPSC 470 is highly recommended, as compiler development is an ideal environment for gaining practical experience with software engineering techniques and tools.

Track in Systems Programming: Students following the track in systems programming will receive instruction in both the conceptual foundation of systems software and the implementation of such systems. In addition to the required core, the track in systems

programming consists of the following courses: CMPSC 436, COMP 517, COMP 545.

Track in Artificial Intelligence: Students following the track in artificial intelligence are expected to gain an understanding in the theory and applications of AI methods as well as evolutionary methods for solving a variety of problems. In addition to the required core, the track in artificial intelligence consists of the following courses: COMP 520, COMP 524, COMP 556.

Additional Information

For further information, see: http://cs.hbg.psu.edu

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMPUTER SCIENCE (COMP) course list

MATHEMATICAL SCIENCES (MA SC) course list

Last Revised by the Department: Fall Semester 2003

Blue Sheet Item #: 31-08-012

Review Date: 6/3/04

UCA Revision #2: 7/30/07

Last updated by Publications: 8/21/09

Computer Science and Engineering (CSE)

RAJ ACHARYA, *Head of the Department*
111 Information Sciences and Technology Building
814-865-9505

Degrees Conferred:

Ph.D., M.S., M.Eng.

The Graduate Faculty

- Raj Acharya, Ph.D. (Minnesota/Mayo School of Medicine) Professor of Computer Science and Engineering; Department Head
- Jesse Barlow, Ph.D. (Northwestern) Professor of Computer Science and Engineering
- Piotr Berman, Ph.D. (MIT) Associate Professor of Computer Science and Engineering
- Guoray Cai, Ph.D. (Pittsburgh) Associate Professor of Information Sciences and Technology, Geography, and Computer Science and Engineering
- Octavia I. Camps, Ph.D. (Washington) Adjunct Associate Professor of Electrical and Computer Engineering, Northeastern
- Guohong Cao, Ph.D. (Ohio) Professor of Computer Science and Engineering
- David Capel, Ph.D. Assistant Professor of Computer Science and Engineering
- Swarat Chauduri, Ph.D. (Pennsylvania) Assistant Professor of Computer Science and Engineering
- Kyusun Choi, Ph.D. (Penn State) Assistant Professor of Computer Science and Engineering
- Robert Collins, Ph.D. (Massachusetts) Associate Professor of Computer Science and Engineering
- Lee D. Coraor, Ph.D. (Iowa) Associate Professor of Computer Science and Engineering
- Chitaranjan R. Das, Ph.D. (Louisiana) Professor of Computer Science and Engineering
- Frederico Torres Fonseca, Ph.D. (Maine) Associate Professor of Information Sciences and Technology
- Dennis F. Dunn, Ph.D. (Penn State) Associate Professor and Director of Academic Affairs, Computer Science and Engineering
- Martin Fürer, Dr.Sc.Math. (ETH-Zürich) Professor of Computer Science and Engineering
- C. Lee Giles, Ph.D. (Arizona) David Reese Professor of Information Sciences and Technology; Professor of Computer Science and Engineering
- Sean Hallgren, Ph.D. Assistant Professor of Computer Science and Engineering
- John Hannan, Ph.D. (Pennsylvania) Associate Professor of Computer Science and Engineering
- William E. Higgins, Ph.D. (Illinois) Professor of Electrical Engineering
- Mary Jane Irwin, Ph.D. (Illinois) Evan Pugh Professor, A. Robert Noll Chair of Engineering, Department of Computer Science and Engineering
- Trent Jaeger, Ph.D. (Michigan) Associate Professor of Computer Science and Engineering
- Mahmut Kandemir, Ph.D. (Syracuse) Associate Professor of Computer Science and Engineering
- George Kesidis, Ph.D. (California, Berkeley) Professor of Computer Science and Engineering; Electrical Engineering
- Daniel Kifer, Ph.D. Assistant Professor of Computer Science and Engineering
- Thomas F. La Porta, Ph.D. (Columbia) Professor of Computer Science and Engineering
- Dongwon Lee, Ph.D. (UCLA) Associate Professor of Information Sciences and Technology; Computer Science and Engineering
- Wang-Chien Lee, Ph.D. (Ohio) Associate Professor of Computer Science and Engineering
- Jia Li, Ph.D. (Stanford) Associate Professor of Statistics
- Peng Liu, Ph.D. (George Mason) Associate Professor of Information Sciences and Technology; Computer Science and Engineering
- Yanxi Liu, Ph.D. (Massachusetts) Associate Professor of Computer Science and Engineering; Electrical Engineering
- Patrick McDaniel, Ph.D. (Michigan) Associate Professor of Computer Science and Engineering
- John J. Metzner, Eng.Sc.D. (New York) Professor of Computer Science and Engineering
- Webb Miller, Ph.D. (Washington) Professor of Biology; Computer Science and Engineering
- Prasenjit Mitra, Ph.D. (Stanford) Assistant Professor of Information Sciences and Technology; Computer Science and Engineering
- Vijaykrishnan Narayanan, Ph.D. (South Florida) Professor of Computer Science and Engineering
- Padma Raghavan, Ph.D. (Penn State) Professor of Computer Science and Engineering
- Sofya Raskhodnikova, Ph.D. (MIT) Assistant Professor of Computer Science and Engineering
- Frank E. Ritter, Ph.D. (Carnegie Mellon) Associate Professor of Information Sciences and Technology; Psychology
- Suzanne Shontz, Ph.D. (Cornell) Assistant Professor of Computer Science and Engineering
- Rajeev Sharma, Ph.D. (Maryland) Associate Professor of Computer Science and Engineering
- Sunil Sinha, Ph.D. (Waterloo) Assistant Professor of Civil and Environmental Engineering
- Anand Sivasubramaniam, Ph.D. (Georgia Tech) Professor of Computer Science and Engineering
- Adam Smith, Ph.D. (MIT) Assistant Professor of Computer Science and Engineering
- Soundar R. Tirupatikumara (Kumara), Ph.D. (Purdue) Allen E. Pearce/Allen M. Pearce Professor of Industrial and Manufacturing Engineering; Professor of Computer Science and Engineering, and Information Sciences and Technology
- Bhuvan Urgaonkar, Ph.D. (Massachusetts) Assistant Professor of Computer Science and Engineering
- James Z. Wang, Ph.D. (Stanford) Associate Professor of Information Sciences and Technology; Computer Science and Engineering
- Yuan Xie, Ph.D. (Princeton) Associate Professor of Computer Science and Engineering
- John Yen, Ph.D. (California, Berkeley) University Professor of Information Sciences and Technology; Professor of Computer Science and Engineering
- Sencun Zhu, Ph.D. (George Mason) Assistant Professor of Computer Science and Engineering; Information Sciences and Technology

The department offers courses and is prepared to direct research in a variety of subfields of computer science and engineering, including VLSI, computer architecture, parallel/distributed processors and processing, multiprocessors, interconnection networks, pattern recognition and image processing, performance evaluation, reliability, fault tolerance, theory of computation, computer systems, numerical analysis and optimization, programming methodology, and analysis of algorithms. Research and instruction are supported by extensive computing facilities within the University's Information Technology Services and by the computer laboratories operated by the department.

For information about areas of specialization, laboratory and research facilities, fellowships assistantships, and other sources of financial assistance, please refer to our Web site: **www.cse.psu.edu**.

Admission Requirements

All applicants must provide a one-page statement of purpose and scores from the Graduate Record Examinations (GRE) Aptitude Test (verbal, quantitative, and analytical). A subject test in the GRE is not required, but the subject test in Computer Science is recommended.

Those students seeking an assistantship in Computer Science and Engineering ARE REQUIRED to submit a Test of Spoken English (TSE) or the TOEFL iBT. A score of 26 on the speaking section of the TOEFL iBT is equivalent to passing the TSE. A lower score would require remedial English as a Second Language courses. For score reporting for TOEFL and TSE, our institution code is 2660 and our department code is 78.

English Proficiency--The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the Internet-based test. The minimum composite score for the IELTS is 6.5. Specific graduate programs may have more stringent requirements.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

Specific graduate programs may require all international applicants to submit a TOEFL or IELTS score, regardless of their academic background and country of origin.

Information about the TOEFL can be obtained by writing to the Educational Testing Service, Box 6155, Princeton, NJ 08541-6155 or visiting its Web site at **www.toefl.org**. Local administration at University Park campus of the TOEFL is handled by the IECP. Information about the IELTS can be obtained by contacting IELTS International, 100 East Corson Street, Suite 200, Pasadena, CA 91103 or visiting its Web site a**www.ielts.org**.

Master's Degree Requirements

Candidates for the master's degree must satisfactorily complete the requirements of the Graduate School. In addition, all students are expected to have completed appropriate courses in computer architecture and machine organization, data structures and analysis of algorithms, programming languages, operating systems, and logical design/switching theory or theory of automata. Students who do not meet background requirements will be required to take the appropriate 400-level courses to prepare them for the 500-level courses. At most, 3 credits of background course work can be used to satisfy the degree requirements. Students admitted to the M.S. program will not be permitted to switch to the M. Eng. program at a later time, except under extenuating circumstances.

Master of Science students must take 15 credits of courses numbered CSE 500 through 589, including a minimum of 9 credits of breadth courses taken from the department's Graduate Handbook in Computer Science and Engineering. An additional 9 credits of 400-level courses and above (excluding independent studies courses and ENGR 588) are required (see Handbook). This must include at least 1, and at most 2, credits of CSE 590 (Colloquium). Students must complete and defend an M.S. thesis (6 credits of CSE 600). The total degree requirement is 30 credits.

Master of Engineering students must take 18 credits of 500-level courses with at least 15 of the credits being associated with courses that have CSE designations and numbered 500-589 (including a minimum of 9 credits of breadth courses referenced above and at least 3 credits of a depth course from the department list. Students must also take 12 additional credits of 400-level courses and above, excluding independent studies courses and ENGR 588 (See Handbook). This must include at least 1, and at most 2, credits of CSE 590 (colloquium). Students are required to complete and defend a 1-credit technical paper (CSE 594). The total degree requirement is 30 credits.

Doctoral Degree Requirements

The doctoral degree requirements include the general requirements of the Graduate School as listed under Doctoral Degree Requirements. Furthermore, students applying for and gaining admittance to the Ph.D. program will not be permitted to switch to the master's program at a later date, except under extenuating circumstances. To qualify for a Ph.D. degree, each student must take 27 credits of courses with numbers CSE 500-589 or CSE 598, and 21 additional credits of 400-level and above courses. The 21 additional credits must include at least 3 credits of CSE 590 (colloquium), with a maximum of 3 credits of CSE 590 being counted toward the total of 48 minimum credits. A maximum of 3 credits of X96 may also be counted. A student must pass the Ph.D. candidacy examination by the third regular semester after entering the program (see Handbook). Students must pass the Ph.D. comprehensive examination after completion of most of the course work, and the English competency and communication requirements. A thesis must be completed under the direction of a Ph.D. committee and the results must be successfully defended in the thesis defense examination.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMPUTER SCIENCE AND ENGINEERING (CSE) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/3/04

Faculty updated by Publications: 1/19/09

Counseling Psychology (CNPSY)

Program Home Page (Opens New Window)

JEFFREY HAYES, *In Charge of Graduate Program in Counseling Psychology*
327 CEDAR Building
814-863-2416
cppic@psu.edu

Degrees Conferred:

Ph.D.

The Graduate Faculty

- Kathleen J. Bieschke, Ph.D. (Michigan) *Professor of Counseling Psychology*
- JoLynn V. Carney, Ph.D. (Ohio) *Associate Professor of Counseling Education*
- Lisa M. Conyers, Ph.D. (Wisconsin, Madison) *Associate Professor of Rehabilitation Services*
- Jeffrey A. Hayes, Ph.D. (Maryland) *Professor of Counseling Psychology*
- Richard J. Hazler, Ph.D. (Idaho) *Professor of Counselor Education*
- Dennis E. Heitzmann, Ph.D. (Texas) *Affiliate Associate Professor of Counseling Psychology*
- James T. Herbert, Ph.D. (Wisconsin, Madison) *Professor of Education and Rehabilitation Services*
- Edwin L. Herr, Ed.D. (Columbia) *Distinguished Professor of Education*
- Brandon Hunt, Ph.D. (Virginia) *Professor of Rehabilitation Services*
- Joyce K. Illfelder-Kaye, Ph.D. (Ohio State) *Affiliate Associate Professor of Counseling Psychology*
- Benjamin D. Locke, Ph.D. (Boston College) *Affiliate Assistant Professor of Counseling Psychology*
- Margaret Lorah, D.Ed. (Penn State) *Affiliate Assistant Professor of Counselor Education*
- Mary McClanahan, Ph.D. (Penn State) *Adjunct Assistant Professor of Counseling Psychology*
- Janet McCracken, Ph.D. (Ohio State) *Adjunct Assistant Professor of Counseling Psychology*
- Elizabeth Mellin, Ph.D. (Ohio) *Assistant Professor of Counselor Education*
- Spencer G. Niles, D.Ed. (Penn State) *Professor of Counselor Education*
- Jack R. Rayman, Ph.D. (Iowa) *Affiliate Professor of Education and Counseling Psychology*
- Elizabeth Skowron, Ph.D. (Albany) *Associate Professor of Counseling Psychology*
- Robert B. Slaney, Ph.D. (Ohio State) *Professor of Counseling Psychology*
- Jerry G. Trusty, Ph.D. (Mississippi State) Professor of Counselor Education
- Keith B. Wilson, Ph.D. (Ohio State) *Professor of Rehabilitation Services*
- Susan S. Woodhouse, Ph.D. (Maryland) *Assistant Professor of Counseling Psychology*

The Ph.D. in Counseling Psychology is fully accredited by the American Psychological Association and approved by the Pennsylvania Board of Psychologist Examiners. This degree program is designed to train counseling psychologists in a multiculturally infused scientist-practitioner model. Graduates of this program are automatically entitled to sit for the psychology licensure examination in Pennsylvania and in most other states. Requirements vary from state to state so students desiring licensure in other states must determine the requirements of the state in which they intend to practice, although graduation from an A.P.A.-approved doctoral training program in counseling psychology is ordinarily sufficient to qualify to sit for a state licensure examination as a psychologist.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

All candidates for the Ph.D. in Counseling Psychology must possess a master's degree program, the content of which is relevant to counseling psychology (e.g., rehabilitation counseling, counselor education, clinical or general psychology). Doctoral candidates should present a 3.33 average in all graduate study completed.

Degree Requirements

In addition to academic competence, all candidates are expected to exhibit effectiveness in interpersonal relations and in both written and oral communication. They also must evidence support of professional counseling activities and organizations.

Ph.D. students in Counseling Psychology must satisfy degree requirements in statistics and research design, general psychology foundations, and counseling psychology core courses. In addition, students participate in extensive practicum, research team, and internship experiences under supervision. As part of the requirements for the Ph.D., all students must complete an approved internship in a counseling center or other facility meeting criteria set by the American Psychological Association.

The communication and foreign language requirement for the Ph.D. degree may be satisfied by a comprehensive knowledge of one foreign language and courses from other designated areas, or by options from designated areas selected to include competence in statistics, research design, computer application, or measurement.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COUNSELING PSYCHOLOGY (CNPSY) course list

Date last reviewed by Graduate School: 04/12/04

Last updated by Publications: 7/21/09

Counselor Education (CN ED)

Program Home Page (Opens New Window)

RICHARD HAZLER, *In Charge of Graduate Programs in Counselor Education*
327 Cedar Building
814-863-2415
rjh29@psu.edu

Degrees Conferred:

Ph.D., D.Ed., M.S., M.Ed.

The Graduate Faculty

- Kathleen J. Bieschke, Ph.D. (Michigan) *Professor of Counseling Psychology*
- JoLynn V. Carney, Ph.D. (Ohio) *Associate Professor of Counselor Education*
- Lisa M. Conyers, Ph.D. (Wisconsin, Madison) *Associate Professor of Rehabilitation Services*
- Catharina (Tineke) J. Cunning, Ph.D.(Penn State), *Affiliate Assistant Professor of Counselor Education*
- Lois A. Ehrmann, Ph.D. (Penn State) *Affiliate Assistant Professor of Counselor Education*
- Jeffrey A. Hayes, Ph.D. (Maryland) *Professor of Counseling Psychology*
- Richard J. Hazler, Ph.D. (Idaho) *Professor of Counselor Education*
- James T. Herbert, Ph.D. (Wisconsin, Madison) *Professor of Education and Rehabilitation*
- Edwin L. Herr, Ed.D. (Columbia) *Distinguished Professor of Education*
- Brandon Hunt, Ph.D. (Virginia) *Professor of Rehabilitation Services*
- W. Terrell Jones, D.Ed. (Penn State) *Affiliate Assistant Professor of Counselor Education*
- Margaret Lorah, D.Ed. (Penn State) *Affiliate Assistant Professor of Counselor Education*
- Elizabeth A. Mellin, Ph.D. (Ohio) *Assistant Professor of Counselor Education*
- Spencer G. Niles, D.Ed. (Penn State) *Professor of Counselor Education*
- Robert M. Orndorff, Ph.D. (Penn State) *Affiliate Assistant of Counselor Education*
- Jack R. Rayman, Ph.D. (Iowa) *Affiliate Professor of Education and Counseling Psychology*
- Elizabeth A. Skowron, Ph.D. (Albany) *Associate Professor of Counseling Psychology*
- Jerry Trusty, Ph.D. (Mississippi State) *Associate Professor of Counselor Education*
- Eric R. White, Ed.D. (Pennsylvania) *Affiliate Assistant Professor of Education*
- Keith B. Wilson, Ph.D. (Ohio State) *Assistant Professor of Rehabilitation Services* Susan S. Woodhouse, Ph.D. (Maryland) *Assistant Professor of Counseling Psychology*

Professional preparation is offered at the master's level for school counselors (elementary and secondary) and rehabilitation counselors. Credits required by different master's options vary from 51 to 54. Specifically, program specializations at the master's level include elementary school counseling (54 credit hours), secondary school counseling (54 credit hours), and rehabilitation counseling (51 credit hours).

The Ph.D. program prepares candidates for positions as counselor education faculty members and consists of a minimum of four academic years of graduate level preparation (including master's-level preparation), defined as eight semesters, with a minimum of 96 graduate-level credits required of all students in the program. The D.Ed. program helps students prepare to become supervisors of counseling services and requires 52 credit hours beyond the master's degree in counselor education.

Admission Requirements

Scores from the Graduate Record Examination (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin.* All candidates for graduate degrees in Counselor Education must present for admission at least 27 undergraduate credits with a GPA of 3.00 or better distributed among at least three of the following areas: economics, education, psychology, sociology, and physiology or anatomy.

Students with a 2.50 junior/senior average (on a scale of 4.00) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 2.50 grade-point average may be made for students with special backgrounds, abilities, and interests. All doctoral candidates should present at least a 3.33 average in all graduate study completed.

All doctoral applicants must have completed a master's degree in counselor education prior to admission into the Ph.D. or D.Ed. program. The master's degree must be comprised of 48 credit hours as specified by the Council for the Accreditation of Counseling and Related Educational Programs (CACREP).

Degree Requirements

All candidates are expected to exhibit, in addition to academic competence, effectiveness in interpersonal relations and in both written and oral communication. They also must evidence support of professional counseling activities and organizations. All degree options require students to participate in extensive practicum or fieldwork experience under supervision.

The Ph.D. program includes 76 credit hours beyond the master's degree in counselor education. The master's degree must be comprised of 48 credit hours as specified by CACREP. Ph.D. students must satisfy advanced degree requirements in the CACREP counselor education core areas (31 credit hours including a counseling and teaching internship), a minor field of study (15 credit hours), and empirical foundations (15 credit hours). Students in the Ph.D. program are expected to complete a dissertation involving independent and original research. Students are expected to use theoretical models of counseling to investigate problems of importance to the field. The additional credits in the Ph.D. program incorporate advanced coursework in research design, statistics, and counseling theory to prepare students for their subsequent roles as faculty members in counselor education programs.

The D.Ed. Program includes 52 credit hours beyond the master's degree in counselor education. Students in the D.Ed. program in Counselor Education must satisfy degree requirements in core counselor education courses (7 credit hours), empirical foundations (15 credit hours), and a counseling specialty area (15 credit hours) such as : career guidance, administration, planning, and management in

service delivery settings, and a minor field of study. D.Ed. students must complete a dissertation (15 dissertation credit hours) that is of practical significance to the delivery or administration of counseling services.

Candidacy Examination

All Ph.D./D.Ed. students are required to have a master's degree in counselor education prior to admission. After completion of 12 credits of doctoral study, which may allow the student to take the candidacy examination as early as the second semester in their doctoral program, Ph.D. and D.Ed. students may take a candidacy examination. Given the requirement that doctoral students will have a master's degree in counselor education thereby demonstrating their ability to complete graduate work successfully, the nature of the candidacy examination will include a review of the following by the student's candidacy committee: (1) the student's professional resume, (2) a statement regarding the general direction of the student's research interests and possible areas of dissertation inquiry, (3) grades from completed graduate courses, (4) proposed course of study for subsequent semesters, (5) selected graduate papers written by the student, and (6) a statement regarding the student's professional goals. In the candidacy examination, the student's candidacy committee determines the student's ability to continue in the program and to conduct doctoral research.

Comprehensive Examination

Both Ph.D. and D.Ed. candidates are required to take a written and oral comprehensive examination once their course work is completed (or when they are in their final semester of required coursework) and prior to the dissertation. The examination, prepared by the student's doctoral committee, covers all areas of the student's doctoral work both in and outside the field of counselor education. The comprehensive examination for Ph.D. students must include an assessment of the student's competence related to conducting independent and original research.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CORE COURSES for Counselor Education Doctoral Program:

- CN ED 502(3) Advanced Counseling Theory
- CN ED 554(3) Cross-Cultural Counseling
- CN ED 555(3) Career Counseling
- CN ED 580(3) Foundations of Counselor Education Seminar
- CN ED 581(3) Professional Issues Seminar
- CN ED 582(3) Advanced Group Psychotherapy
- CN ED 589(1) Seminar on Counseling Supervision
- CN ED 595D(3) Supervision of Counselors
- CN ED 595I(3) Teaching Internship
- CN ED 595K(3) Doctoral Counseling Internship
- CN ED 595P(3) Counselor Education Doctoral Practicum

COUNSELOR EDUCATION (CN ED) course list

Last Revised by the Department: Fall Semester 2005

Blue Sheet Item #: 33-07-103

Review Date: 06/14/05

Faculty updated: 6/22/09

Crime, Law, and Justice (C L J)

Program Home Page (Opens New Window)

JOHN D. McCARTHY, *Head of the Department of Sociology and Crime, Law, and Justice*
211 Oswald Tower
814-863-8260

Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- Duane Alwin, Ph.D. (Wisconsin) McCourtney Professor of Sociology, Demography, and Human Development and Family Studies
- Paul Amato, Ph.D. (James Cook, Australia) Professor of Sociology and Demography
- Roy L. Austin, Ph.D. (Washington) Associate Professor of Sociology and Justice
- Alan A. Block, Ph.D. (California, Los Angeles) Professor of Crime, Law, and Justice, and Jewish Studies
- Alan Booth, Ph.D. (Nebraska) Distinguished Professor Emeritus of Sociology, Human Development, and Demography
- Richard Bord, Ph.D. (Iowa) Professor Emeritus of Sociology
- Lori Burrington, Ph.D. (Ohio State) Assistant Professor of Crime, Law, and Justice
- Frank Clemente, Ph.D. (Tennessee) Professor of Sociology
- Stephen R. Couch, Ph.D. (SUNY) Professor of Sociology
- Gordon F. De Jong, Ph.D. (Kentucky) Distinguished Professor of Sociology and Demography; Director, Graduate Program in Demography
- Francis Dodoo, Ph.D. (Pennsylvania) Professor of Sociology and Demography
- James Eisenstein, Ph.D. (Yale) Professor Emeritus of Political Science and Crime, Law, and Justice
- Richard Felson, Ph.D. (Indiana) Professor of Crime, Law, and Justice, and Sociology
- Roger Finke, Ph.D. (Washington) Professor of Sociology and Religious Studies
- Glenn Firebaugh, Ph.D. (Indiana) Professor of Sociology and Demography
- Michelle Frisco, Ph.D. (Texas) Assistant Professor of Sociology and Demography
- Emily Greenman, Ph.D. (Michigan) Assistant Professor of Sociology
- Melissa Hardy, Ph.D. (Indiana) Distinguished Professor of Human Development and Family Studies, Sociology, and Demography
- Michael Hecht, Ph.D. (Illinois) Distinguished Professor of Speech Communication, and Crime, Law, and Justice
- Julie Horney, P{h.D. (California, San Diego) Professor of Crime, Law, and Justice; Graduate Officer
- Craig Humphrey, Ph.D. (Brown) Professor Emeritus of Sociology
- John Iceland, Ph.D. (Brown) Professor of Sociology and Demography
- David R. Johnson, Ph.D. (Vanderbilt) Professor of Sociology, and Human Development and Family Studies; Director, Survey Research Center
- Kurt Johnson, Ph.D. (Nebraska) Research Associate, Social Science Research Institute
- Michael P. Johnson, Ph.D. (Michigan) Professor Emeritus of Sociology, Women's Studies, and African and African American Studies
- Valarie King, Ph.D. (Pennsylvania) Associate Professor of Sociology, Demography, and Human Development and Family Studies
- John H. Kramer, Ph.D. (Iowa) Professor of Sociology, and Crime, Law, and Justice
- Derek Kreager, Ph.D. (Washington) Assistant Professor of Crime, Law, and Justice
- Nancy S. Landale, Ph.D. (Washington) Professor of Sociology and Demography
- Barrett A. Lee, Ph.D. (Washington) Professor of Sociology and Demography
- Doris MacKenzie, Ph.D. (Penn State) Professor of Crime, Law, and Justice
- Molly Martin, Ph.D. (Wisconsin) Assistant Professor of Sociology and Demography
- Michael Massoglia, Ph.D. (Minnesota) Assistant Professor of Crime, Law, and Justice
- Jennifer Mastrofski, Ph.D. (Penn State) Associate Professor of Administration of Justice
- Stephen Matthews, Ph.D. (Wales) Associate Professor of Sociology, Anthropology, and Demography
- John D. McCarthy, Ph.D. (Oregon) Professor of Sociology
- Hart Nelsen, Ph.D. (Vanderblit) Professor Emeritus of Sociology
- R. Salvador Oropesa, Ph.D. (Washington) Professor of Sociology and Demography
- D. Wayne Osgood, Ph.D. (Colorado) Professor of Crime, Law, and Justice, and Sociology
- William Parsonage, Ph.D. (South Dakota) Professor Emeritus of Crime, Law, and Justice
- Evelyn Patterson, Ph.D. (Pennsylvania) Assistant Professor of Crime, Law, and Justice, Sociology, and Demography
- Roland Pellegrin, Ph.D. (North Carolina) Professor Emeritus of Sociology
- Eric Plutzer, Ph.D. (Washington-St. Louis) Associate Professor of Political Science and Sociology
- Suet-Ling Pong, Ph.D. (Chicago) Associate Professor of Education and Sociology
- Richard Ritti, Ph.D. (Cornell) Professor Emeritus of Crime, Law, and Justice
- R. Barry Ruback, Ph.D. (Pittsburgh) Professor of Crime, Law, and Justice, and Sociology
- Eric Silver, Ph.D. (SUNY, Albany) Associate Professor of Crime, Law, and Justice, and Sociology
- Graham B. Spanier, Ph.D. (Northwestern) Professor of Human Development, Sociology, and Family, and Community Medicine
- Jeremy Staff, Ph.D. (Minnesota) Assistant Professor of Crime, Law, and Justice, and Sociology
- Darrell J. Steffensmeier, Ph.D. (Iowa) Professor of Sociology and Crime, Law, and Justice
- C. Shannon Stokes, Ph.D. (Kentucky) Professor of Rural Sociology, Sociology, and Demography
- Marylee C. Taylor, Ph.D. (Harvard) Associate Professor of Sociology
- George Theodorson, Ph.D. (Cornell) Professor Emeritus of Sociology
- Kevin J. A. Thomas, Ph.D., (Pennsylvania) Assistant Professor of African and African American Studies, Sociology, and Demography
- Jenny Trinitapoli (Texas) Assistant Professor of Sociology, Demography, and Religious Studies)
- Jeffery T. Ulmer, Ph.D. (Penn State) Associate Professor of Crime, Law, and Justice, and Sociology
- Jennifer Van Hook, Ph.D. (Texas) Associate Professor of Sociology and Demography
- Edward Walsh, Ph.D. (Michigan) Professor Emeritus of Crime, Law, and Justice
- Susan Welch, Ph.D. (Illinois) Professor of Political Science and Crime, Law, and Justice

The graduate program in Crime, Law, and Justice is for students seeking the Ph.D. degree. It offers an advanced education on crime and its control to persons interested in research careers in academia and public service.

The graduate program emphasizes theory and research on crime and justice, research and statistical methodology, and substantive knowledge about crime and its control.

Admission Requirements

Applications from students with either the B.A. or M.A. degree will be accepted through January 1 for admission in the fall of the following year. Selection is based on transcripts, three letters of recommendation from persons familiar with the applicant's academic performance, a statement of goals, a sample of written work such as a term paper, and Graduate Record Examinations (GRE) verbal and quantitative scores. The best-qualified applicants will be admitted to the program up to the number of spaces available.

M.A. and Ph.D. Degree Requirements

Students entering the program with the B.A. degree will first earn the M.A. degree. Thirty-seven credits of course work and a master's thesis are required for the M.A. The course work includes a sequence of methods and statistics courses; a crime theory course; a course in the organization and criminal justice system; and additional 500-level substantive Crime, Law, and Justice courses selected in consultation with a student's faculty committee.

A candidacy exam is required of all students seeking the Ph.D., after a master's degree has been earned. This exam will consist of an evaluation by the program's graduate faculty of the student's seminar papers, master's thesis, and overall record of performance. Students admitted with a master's degree will stand for this exam in the second semester of full-time study.

To complete the Ph.D., students must, in consultation with their committee, select 12 credits of 500-level courses outside the program that form a coherent disciplinary concentration that complements the study of Crime, Law, and Justice. A comprehensive exam must be passed by all students before intensive dissertation research begins.

The program in Crime, Law, and Justice has no formal foreign language or communication requirement. However, students are encouraged to pursue additional training in statistics, computer science, foreign language, technical writing, specialized methods, or specialized theory that will further their dissertation or career plans.

Student Aid

All students admitted to the program are supported with stipends and tuition waivers for either four years (students entering with a master's degree) or five years (students entering with a bachelor's degree). Support may be in the form of research assistantships or teaching assistantships, with most students receiving a combination of types of support across their graduate careers.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CRIME, LAW, AND JUSTICE (C L J) course list

Last reviewed by Graduate School: 5/25/04

Last updated by Publications: 2/2/10

Criminal Justice (CRIMJ)

BARBARA S. SIMS, *Graduate Programs Chair*
Penn State Harrisburg
777 W. Harrisburg Pike
Middletown, PA 17057-4898
717-948-6044
717-948-6322 (administrative assistant)
717-948-6320 (fax)
bas4@psu.edu
www.hbg.psu.edu (Opens New Window)

Degree Conferred:

M.A.

The Graduate Faculty

- Danielle Boisvert, Ph.D. (Cincinnati) *Assistant Professor of Criminal Justice*
- Shaun L. Gabbidon, Ph.D. (Indiana U of Pa.) *Professor of Criminal Justice*
- Carl Garver, D.Ed. (Penn State) *Instructor in Criminal Justice*
- Don Hummer, Ph.D. (Michigan State) *Associate Professor of Criminal Justice*
- James M. Ruiz, Ph.D. (Sam Houston State) *Associate Professor of Criminal Justice*
- Barbara A. Sims, Ph.D. (Sam Houston State) *Professor of Criminal Justice*
- Jennifer Sumner, Ph.D. (California, Irvine) *Assistant Professor of Criminal Justice*

The program reflects the numerous complexities of the discipline. It provides academic leadership for students to work within corrections, institutionalized and non-institutionalized settings, victim services, adult and juvenile services, policing and law enforcement, private security, courts, and other human service organizations serving the clients of these institutions. It also helps develop research acumen for those students who may wish to consider doctoral studies.

Strong ties developed in state, local, and federal level law enforcement, corrections, drug treatment, victimization, and crime control policy organizations provide research and learning opportunities for interested students.

The degree may be earned by full or part-time study. Most courses will be offered in the evening, although some will be offered during the day or on weekends.

Admission Requirements

- A completed application form with the application fee.
- Two official transcripts of all colleges and universities attended.
- Graduation from a regionally accredited college or university.
- Three letters of recommendation.
- A brief (two-page) statement of purpose or a writing sample.
- Minimum GPA of a 3.0 for the last 60 credits of undergraduate study. Satisfactory scores on the Graduate Record Examination (GRE), Graduate Management Admissions Test (GMAT), or Law School Admissions Test (LSAT) are required if the GPA is less than 3.0. *Note: All students who seek funding must take one of these standardized tests, preferably the GRE.*
- The language of instruction at Penn State is English. All international applicants whose first language is not English or who have not received a baccalaureate or master's degree from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test, a score of 213 on the compluter-based test, or 80 points on the new Internet-based test with a minimum of 20 points on the speaking portion; or the IELTS module with a minimum compusite score of 6/5 is required for admission.
- Some foundational course work may be required for those students who did not major in criminal justice as an undergraduate. This decision will be made by the MACJ Program Coordinator after a close review of the undergraduate transcript.
- In exceptional cases, the program may also approve admission by reason of special backgrounds, abilities, and interests.
- Students must submit admission materials for fall by February 15.

Degree Requirements

1. The thesis track requires 36 credits. Six of the credits will be for the thesis.
2. The non-thesis track will require 36 credits plus successful completion of the comprehensive essays, for which a student will register for one credit of CRIMJ 594.
3. These credits must be at the 400 level or above with a minimum of 30 credits at the 500 level or above.
4. A minimum grade-point average of a 3.0 must be earned for course work taken as a graduate student.
5. Students are required to take the following courses: CRIMJ 500, CRIMJ 501, CRIMJ 502, CRIMJ 503, and CRIMJ 504. CRIMJ 501 and CRIMJ 503 are to be taken concurrently.
6. Students who believe they have completed a course substantially similar to one of the specific course requirements may apply to have their previous work evaluated for the purposes of exemption to that requirement. If approved, another course will be taken in place of that requirement.
7. A maximum of 6 credits of completed graduate work may be transferred in from another accredited institution.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CRIMINAL JUSTICE (CRIMJ) course list

Graduate Bulletin Archive - July 2010

Last Revised by the Department: Spring Semester 2009

Blue Sheet Item #: 37-03-043

Review Date: 11/18/08

Last updated by Publications: 2/2/10

Curriculum and Instruction (C I)

Program Home Page

GLENDON W. BLUME, *Coordinator for Graduate Programs in Curriculum and Instruction*
269 Chambers Building
814-865-2169
bti@psu.edu

Degrees Conferred:

Ph.D., D.Ed., M.S., M.Ed. (Penn State University Park), M.Ed. (Penn State Great Valley)
Integrated B.S. in Special Education/M.Ed. in Curriculum and Instruction

The Graduate Faculty

- Glendon W. Blume, Ph.D. (Wisconsin) Professor of Education
- William S. Carlsen, Ph.D. (Stanford) Professor of Education
- Jacqueline Edmondson, Ph.D. (Penn State) Assistant Professor of Education
- Miriam Espinosa-Dulanto, Ph.D. (Wisconsin, Madison) Assistant Professor of Education
- Marnina Gonick, Ph.D. (Ontario Inst for Studies in Education) Assistant Professor of Education
- Daniel D. Hade, Ph.D. (Ohio State) Associate Professor of Education
- M. Kathleen Heid, Ph.D. (Maryland) Professor of Education
- Steven Herb, Ph.D. (Penn State) Librarian; Head, Education Library, Affiliate Associate Professor of Education
- Patricia H. Hinchey, Ed.D. (Columbia) Associate Professor of Education
- James E. Johnson, Ph.D. (Wayne State) Professor of Education
- Ravinder Koul, Ph.D. (Penn State) Associate Professor of Education
- James Levin, Ph.D. (Penn State) Affiliate Associate Professor of Education
- Arlene Mitchell, Ph.D. (Penn State) Associate Professor of Education
- Jamie Myers, Ph.D. (Indiana) Associate Professor of Education
- Murry R. Nelson, Ph.D. (Stanford) Professor of Education
- Peter A. Rubba, Ed.D. (Indiana) Professor of Education
- David W. Saxe, Ph.D. (Illinois) Associate Professor of Education
- Patrick W. Shannon, Ph.D. (Minnesota) Professor of Education
- Iris M. Striedieck, D.Ed. (Penn State) Assistant Professor of Education
- Thomas D. Yawkey, Ph.D. (Illinois) Professor of Education
- Rose Mary Zbiek, Ph.D. (Penn State) Associate Professor of Education
- Carla M. Zembal-Saul, Ph.D. (Michigan) Associate Professor of Education

This program provides advanced professional preparation in the special areas of bilingual education, curriculum and supervision, early childhood education, elementary education, instructional leadership, language and literacy education, science education, social studies education, and mathematics education.

The M.Ed. program in the areas of curriculum and supervision and instructional leadership is available at Penn State Great Valley (see www.gv.psu.edu).

Admission Requirements

Scores from the Miller Analogies Test (MAT) or the Graduate Record Examinations (GRE) are required for admission. However, applicants for the doctoral degree are strongly encouraged to take the GRE. Moreover, students with excellent academic records who wish to be considered for fellowships, scholarships, and assistantships should take the GRE as a matter of course. At the discretion of an option area, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Students with appropriate course and professional backgrounds will be considered for admission, subject to the limitation of program facilities. For admission to the professional degree programs leading to the M.Ed. and D.Ed., teaching or equivalent experience and at least 18 credits in education are recommended.

Master's Degree Requirements

M.Ed. and M.S. candidates are expected to complete the core: EDPSY 421, C I 400, and C I 550, or the equivalent.

Candidates for the M.Ed. degree with a minor in Curriculum and Instruction must take a minimum of 6 course credits approved in advance.

Doctoral Degree Requirements

The completion of a core of competencies in curriculum, instruction, and supervision is expected of Ph.D. and D.Ed. candidates.

To meet residency requirements, the Ph.D. candidate must spend at least two consecutive semesters enrolled as a full-time student at the University Park campus. The D.Ed. candidate must spend at least two consecutive sessions (e.g., semester, summer session) enrolled as a full-time student at the University Park campus.

Candidates for the D.Ed. degree with a minor in Curriculum and Instruction must take a minimum of 15 course credits approved in advance by the graduate program coordinator in Curriculum and Instruction.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Integrated B.S. in Special Education/M.Ed. in Curriculum and Instruction

The Special Education and Curriculum and Instruction with emphasis in Language and Literacy Education Integrated Undergraduate-Graduate (SE/CI-LLED IUG) leading to certification as a Reading Specialist.

The Special Education and Curriculum Instruction with Emphasis in Language and Literacy Education Integrated Undergraduate-Graduate (SE/CI-LLED IUG) Degree Program consists of integration of required courses for a B.S. in Special Education with courses required for certification as a Reading Specialist and a M.Ed. in Curriculum and Instruction with emphasis in Language and Literacy Education (LLED). The five-year, SE/CI-LLED IUG is an option for highly qualified students seeking certification to teach Special Education in Pennsylvania in grades K-12. Students in this IUG will be taught how to design and deliver appropriate instruction based on individual needs and incorporate a variety of materials and strategies. Students are expected to complete courses required for the graduate level K-12 reading specialist integrated with their undergraduate experiences and coursework in Special Education and will complete a summer practicum in an on-campus reading clinic as well as a capstone Special Education teaching experience in their final semester. Completion of the IUG (along with earning a passing score on PDE required PRAXIS tests) leads to a B.S. in Special Education, certification in special education and as a reading specialist in the state of Pennsylvania, and a M.Ed. in Curriculum and Instruction.

Admission to the SE/CI-LLED IUG Reading Specialist program will be based upon having attained a minimum GPA of 3.5 in Special Education courses, with a grade of B or better in SPLED 412. Admission will be based on a recommendation by the Reading Specialist Program Coordinator in consultation with the Coordinator of Teacher Education in Special Education.

For the B.S./M.Ed. Degree in integrated Special Education B.S. and Curriculum and Instruction M.Ed., a minimum of 150 credits is required. Up to 12 graduate level credits can apply to both undergraduate and graduate degrees; half of these must be at the 500-level. Students can complete the B.S. in Special Education and not advance to the M.Ed. CI degree if they desire.

Master of Education

CURRICULUM AND INSTRUCTION M.Ed. (30 credits)

Core Areas (9 credits - choose one course from each area):
Curriculum: C I 550
Research: C I 501 or EDPSY 400
Learning: EDPSY 421, EDPSY 545, or HD FS 429

Emphasis in Language and Literacy Education with Reading Specialist (* denotes required courses)
EDLDR 563, EDPSY 526 *LL ED 500, *LL ED 501, *LL ED 550, *LL ED 595A,

Note: A Master's paper is required for completion of the M.Ed.

A passing score on the PRAXIS Reading Specialist Exam (qualifying score of 570) is required for Reading Specialist certification.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CURRICULUM AND INSTRUCTION (C I) course list

CURRICULUM AND SUPERVISION (C & S) course list

EARLY CHILDHOOD EDUCATION (E C E) course list

LANGUAGE AND LITERACY EDUCATION (LL ED) course list

MATHEMATICS EDUCATION (MTHED) course list

SCIENCE EDUCATION (SCIED) course list

SOCIAL STUDIES EDUCATION (SS ED) course list

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-098

Review Date: 01/12/2010

Last updated by Publications: 12/23/09

Demography (DEMOG)

Program Home Page

GORDON F. De JONG, *In Charge*
601 Oswald Tower
814-865-0486
demography@pop.psu.edu

Degrees Conferred:

Students electing this option through participating programs will earn a degree with a dual title at both the Ph.D. and M.A. levels, i.e., Ph.D. in (graduate program name) and Demography, or M.A. or M.S. in (graduate program name) and Demography.

The following graduate programs offer dual degrees in Demography: M.A. and Ph.D. in Sociology and Demography; M.A. and Ph.D. in Economics and Demograpy; M.A. and Ph.D. in Anthropology and Demography; M.S. and Ph.D. in Rural Sociology and Demography; M.S. and Ph.D. in Human Development and Family Studies, and Demography; M.S. and Ph.D. in Agricultural, Environmental, and Regional Economics, and Demography; M.S. and Ph.D. in Health Policy and Administration.

The Graduate Faculty

- David G. Abler, Ph.D. (Chicago) Professor of Agricultural, Environmental, and Regional Economics and Demography
- Duane F. Alwin, Ph.D. (Wisconsin) McCourtney Professor of Sociology, Demography, and Human Development and Family Studies
- Paul R. Amato, Ph.D. (James Cook University) Hoffman Professor of Sociology and Demography
- Alan Booth, Ph.D. (Nebraska) Distinguished Professor of Sociology, Human Development, and Demography
- Linda M. Burton, Ph.D. (USC) Professor of Human Development and Sociology
- Jeffrey H. Cohen, Ph.D. (Indiana) Assistant Professor of Anthropology and Demography
- Gretchen T. Cornwell, Ph.D. (Penn State) Assistant Professor of Rural Sociology and Demography
- Gordon F. De Jong, Ph.D. (Kentucky) Distinguished Professor of Sociology and Demography
- Francis Dodoo, Ph.D. (Pennsylvania) Liberal Arts Research Professor of Sociology and Demography
- David J. Eggebeen, Ph.D. (North Carolina) Associate Professor of Human Development
- George Farkas, Ph.D. (Cornell) Professor of Sociology and Demography
- Jill L. Findeis, Ph.D. (Washington State) Distinguished Professor of Agricultural, Environmental, and Regional Economics, and Demography
- Glenn Firebaugh Ph.D. (Indiana) Distinguished Professor of Sociology and Demography
- E. Michael Foster, Ph.D. (North Carolina) Professor of Health Policy and Administration, and Demography
- Mark D. Hayward, Ph.D. (Indiana) Distinguished Professor of Sociology and Demography
- Mark Hill, Ph.D. (Pennsylvania) Assistant Professor of Sociology and Demography
- Marianne Hillemeier, Ph.D. (Michigan) Associate Professor of Health Policy Administration and Demography
- John Iceland, Ph.D. (Brown) Professor of Sociology and Demography
- Rukmalie Jayakody, Ph.D. (Michigan) Associate Professor of Human Development and Family Studies, and Demography
- Leif I. Jensen, Ph.D. (Wisconsin) Professor of Rural Sociology and Demography
- David R. Johnson, Ph.D. (Vanderbilt) Professor of Sociology, Human Development and Family Studies, and Demography
- Patricia L. Johnson, Ph.D. (Michigan) Associate Professor of Anthropology, Demography, and Women's Studies
- Valarie King, Ph.D. (Pennsylvania) Professor of Sociology, Demography, and Human Development and Family Studies
- Nancy S. Landale, Ph.D. (Washington) Professor of Sociology and Demography
- Barrett A. Lee, Ph.D. (Washington) Professor of Sociology and Demography
- Bruce G. Lindsay, Ph.D. (Washington) Distinguished Professor of Statistics
- Stephen A. Matthews, Ph.D. (Wales College of Cardiff) Associate Professor of Sociology, Geography, and Demography
- Diane K. McLaughlin, Ph.D. (Penn State) Professor of Rural Sociology and Demography
- Salvador R. Oropesa, Ph.D. (Washington) Professor of Sociology and Demography
- Suet-ling Pong, Ph.D. (Chicago) Professor of Foundations and Comparative/International Education
- David Shapiro, Ph.D. (Princeton) Professor of Economics, Demography, and Women's Studies
- Pamela Farley Short, Ph.D. (Yale) Professor of Health Policy Administration
- Anastasia R. Snyder, Ph.D. (Penn State) Assistant Professor of Rural Sociology and Demography
- Graham B. Spanier, Ph.D. (Northwestern) Professor of Human Development, Sociology, and Demography
- Jennifer Van Hook, Ph.D. (Texas, Austin) Professor of Sociology and Demography
- James W. Wood, Ph.D. (Michigan) Professor of Anthropology and Demography
- Wilbur Zelinsky, Ph.D. (California, Berkeley) Professor Emeritus of Geography

The Demography dual-title degree program option is administered by the Demography Program Committee, which is responsible for management of the program. The committee maintains program definition, identifies faculty and courses appropriate to the option, and recommends policies and procedures for its operation to the dean of the Graduate School. This dual-title degree program is offered as an option to graduate major programs in three colleges: Agricultural Sciences, Health and Human Development, and the Liberal Arts. The option enables students from diverse graduate programs to attain and be identified with the content, techniques, methodology, and policy implications of demography, while maintaining a close association with areas of application. Through demography, students study (1) the size, composition, and distribution of the population; (2) changes in these characteristics; (3) the processes that determine these changes--fertility, migration, and mortality; and (4) their social, economic, and cultural causes and consequences. To pursue a dual-title degree under this program option, the student must apply to the Graduate School and register through one of the following graduate programs: Agricultural Economics, Anthropology, Economics, Human Development and Family Studies, Rural Sociology, or Sociology.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

There are no prerequisites for admission to the M.A., M.S., or Ph.D. program options other than those imposed by the participating graduate program.

All application materials should be submitted by January 1. Applicants should have a junior/senior cumulative average of at least 3.00 (on

a 4.00 scale) and appropriate courses in statistics and in the social science department to which they are applying. The application should include three letters of reference and a statement describing and explaining the applicant's interest in demography and goals during and after graduate study. TOEFL scores are required of all students for whom English is a second language.

Degree Requirements

To qualify for a dual-title degree, students must satisfy the requirements of the graduate program in which they are enrolled, including the communication/foreign language requirements, if any. In addition, they must satisfy the minimum requirements in the Demography option described here, as established by the Demography Program Committee. Within this framework, final course selection is determined by students and their degree committees. All dual-title degree candidates who are in residence must enroll in DEMOG 590 for 1 credit each year in residence.

Master's Degree: For the M.A. and M.S. degree with the Demography option, 12 course credits are required in addition to the colloquium credit or credits. A minimum of 3 credits is required in each of the following areas: (1) disciplinary perspective courses-ANTH 408 and 462, ECON 463, SOC 423; (2) demographic methods courses-SOC 573 (required of all candidates), 576, 577, DEMOG 597, SOC/EDTHP 597; (3) seminars in demographic processes-SOC 521, 523, 524, 535, R SOC 525, ANTH 566, DEMOG 597, SOC 597; (4) seminars in population studies-ECON 516, SOC 522, 530, 531, 537, 560, 597, R SOC 530, 597, HD FS 531, 537, 577, AG EC 597, EDTHP 516, ANTH 597, H P A 525.

Particular courses may satisfy both the graduate major program requirements and those of the Demography option. The thesis supervisor must be a member of the graduate faculty recommended by the chair or the graduate officer of the program granting the degree and approved by the Demography Program Committee as qualified to supervise thesis work in demography. If a nonthesis option is available in the student's graduate program, a paper or report may be written in lieu of the M.A. or M.S. thesis. A student selecting the paper instead of a thesis must take an additional 3 credits in the Demography option.

Ph.D. Degree: For the Ph.D. degree with the Demography option, a minimum of 24 credits (a minimum of 27 credits for students who completed a non-thesis M.A. or M.S. program) is required in addition to the colloquium credits. For students entering with a master's degree from another institution, equivalent course credits may be accepted. The following minimum number of credits is required in each curriculum category: 3 credits of disciplinary perspective courses; 6 credits of demographic methods courses; 6 credits of seminars in demographic processes; 3 credits of seminars in population studies; and 6 credits of electives. Final course selection is determined in consultation with the doctoral committee.

The doctoral committee is recommended by the graduate major program granting the degree. A four-member committee is required for a dual-title degree program. The chair and at least one additional member of the doctoral committee must be members of the graduate faculty approved by the Demography Program Committee as qualified to supervise doctoral theses in demography. The Demography faculty members on the student's committee are responsible for administering an examination in demography that constitutes a portion of the comprehensive examination of the doctoral student in the program option. A dissertation on a demographic topic is required of students in the dual-title degree program.

Other Relevant Information

A Ph.D. minor in Demography is available for doctoral students in graduate programs other than the dual-title participating programs who find it advantageous to include demographic content, methods, and policy analysis in their program of study. The student's doctoral committee must approve the choice of this minor, and one member of the doctoral committee must be from the Demography faculty.

To qualify for a minor in Demography, students must satisfy the requirements of their graduate major program and take at least 15 credits in demography in addition to colloquium credits. A minimum of at least 3 credits each in (1) disciplinary perspective, (2) demographic methods courses, (3) seminars in demographic processes, and (4) seminars in population studies is required. Students must enroll in DEMOG 590 for 1 credit during each year enrolled in the program and in residence.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following award typically has been available to graduate students in this program:

HEWLETT FOUNDATION AND NICHO TRAINEESHIP AWARDS

Available to demography students from developing countries. NICHD traineeships available to Demography students from the United States.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

DEMOGRAPHY (DEMOG) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/24/04

Last updated by Publications: 3/2/10

Dual-Title Graduate Degree in History (HIST) and in Classics and Ancient Mediterranean Studies (CAMS)

Degrees Conferred

Students electing this program through the participating departments (History and CAMS) will earn a degree with a dual-title at both the PH.D. and the M.A. levels, i.e., Ph.D. in History with a dual-title in CAMS, or M.A. in History with a dual-title in CAMS.

The Graduate Faculty
Classics and Ancient Mediterranean Studies and History

David G. Atwill, Ph.D. (U of Hawaii) Assistant Professor of History and Religious Studies
Philip H. Baldi, Ph.D. (U of Rochester) Professor of Classics and Linguistics
Daniel C. Beaver, Ph.D. (Chicago) Associate Professor of History
Daniel William Berman, Ph.D. (Yale) Associate Professor of Classics and Ancient Mediterranean Studies
Lila C. Berman, Ph.D. (Yale) Assistant Professor of History and Religious Studies
William A. Blair, Ph.D. (Penn State) Professor of History; Director, Civil War Era Center
Chris Brady ,D. Phil. (Oxford) Associate Professor of Classics and Ancient Mediterranean Studies
Erica F. Brindley, Ph.D. (Princeton) Assistant Professor of History and Religious Studies
Jonathan E. Brockopp, Ph.D. (Yale) Associate Professor of Religious Studies and History
Kumkum Chatterjee, Ph.D. (Calcutta, India) Associate Professor of History
Gary S. Cross, Ph.D. (Wisconsin, Madison) Distinguished Professor of Modern History
Grace Delgado, Ph.D. (UCLA) Assistant Professor of History and Religious Studies
Alan Derickson, Ph.D. (California) Professor of History
Sophie C. M. deSchaepdrijver, Ph.D. (U of Amsterdam) Associate Professor of History
Greg A. Eghigian, Ph.D. (Chicago) Associate Professor of History
Garrett G. Fagan, Ph.D. (McMaster) Associate Professor of Classics and Ancient Mediterranean Studies and History
Cary F. Fraser, Ph.D. (U of Geneva) Associate Professor of African and African American Studies and History
Lori D. Ginzberg, Ph.D. (Yale) Professor of History and Women's Studies
Amy Greenberg, Ph.D. (Harvard) Professor of History and Women's Studies
Baruch Halpern, Ph.D. (Harvard) Professor of Ancient History, Jewish Studies, and Classics and Ancient Mediterranean Studies
Paul B. Harvey, Jr., Ph.D. (Pennsylvania) Associate Professor of Classics and Ancient Mediterranean Studies, History, and Religious Studies, and Jewish Studies
Brian Hesse, Ph.D. (Columbia) Professor of Jewish Studies and Ancient Mediterranean Studies
Ronnie Po-chia Hsia, Ph.D. (Yale) Edwin Erle Sparks Professor of History
Benjamin T. Hudson, Ph.D. (Oxford) Professor of History and Medieval Studies
Philip Jenkins, Ph.D. (Cambridge) Distinguished Professor of Religious Studies and History
Anthony E. Kaye, Ph.D. (Columbia) Assistant Professor of History
Ann Eloise Killebrew, Ph.D. (Hebrew University, Jerusalem) Associate Professor of Classics and Mediterranean Studies, Jewish Studies, and Anthropology
Gerald Neil Knoppers, Ph.D. (Harvard) Sparks Professor of Classics and Ancient Mediterranean Studies and Jewish Studies
Tijana Krstic, Ph.D. (Michigan) Assistant Professor of History
Joan B. Landis, Ph.D., (NYU) Professor of Women's Studies and History
Daniel L. Letwin, Ph.D., (Yale) Associate Professor of History
Sally A. McMurry, Ph.D., (Cornell) Professor of American History
Jennifer L. Mittelstadt, Ph.D., (Michigan) Assistant Professor of History and Women's Studies
Wilson J. Moses, Ph.D., (Brown) Professor of American History
Mark Munn, Ph.D., (Pennsylvania) Professor of Greek History and Greek Archaeology, and Classics and Ancient Mediterranean Studies
Mark E. Neely, Jr., Ph.D., (Yale) McCabe Greer Professor of the ERa of the American Civil War
Sylvia Neely, Ph.D., (Notre Dame) Associate Professor of History
On-Cho Ng, Ph.D., (Hawaii, Manoa) Associate Professor of History
William A. Pencak, Ph.D., (Columbia) Professor of American History
Carol Reardon, Ph.D., (Kentucky) Professor of History
Donald Redford, Ph.D., (U of Toronto) Professor of Classics and Ancient Mediterranean Studies
Matther Restall, Ph.D., (California, Los Angeles) Sparks Professor of History
A.G. Roeber, Ph.D., (Brown) Professor of Early Modern History and Religious Studies
Adam Rome, Ph.D., (Kansas) Associate Professor of History
Anne Carver Rose, Ph.D., (Yale) Professor of History, Religious Studies, and Jewish Studies
Paul Lawrence Ross, Ph.D., (Sorbonne) Professor of European History and Mitrani Professor of Jewish Studies
Aaron Rubin, Ph.D., (Harvard) Assistant Professor of Classics and Ancient Mediterranean Studies, Jewish Studies, and Comparative Literature
Gonzala Rubio, Ph.D., (Johns Hopkins) Associate Professor of Classics and Ancient Mediterranean Studies, and History and Religious Studies
Janina Safran, Ph.D., (Harvard) Associate Professor of History
Mrinalini Sinha, Ph.D., (SUNY, Stony Brook) Research Professor of History and Women's Studies
Gregory Smits, Ph.D., (Southern California) Associate Professor of History
Catherine Wanner, Ph.D., (Columbia) Assistant Professor of History and Religious Studies
Stephen Wheeler, Ph.D., (Princeton) Associate Professor of Classics
Nan E. Woodruff, Ph.D., (Tennessee) Professor of History

This dual-title degree program will increase the intellectual rigor, breadth, and depth of graduate work in history through immersion in the disciplinary fields covered by the Department of Classics and Ancient Mediterranean Studies: the philology and literature of ancient Mediterranean languages; the history and material cultures of those societies.

This dual-title program will thus provide a context in which history graduate students will learn how to synthesize knowledge within and across traditional disciplinary boundaries. In addition, this dual-title degree program will provide qualified history graduate students opportunities for instructional training encouraging an interdisciplinary approach to teaching.

The primary advantages of this dual-title program include the intellectual and academic advantages and benefits of interdisciplinary study, as well as the enhancement of the reputation of the history department through an innovative program, leading to recruitment of highly qualified history graduate students, and an improved placement of doctoral graduates in the highly-competitive field of ancient history.

This dual-title degree program does not duplicate any other degree program in the University.

Admission Requirements

Students must first be admitted to the graduate program of the Department of History; only after admittance by the Department of History will history graduate students be eligible to apply for graduate study in the dual-title program. An admissions committee of CAMS faculty will review applications for graduate study in the dual-title program. The dual-title program will follow the timetable and admissions requirements of the Department of History. Applicants to this dual-title degree program should have a junior/senior cumulative average of at least a 3.30 (on a 4.00 scale) and appropriate academic preparation. Preference will be given to those candidates whose undergraduate record demonstrates expertise in ancient Mediterranean studies (history; literature; archaeology) and proficiency to the 12th credit level in one or more ancient languages. Where applicable, a minimum GPA of 3.5 (on a 4.00 scale) is requisite for graduate work previously undertaken. Prospective students seeking admission to this dual-title degree program are required to write a statement of purpose that addressees the ways in which their research and profession goals will reflect an interest in interdisciplinary research in history and the disciplines and fields included in the CAMS dual-title program.

Degree Requirements

This dual-title degree will have requirements in addition to those for graduate degrees in History. Those requirements include additional course work in ancient languages, additional components to the candidacy and comprehensive examinations at the doctoral level, and the completion of CAMS-related thesis at the master's level (optional; see below) and doctoral levels (compulsory). A dual-title M.A. committee and/or a Ph.D. (doctoral) committee, chaired by faculty closely related to the student's field of interest, will supervise and direct the graduate study of each student accepted into this dual-title program. That committee will, as pertinent, also serve as the student's candidacy committee and, in accordance with Graduate Faculty policies, serve as the student's doctoral Comprehensive Examination committee. Students will be expected to attend and participate actively in the CAMS regularly-scheduled colloquia.

Master's Degree

33 credits, including 18 credits at the 500-level and above.
6 required credits in CAMS: CAMS 592: CAMS Proseminar; CAMS 593: Research Seminar.
6 required credits in 500-level History Seminars (e.g., History 502, 503, 504, 505).
Students electing to complete a thesis must enroll for 6 credits at the 600-level.
Students electing to submit research papers (see the next paragraph), in lieu of a thesis, must enroll for additional 500-level credits to fulfill the Graduate Faculty requirement of 18 credits at the 500-level or above.
9 additional credits in 500 or 400-level work in CAMS courses.

Ph.D. Degree

6 required credits in CAMS: CAMS 592:CAMS Proseminar; CAMS 593: Research Seminar
6 required credits in 500-level History seminars (e.g., History 502, 503, 504, 505)
9 additional credits (a minimum of 6 should be at the 500-level) in CAMS courses or History courses relevant to the student's research interests.
Reading knowledge of a second ancient language--proficiency to be demonstrated through 400/500 level course work in that language as instructed by CAMS language faculty--or competence, demonstrated in course work or field study as approved by the student's dual-title doctoral committee, in a research technique in a technical field relevant to the dual-title program: e.g., archaeology, art history, anthropology, historical linguistics, literary studies and analysis. Following Department of History guidelines, the comprehensive examination must take place in either spring or summer of the second year (if entering as a M.A./Ph.D. student) or in either spring or summer of the second year (if entering as a Ph.D. only student). Dual-title students may receive an additional one to two semesters of coursework prior to taking the examination only if the student's dual-title doctoral committee determines that need. That committee will then request the written approval of the Department of History's Director of Graduate Studies.

Dissertation on a CAMS-related topic is required of students in this dual-title degree program, as approved by the student's dual-title doctoral committee.

Communications and English Competency Requirements
The student will fulfill the English Competency requirements specified by the History department. Master's students will fulfill a requirement of reading knowledge of one ancient language; Ph.D. candidates will fulfill a requirement of reading knowledge of two ancient languages or of one ancient language and competence in a research technique. Language proficiency will be demonstrated through 400/500 level work in the languages concerned, as instructed by CAMS faculty. Students will be expected to acquire and demonstrate reading proficiency in those modern foreign languages (e.g., but not exclusively, French, German, Italian) appropriate to their research interests, as identified in consultation with their dual-title master's and/or doctoral committee.

Candidacy
In order to be admitted to doctoral candidacy in this dual-title program, students must meet the Ph.D. candidacy requirements specified by the History and CAMS dual-title programs. A Ph.D. candidacy examination is required of all students pursuing a doctorate in this dual-title program. The examination may be taken on completion of at least 18 credits of acceptable graduate work at Penn State and must be taken by the third semester of full-time study in this doctoral program. A single candidacy examination will contain elements of History and the participating program (CAMS). Following successful passage of the candidacy exam, a program plan will be submitted to the Departments of History and the participating program after consultation with members of the student's doctoral committee.

Committee Composition
For the dual-title M.A., the student's dual-title master's committee will include, at a minimum, one CAMS faculty member. For the dual-title Ph.D., one CAMS faculty member, at a minimum, will be a member of the dual-title doctoral committee. The chair of the committee may represent both the History and the CAMS dual-title programs. Graduate Faculty requirements stipulate that a minimum of four graduate faculty must constitute a doctoral committee of which at least two members of the doctoral committee must be from the major program and at least one member must be the outside member. The outside member of the doctoral committee of a dual-title student must have no budgetary connection either to History or to CAMS.

Comprehensive Exams
Dual-title students must successfully pass a comprehensive examination, as required by History. The comprehensive examination must

take place in either spring or summer at the end of the student's third year (if entering as a master's/Ph.D. student) or in either spring or summer of the second year (if entering as a Ph.D. only student); dual-title students may receive an additional one or two semesters of coursework prior to taking the examination only by petition from the student's dual-title doctoral committee and the written approval of the participating program's Director of Graduate Studies. The comprehensive examination must reflect the dual-title content or the History and CAMS dual-title programs. The participating program faculty on the student's dual-title doctoral committee are responsible for administering the part of the comprehensive examination covering CAMS topics. The comprehensive exam will have written and oral components. The CAMS portion of this examination will focus on those CAMS-related fields the student has studied as well as the topic of the proposed Ph.D. The comprehensive examination will therefore cover the research field, as well as the other historical fields, ancient languages, and research techniques the student has studied.

Dissertation
A dissertation on a CAMS topic is required of students in this dual-title degree program. The CAMS topic of the dissertation will be approved by the student's dual-title doctoral committee.

Student Aid

Graduate assistantships are available to students in this program and other forms of student aid are described in the STUDENT AID section of the Graduate Bulletin.

Courses

Graduate courses carry number from 500-599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate language requirements when taken by graduate students. Courses below the 400 level do not qualify. A graduate student may register for or audit these lower-level courses in order to make up deficiencies, but not to meet requirements for an advanced (graduate) degree.

CLASSICS AND ANCIENT MEDITERRANEAN STUDIES (CAMS) course list

HISTORY (HIST) course list

Effective Date: Spring Semester 2010

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 38-02-030

Review Date: 10/6/2009

Last updated by Publications: 01/20/10 (minor heading changes and link fixes only)

Earth Sciences (EARTH)

Program Home Page (Opens New Window)

KATHERINE FREEMAN, *Associate Head for Graduate Programs and Research*
235 Deike Building
University Park, PA 16802
814.863.8177
khf4@psu.edu

Degree Conferred:

M.Ed.

The Graduate Faculty

- Eliza Richardson, Ph.D. (MIT), Assistant Professor of Geosciences, Program Manager
- Richard Alley, Ph.D. (UW Madison), Evan Pugh Professor of Geosciences
- Sridhar Anandakrishnan, Ph.D. (UW Madison), Associate Professor of Geosciences
- Charles Ammon, Ph.D. (Penn State), Associate Professor of Geosciences
- Michael Arthur, Ph.D. (Princeton), Professor of Geosciences
- David Babb, Ph.D. (Penn State), Assistant Professor of Meteorology
- Timothy Bralower, Ph.D., (UC San Diego), Professor and Head, Department of Geosciences
- Roger Downs, Ph.D. (Bristol), Professor of Geography
- Kevin P. Furlong, Ph.D. (Utah), Professor of Geosciences and Director, EMS Environment Institute Natural Hazards Center
- Tanya Furman, Ph.D. (MIT) Associate Professor of Geosciences
- Russell W. Graham, Ph.D. (UT Austin), Associate Professor of Geosciences and Director, EMS Museum
- Peter J. Heaney, Ph.D. (Johns Hopkins), Associate Professor of Geosciences
- Paul Howell, Ph.D. (Cambridge), Professor of Materials Science and Engineering
- James F. Kasting, Ph.D. (Michigan) Professor of Geosciences
- R. Allen Kimel, Ph.D. (Penn State), Assistant Professor of Materials Science and Engineering
- Eric Kirby, Ph.D. (MIT), Assistant Professor of Geosciences
- Lee Kump, Ph.D. (South Florida), Professor of Geosciences
- Chris Marone, Ph.D. (Columbia), Professor of Geosciences
- Jonathan Mathews, Ph.D. (Penn State), Assistant Professor of Energy and Mineral Engineering
- Scott P. McDonald, Ph.D. (Michigan), Professor of Geosciences
- Andrew A. Nyblade, Ph.D. (Michigan), Associate Professor of Geosciences
- Christopher Palma, Ph.D. (Virginia), Outreach Fellow, Science
- Demian M. Saffer, Ph.D. (UC Santa Cruz), Assistant Professor of Geosciences
- Kamini Singha, Ph.D. (Stanford), Assistant Professor of Geosciences
- Timothy White, Ph.D. (Penn State), P.G., Senior Research Associate, EMS Earth and Environmental Systems Institute

The M.Ed. in Earth Sciences program is designed for secondary science teachers who seek to enrich their knowledge and practice through rigorous courses and individual projects supervised by Penn State faculty members. Combining graduate courses from academic departments in Penn State's College of Earth and Mineral Sciences, College of Education, and Eberly College of Science, the curriculum will prepare teachers to help students in grades 7 through 12 master educational objectives related to Earth and space science, as specified in National Science Education Standards (National Academy of Sciences, 1996). To accommodate working teachers who are only able to study part-time and at a distance, courses will be offered online through Penn State's World Campus. Fall, Spring, and Summer semester offerings will be available. Students will be granted licenses to use the courseware modules developed for the M.Ed. in Earth Sciences program in their secondary classrooms.

Admission Requirements

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the internet-based test. The minimum composite score for the IELTS is 6.5. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a masters degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British west Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, The United States, and Wales.

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Students may initially enroll in M.Ed. in Earth Sciences classes as non-degree graduate students. Up to 15 credits earned in non-degree status may be counted toward the M.Ed. in Earth Sciences degree.

Master's Degree Requirements

The M.Ed. in Earth Sciences degree is conferred upon students who earn a minimum of 30 credits while maintaining an average grade of 3.0 or better in all course work, including at least 18 credits at the 500 level or above (with at least 6 credits at the 500 level), and who complete a quality culminating individual project in consultation with a graduate adviser. Students will have the opportunity to participate in face-to-face field experiences or workshops at University Park or other locations during Summer sessions.

Student Aid

Graduate assistantships are not available. Financial aid opportunities for part-time students who participate through the World Campus are discussed at http://worldcampus.psu.edu/StudentServices_Paying.shtml.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

EARTH SCIENCES (EARTH) course list

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-06-187

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Last updated by Publications: 9/18/09

Ecology (ECLGY)

Program Home Page (Opens New Window)

DAVID EISSENSTAT, *Chair*, *Intercollege Graduate Degree Program in Ecology*
101 Life Sciences Building
Phone: 814-863-3371

Fax: 814-867-1769

E-mail: dme9@psu.edu, jep32@psu.edu, mwr1@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- § Marc D. Abrams, Ph.D. (Michigan State) *Professor of Forest Ecology and Physiology*
- Mary Barbercheck, Ph.D. (California, Davis) *Professor of Entomology*
- Paul Bartell, Ph.D. (Virginia) *Assistant Professor of Avian Biology*
- Iliana Baums, Ph.D. (Miami) *Assistant Professor of Biology*
- § Stephen J. Beckerman, Ph.D. (New Mexico) *Associate Professor of Anthropology*
- Ottar Bjornstad, Ph.D. (Oslo) *Assistant Professor of Entomology*
- Victoria Braithwaite-Read, D.Phil. (Oxford, UK) *Professor of Fisheries and Biology*
- § Margaret C. Brittingham, Ph.D. (Wisconsin) *Associate Professor of Wildlife Resources*
- § Robert P. Brooks, Ph.D. (Massachusetts) *Professor of Wildlife and Wetlands*
- # Mary Ann Bruns, Ph.D. (Michigan State) *Assistant Professor of Agronomy/Soil Microbial Ecology*
- Tomas Carlo-Joglar, Ph.D. (Colorado) *Assistant Professor of Biology*
- Hunter Carrick, Ph.D. (Michigan) *Assistant Professor of Forest Resources*
- Charles Andrew Cole, Ph.D. (Southern Illinois) *Assistant Professor of Landscape Architecture and Ecology*
- William S. Curran, Ph.D. (Illinois) *Professor of Weed Science*
- Rick Day, Ph.D. (Penn State) *Associate Professor of Soil Science and Environmental Information Systems*
- Dennis Decoteau, Ph.D. (Massachusetts) *Professor of Horticulture and Plant Ecosystem Health*
- Consuelo M. DeMoraes, Ph.D. (Georgia) *Assistant Professor of Entomology*
- Claude dePamphilis, Ph.D. (Georgia) *Associate Professor of Biology and Life Sciences Consortium*
- Duane Diefenbach, Ph.D. (Georgia) *Adjunct Assistant Professor of Wildlife Ecology*
- Patrick Drohan, Ph.D. (Penn State) *Assistant Professor of Pedology*
- David M. Eissenstat, Ph.D. (Utah State) *Professor of Woody Plant Physiology; Coordinator, Physiological Ecology Option*
- § C. Paola Ferreri, Ph.D. (Michigan State) *Assistant Professor of Fisheries Management*
- James Finley, Ph.D. (Penn State) *Associate Professor of Forest Resources*
- Charles R. Fisher, Jr., Ph.D. (California, Santa Barbara) *Professor of Biology*
- * Shelby J. Fleischer, Ph.D. (Auburn) *Associate Professor of Entomology*
- Robert Gallagher, Ph.D. (Ohio State) *Associate Professor of Cropping Systems*
- § Michael R. Gannon, Ph.D. (Texas Tech) *Associate Professor of Biology*
- Bryan T. Grenfell, Ph.D. (Sheffield, UK) *Professor of Biology*
- § Lauraine K. Hawkins, Ph.D. (New Mexico) *Assistant Professor of Biology*
- § S. Blair Hedges, Ph.D. (Maryland) *Associate Professor of Biology*
- Dale Holen, Ph.D. (Wisconsin, Milwaukee) *Associate Professor of Biology*
- Peter Hudson, Ph.D. (Oxford, UK) *Willaman Professor of Biology*
- Scott Isard, Ph.D. (Indiana) *Professor of Aerobiology*
- § Heather D. Karsten, Ph.D. (Cornell) *Assistant Professor of Crop Production/Ecology*
- Jason P. Kaye, Ph.D. (Colorado) *Assistant Professor of Soil Biogeochemistry*
- Margot Kaye, Ph.D. (Colorado State) *Assistant Professor of Forest Ecology*
- *§ K. C. Kim, Ph.D. (Minnesota) *Professor of Entomology*
- Roger Koide, Ph.D. (California, Berkeley) *Professor of Horticulture Ecology*
- Tracy Langkilde, Ph.D. (Sydney) *Assistant Professor of Biology*
- Henry Lin, Ph.D. (Texas A&M) *Assistant Professor of Crop and Soil Science*
- Jonathan P. Lynch, Ph.D. (California, Davis) *Associate Professor of Plant Nutrition*
- Jennifer Macalady, Ph.D. (Caifornia, Davis) *Assistant Professor of Geosciences*
- Carolyn G. Mahan, Ph.D. *Associate Professor of Biology; Co-coordinator, Environmental Studies Program, Penn State Altoona*
- James H. Marden, Ph.D. (Vermont) *Associate Professor of Biology*
- Mark Mescher, Ph.D. (Georgia) *Assistant Professor of Entomology*
- David A. Mortensen (North Carolina State) *Associate Professor of Crop and Soil Sciences*
- §* Wayne L. Myers, Ph.D. (Michigan) *Associate Professor of Forest Biometrics*
- Nancy Ostiguy, Ph.D. (Cornell) *Senior Research Associate in Entomology*
- Susan Parks, Ph.D. (MIT/Woods Hole Oceanographic Inst) *Research Associate*
- * Ganapati P. Patil, Ph.D. (Michigan) *Distinguished Professor of Mathematical Statistics*
- Eric Post, Ph.D. (Alaska) *Assistant Professor of Biology*
- Andrew Read, D.Phil. (Oxford, UK) Professor of Biology and Entomology
- §* Michael C. Saunders, Ph.D. (Georgia) *Associate Professor of Entomology*
- Robert Shannon (Indiana) *Associate Professor of Agricultural Engineering*
- Beth Shapiro, D.Phil. (Oxford, UK) *Schaffer Career Development Assistant Professor of Biology*
- William E. Sharpe, Ph.D. (West Virginia) *Professor of Forest Hydrology*
- Katriona Shea, Ph.D. (London) *Assistant Professor of Theoretical Applied Ecology, Life Sciences Consortium*
- Erica Smithwick, Ph.D. (Oregon State) *Assistant Professor of Geography*
- § Jay R. Stauffer, Jr., Ph.D. (Virginia Tech) *Professor of Ichthyology; Coordinator, Conservation Biology Option*
- § Kim C. Steiner, Ph.D. (Michigan State) *Professor of Forest Biology*
- § Andrew G. Stephenson, Ph.D. (Michigan) *Professor of Biology*
- Kenneth R. Tamminga, M.P. (Queens, Canada) *Associate Professor of Landscape Architecture*
- § Alan H. Taylor, Ph.D. (Colorado) *Associate Professor of Geography*

- John Tooker, Ph.D. (Illinois, Urbana-Champaign) *Assistant Professor of Entomology*
- James Tumlinson, Ph.D. (Mississippi) *Ralph O. Mumma Professor of Entomology*
- § Christopher F. Uhl, Ph.D. (Michigan State) *Professor of Biology; Chair, IGDP in Ecology*
- Tyler Wagner, Ph.D. (Michigan State) Adjunct Assistant Professor of Fisheries Ecology
- Denice Wardrop, Ph.D. (Penn State) *Assistant Director, Penn State Cooperative Wetlands Center*
- Peter Wilf, Ph.D. (Pennsylvania) *Associate Professor of Geosciences; John T. Ryan Jr. Faculty Fellow*
- Eric Zenner, Ph.D. (Oregon State) *Associate Professor of Silviculture*

Note: Quantitative Ecology option faculty are designated by (*), Microbial Ecology option faculty by (#), Conservation Biology option faculty by (§), and Physiological Ecology option faculty by (). See text for further explanation.

This intercollege program emphasizes the properties of ecosystems by focusing attention on interactions of single organisms, populations, and communities with their environment. It is designed to give students a basic understanding of ecological theory and hypothesis testing and is complementary to other environmental programs that emphasize the human role in ecosystems.

The program is administered by a committee drawn from faculty members in several departments and colleges of the University. This committee and its chair are appointed by the dean of the Graduate School. The instructional staff is composed of participating faculty in those departments offering graduate courses in fields closely allied to ecology.

The advisory committee is selected by the candidate and his/her adviser and approved by the Graduate School. The committee has the responsibility for determining the course program and research acceptable in satisfying degree requirements.

Four options for specialization are offered: Quantitative Ecology, Microbial Ecology, Conservation Biology and Physiological Ecology. Students are not required to select an option. The quantitative ecology option includes mathematical and statistical modeling and applications of statistics to experimental design and data analysis. The microbial ecology option includes basic aquatic and soil microbial ecology and applications to recycling of materials and release of genetically engineered organisms. The conservation biology option is concerned with problems of maintaining the rapidly disappearing diversity of organisms and their habitats, and the global reservoir of genetic diversity that these organisms represent. The physiological ecology option is concerned primarily with the function and performance of organisms in their environment. Each option entails extra course requirements plus a thesis directed by an ecology faculty member in the option. Additional information can be obtained from the option coordinators.

Admission Requirements

Scores from the Grade Record Examination (GRE), including verbal, quantitative, and advanced biology test, are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*. Candidates should have a strong science background, including chemistry through organic chemistry, mathematics through calculus, physics, and biology. A limited number of such courses can be made up while the student is pursuing graduate student.

Students with a background in another discipline that has potential value to original ecological work will be seriously considered. A junior/senior grade-point average of 3.00 or better (on a 4.00 scale) is required.

Students are strongly urged to choose their research interests and initiate communication with the relevant faculty member(s) before applying for admission. A student will not be admitted without the commitment of a faculty member to serve as the student's research adviser. Teaching and research assistantships are available only through the student's faculty adviser.

The top sheet (white copy) of the application and application fee are to be sent to the Graduate School. The applicant should forward the following directly to the program chair: (1) pink copy of the application; (2) three or more letters of recommendation regarding the student's academic and professional promise; (3) a concise one-page statement describing the student's goals both within the program and in professional life; and (4) GRE scores (general test and the subject test in biology) Specific inquiries about the Ecology Program may be directed to the program chair. Applications should be submitted by February 1 for summer or fall semester admission.

Master's Degree Requirements

In addition to Graduate School requirements, the instructional program includes two graduate core courses in ecology (one each in two of the three core areas: population ecology, community/ecosystem ecology, and physiological ecology), an advanced 3-credit statistic course, two credits of colloquium, a minimum of six thesis credits, breadth courses selected by the student in consultation with the research adviser and research committee, and a thesis research project directed by the student's adviser. A nonthesis option is available for the M.S. degree, at the adviser's discretion.

Doctoral Degree Requirements

In addition to Graduate School requirements, the instructional program includes three graduate core courses in ecology (one each of three core areas: population ecology, community/ecosystem ecology, and physiological ecology), two advanced 3-credit statistics courses, 4 credits of colloquium, breadth courses selected by the student in consultation with the research adviser and research committee, a minimum of 15 thesis credits, and a thesis research project directed by the student's adviser.

The communication and foreign language requirement for the Ph.D. degree may be satisfied by strong performance in two semesters of one foreign language or the equivalent. Both the candidacy and comprehensive examinations will be written and oral.

Biogeochemistry Dual-Title Degree Program

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree Program. Students in the Biogeochemistry Dual Title program are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. Additional coursework from an approved list of courses is required. All students must pass a candidacy examination that includes an assessment of their potential in the field of biogeochemistry. A single candidacy examination that includes biogeochemistry will be administered for admission into the student's Ph.D. program, as well as the biogeochemistry dual-title. The structure and timing of this exam will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise in biogeochemistry. The field of biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of biogeochemistry is required.

Watershed Stewardship Option

The Graduate Option in Watershed Stewardship is intended to provide enhanced educational opportunities for students with an interest in water resources management who are enrolled in the Intercollege Graduate Degree Program in Ecology at the University Park campus. The objective of the Graduate Option in Watershed Stewardship is to educate students to facilitate team-oriented, community-based watershed management planning directed at natural resources conservation and environmental problems encountered in Pennsylvania communities, especially non-point source water pollution. The Graduate Option in Watershed Stewardship requires 22 credits of graduate course work: 12 credits of breadth courses, 2 credits of Watershed Stewardship Seminar courses (FOR 591A and FOR 591B or LARCH 510.2), and 8 credits of Watershed Stewardship Practicum I and II courses (FOR 570 and FOR 571 or LARCH 540.2 and LARCH 550.2). Breadth courses will consist of three graduate credits of course work from each of four subject matter areas: (1) water resources science, (2) social science, public policy and economics, (3) humanities, and (4) communications and design. In the watershed stewardship practicum courses, students work in teams with community, government, and business leaders to analyze and understand natural resources and ecological issues and creatively synthesize appropriate solutions in the form of a written watershed management plan.

Other Relevant Information

Detailed descriptions of courses now available for students majoring in ecology may be found under the offerings of several ecologically oriented departments.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

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Last Revised by the Department: Fall Semester 2008

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Review Date: 4/15/08

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Economics (ECON)

Program Home Page (Opens New Window)

ROBERT C. MARSHALL, *Head of the Department*
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Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- Sophie Bade, Ph.D. (New York University) Assistant Professor of Economics
- Herman J. Bierens, Ph.D. (Amsterdam) Professor of Economics
- Kalyan Chatterjee, D.B.A. (Harvard) Distinguished Professor of Management Science and Economics
- N. Edward Coulson, Ph.D. (California, San Diego) Professor of Economics
- Jonathan Eaton, Ph.D. (Yale) Professor of Economics
- Emmanouil Galenianos (Manolis), Ph.D. (Pennsylvania) Assistant Professor of Economics
- Edward J. Green, Ph.D. (Carnegie Mellon) Professor of Economics
- Barry Ickes, Ph.D. (California, Berkeley) Professor of Economics
- James S. Jordan, Ph.D. (Northwestern) Professor of Economics
- Sung Jae Jun, Ph.D. (Brown) Assistant Professor of Economics
- Thomas A. Knapp, Ph.D. (Colorado, Boulder) Associate Professor of Economics
- Kala Krishna, Ph.D. (Princeton) Professor of Economics
- Vijay Krishna, Ph.D. (Princeton) Distinguished Professor of Economics
- Derek Laing, Ph.D. (Essex) Associate Professor of Economics
- Jenny Li, Ph.D. (Cornell) Associate Professor of Economics and Mathematics
- Raymond E. Lombra, Ph.D. (Penn State) Professor of Economics
- Robert C. Marshall, Ph.D. (California, San Diego) Professor of Economics
- Alexander Monge-Naranjo, Ph.D. (Chicago) Assistant Professor of Economics
- Tymofiy Mylovanov, Ph.D. (Wisconsin) Assistant Professor of Economics
- Rajen Mookerjee, Ph.D. (Northwestern) Associate Professor of Economics
- Coenraad A. Pinkse (Joris), Ph.D. (London School of Economics) Associate Professor of Economics
- Theodore Papageorgiou, Ph.D. (Yale) Assistant Professor of Economics
- Isabelle Perrigne, Ph.D. (Toulouse) Associate Professor of Economics
- Marek Pycia, Ph.D. (MIT) Assistant Professor of Economics
- John Riew, Ph.D. (Wisconsin) Professor Emeritus of Economics
- Bee-Yan Roberts, Ph.D. (Wisconsin) Professor of Economics
- Mark J. Roberts, Ph.D. (Wisconsin) Professor of Economics
- Andre Rodriguez-Clare, Ph.D. (Stanford) Professor of Economics
- David Shapiro, Ph.D. (Princeton) Professor of Economics
- James Tybout, Ph.D. (Wisconsin) Professor of Economics
- Quang Vuong, Ph.D. (Northwestern) Professor of Economics
- Neil Wallace, Ph.D. (Chicago) Distinguished Professor of Economics
- Stephen Yeaple, Ph.D. (Wisconsin) Associate Professor of Economics
- Ruilin Zhou, Ph.D. (Pittsburgh) Associate Professor of Economics

NOTE: For details regarding admission, degree requirements, and financial aid, see "Graduate Program" on the department's home page. Click on "Program Home Page" above.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ECONOMICS (ECON) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

Last updated by Publications: 10/06/09

Educational Leadership (EDLDR)

Program Home Page (Opens New Window)

WILLIAM HARTMAN, *In Charge of Graduate Programs in Educational Leadership*
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Degrees Conferred:

Ph.D., D.Ed., M.S., M.Ed.

Graduate work in the Educational Leadership program encompasses two major strands or paths. The first strand focuses on those who want to engage in a wide variety of leadership roles within and directly affecting schools and districts. These roles include, but are not limited to teacher leadership, instructional leadership, principal leadership, and district-level leadership. This strand may also lead to certification and/or letters of endorsement in supervision, the principalship or the superintendency. The second strand focuses on those who want to exercise leadership roles in educational policy arenas and/or engage in educational research. Possible roles include: intermediate unit officials, state and federal agency administrators and staff, professors of educational administration, and research and development personnel. The principalship certification is also available at Penn State Great Valley and Penn State Harrisburg.

Admission Requirements

Scores from the Miller Analogies Test (MAT) are required for admission to the doctoral programs in Educational Leadership. When the MAT is not available (e.g., some overseas locations), Graduate Record Examinations (GRE) scores or Graduate Management Admissions Test (GMAT), may be substituted. At the discretion of a graduate program, a student may be admitted provisionally. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Applicants to the M.Ed. and M.S. degree programs must present evidence of at least a 2.60 grade-point average in the last two years of undergraduate work. A grade-point average of 3.50 in prior graduate work is required of those desiring admission to enter a doctoral program. The best-qualified students will be accepted up to the number of spaces available. Special backgrounds and experiences may allow for conditional admission to those not meeting stated criteria.

More details concerning the degree and certification programs are presented in a prospectus that is available upon request.

Students interested in pursuing the on-line M.Ed. in Educational Leadership with a Teacher Leadership option must first be admitted to Penn State's Graduate School. The requirements listed below are in addition to general Graduate School requirements as stated in the GENERAL INFORMATION section of the *Graduate Bulletin*. Scores from the Miller Analogies Test (MAT), the Graduate Record Examinations (GRE), or some other pertinent standardized test are required for admission to all graduate programs in Educational Leadership, including the proposed online M.Ed. with an option in Teacher Leadership.

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with exceptions noted below.

The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test or a total score of 80 with a 20 on the speaking section for the internet-based test. Applicants with IBT speaking scores between 15 and 19 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work.

The minimum composite score for the IELTS is 6.5. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States and Wales. Complete details concerning the TOEFL/IELTS requirements are available at the Applications and Admission Procedures section of the Graduate Bulletin.

In addition to standardized test scores, the Educational Leadership Program requires all graduate program applicants to submit three reference letters, official copies of undergraduate and graduate transcripts, a short review of a professional journal article of the applicant's choosing (along with a copy of the actual article), and a current resume or CV. Applicants must present evidence of at least a 3.0 grade-point average in the last two years of undergraduate work. The best-qualified students will be accepted up to the number of spaces available. Special backgrounds and experiences may allow for provisional admission to those not meeting all of the above criteria.

Master's Degree and Certification Requirements

All candidates for the M.Ed. and M.S. degrees will complete a minimum of 30 graduate credits. Certification for various public school administrative positions requires additional graduate work beyond the master's degree and such requirements as specified in the program prospectus.

M.Ed. students must submit a master's paper. M.S. degree students are expected to submit a thesis.

The M.Ed. in Educational Leadership with an Option in Teacher Leadership via World Campus and in residence at Penn State University Park is a 30-credit M.Ed. program with 2 designated "core" courses and 6 required courses for a total of 24 credits. The two designated "core" courses for this M.Ed. option are: (1) EDLDR 560 Principles of Instructional Supervision and (2) EDLDR 559 School Improvement. Six other courses are required and include EDLDR 563, EDLDR 553, C I 501, EDLDR 551, EDPSY 421, and EDLDR 596. Six additional credits (2 courses) from outside of the Educational Leadership Program are considered electives in the proposed Teacher Leadership option.

The resident M.Ed. in Educational Leadership (non-option) requires 30 credits, including the 2 "core" courses noted above and 6 required courses for a total of 24 credits. The two designated "core" courses for the M.Ed. non-option are: (1) EDLDR 560 Principles of Instructional Supervision and (2) EDLDR 559 School Improvement. The six required courses are drawn from several "strands" or areas of concentration offered, including School Leadership, Professional Development, Curriculum, School Policy, & Change and an "Open" area. Determination of the specific courses is dependent on: (1) the "strand" or area of concentration selected by the student and (2) advisement and guidance from the assigned academic advisor.

Credits toward a M.Ed. in Educational Leadership will be from graduate level courses - 400 or above - with a minimum of 18 credits

earned from courses at or above the 500-level. At least six (6) credits must be completed outside of the EDLDR Program area. An additional Program requirement states that all master's degrees (either the M.S. or the M.Ed.) must contain a total of at least 18 credits of EDLDR course work.

Each student will complete the M.Ed. in Educational Leadership with an option in Teacher Leadership via World Campus in conjunction with a designated EDLDR faculty member and in connection with the EDLDR 596 course work. This is the culminating course of the program and focuses on an application of course information in the form of an action research project. This project will be planned in cooperation with the EDLDR faculty member who serves as the student's project advisor and must reflect an appropriate degree of graduate-level scholarship, as determined by the advisor.

The master's project is a completed piece of work representing the culmination of academic work toward the M.Ed. degree.

Doctoral Degree Requirements

Candidates for the D.Ed. degree are required to spend at least one semester and one summer session consecutively in full-time residence during a twelve-month period. Ph.D. candidates are strongly encouraged to spend two academic years in residence, but must spend at least two consecutive semesters in residence. D.Ed. candidates may satisfy the residence requirement in another manner consistent with Graduate School policy, including attendance at the day-long seminars offered weekly every other academic year. Candidates for all degrees are required to combine work in the social sciences and humanities with the specialization in Educational Leadership.

Expectations of candidates for both the D.Ed. and Ph.D. are high in the field of research competence and require the ability to identify and conceptualize a research problem for the thesis. The D.Ed. is more appropriate for those with career goals in administration and policy making. The Ph.D. is more appropriate for those with career goals in research and scholarship.

After the doctoral student has been admitted to a doctoral program and has completed forty to forty-five hours beyond the bachelor's degree, his or her name is usually submitted for candidacy. After a student is admitted to candidacy for the doctoral degree, he or she takes the comprehensive written and oral examinations. After those are successfully completed, the student presents a thesis problem on a significant, researchable topic, evidenced by a prospectus to the doctoral committee for review.

Other Relevant Information

American Indian students participate in a special administrator preparation program. Foreign students can work on research topics in their home nations.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

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Review Date: 2/26/08

Educational Psychology (EDPSY)

Program Home Page (Opens New Window)

KATHY L. RUHL, *Head of the Department of Educational and School Psychology, and Special Education*
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RAYNE A. SPERLING, *Professor-in-Charge of Graduate Programs in Educational Psychology*
232 CEDAR Building
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edpsy@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Jeanne T. Amlund, Ph.D. (Arizona State) Assistant Professor of Educational Psychology
- Robert L. Hale, Ph.D. (Nebraska) Professor of Education
- Jonna Kulikowich, Ph.D. (Texas A&M) Professor of Education
- Pui-Wa Lei, Ph.D. (Iowa) Assistant Professor of Education
- Bonnie J. F. Meyer, Ph.D. (Cornell) Professor of Educational Psychology
- P. Karen Murphy, Ph.D. (Maryland) Associate Professor of Education
- Rayne A. Sperling, Ph.D. (Nebraska) Associate Professor of Education
- Robert J. Stevens, Ph.D. (Illinois) Associate Professor of Educational Psychology
- Hoi K. Suen, Ed.D. (Northern Illinois) Professor of Educational Psychology
- Peggy Van Meter, Ph.D. (Maryland) Associate Professor of Education

The graduate program in Educational Psychology focuses on the study of learning, instruction, and measurement across the life span. The learning and instruction emphasis applies the study of cognitive psychology to research on learning and instruction in applied settings like schools. The course of study provides a strong foundation in psychological theory, principles related to instructional applications, and quantitative methodology. The measurement emphasis applies cognitive psychology and theories of measurement to test design, instrument construction, scale analysis, and measurement theory. The Educational Psychology program emphasizes the use of rigorous quantitative methodology in the scientific study of learning, instruction, and measurement in applied settings. Typically this program prepares individuals for professions in universities, research institutions, government agencies, and industry. Individuals interested in more clinical applications of psychology, such as counseling psychology or school psychology should contact those specific graduate programs in the University.

Admission Requirements

Applicants are required to submit scores from the Graduate Record Examinations (GRE) verbal, quantitative, and analytic writing. Typically applicants have at least a 3.0 junior/senior grade-point average (on a 4.0 point scale) and broad undergraduate background including college level mathematics. Exceptions may be made for students with special backgrounds, abilities, and interests. Applicants with a master's degree will be required to show strong performance in their graduate program. Applicants will also supply letters of reference and a written statement of their professional goals. The requirements specified here are in addition to the Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin.*

Master's Degree Requirements

Students in the master's degree program are required to take 30 credits, including core courses EDPSY 406, 421, 450, and 475. Students will also take at least one foundational course in educational theory, philosophy, or individual differences. The remaining credits will be taken in a way to develop the student's area of specialization, in consultation with the student's adviser. The program offers two options, M.S. with a thesis, and an M.S. without a thesis. Students wishing to go on to the Ph.D. are required to complete the M.S. with thesis option.

Doctoral Degree Requirements

Students in the doctoral degree program will select a major emphasis in either learning and instruction or measurement. Students in the doctoral program must complete the core courses as listed in the master's program. All students must also have at least one advanced-level course in learning and in measurement. Students will also have three courses spread across the foundational areas of educational theory and history, philosophy, and individual differences. Students must pass a candidacy examination to enter into the doctoral program, assessing their mastery of the content in the core courses. Students must also pass a comprehensive examination assessing their areas of specialization near the end of their doctoral studies. Students are also expected to develop and defend a theoretically based scholarly research proposal that will become their dissertation project. The doctoral program culminates in the production of and defense of the student's dissertation that is expected to be a publishable quality independent research study. All of these requirements are specified in more detail in the student handbook.

Student Aid

All applicants are considered for Graduate Assistantships that are available in the program. Typically these assistantships provide tuition waiver plus a stipend.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not

to meet requirements for an advanced degree.

EDUCATIONAL PSYCHOLOGY (EDPSY) course list

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Last updated by Publications: 12/06/07

Educational Theory and Policy (EDTHP)

Program Home Page (Opens New Window)

DAVID GAMSON, *In Charge of Graduate Programs in Educational Theory and Policy*
300 Rackley Building
814-865-2583
EDTHP@psu.edu

Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- David P. Baker, Ph.D. (Johns Hopkins) Professor of Education and Sociology
- Katerina Bodovski, Ph.D. (Penn State) Assistant Professor of Education
- David Gamson, Ph.D. (Stanford) Associate Professor of Education
- Henry C. Johnson, Jr., Ph.D. (Illinois) Professor Emeritus of Education
- Mindy L. Kornhaber, Ed.D. (Harvard) Associate Professor of Education
- Gerald K. LeTendre, Ph.D. (Stanford) Professor of Education
- Dana Mitra, Ph.D. (Standford) Assistant Professor of Education
- Suet-Ling Pong, Ph.D. (Chicago) Professor of Education, Demography, and Sociology
- Madhu S. Prakash, Ph.D. (Syracuse) Professor of Education
- Liang Zhang, Ph.D. (Cornell) Assistant Professor of Education

The master's and doctoral programs in Educational Theory and Policy are designed primarily to prepare persons for careers in education policy development and analysis. Students in the program may choose to emphasize policy development and analysis either in the United States or in terms of a comparative and international perspective. Additionally, individualized multidisciplinary programs of study in the foundation areas of education (history, philosophy, sociology, and comparative/international) and in the social sciences, management sciences, and/or humanities will be designed jointly by the student and the program faculty. It is anticipated that graduates will find employment in state departments of education, ministries of education, federal and international education agencies, academic institutions, and various professional associations.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Students with a 2.75 grade-point average will be considered for admission to the master's program, and with a 3.00 grade-point average at the master's level for the Ph.D. program. Exceptions to the minimum grade-point average may be made for students with special backgrounds, abilities, and interests.

Master's Degree Requirements

Candidates who seek an M.A. in Educational Theory and Policy shall complete programs that will include studies in social theory, policy, and planning or in the social sciences or humanities. A thesis is required.

Doctoral Degree Requirements

Candidates who seek a Ph.D. in Educational Theory and Policy shall complete programs that will include studies in social theory, policy, and planning, or in the social sciences or humanities.

All doctoral students must pass a written candidacy examination after nine to eighteen hours of study.

Candidates for the Ph.D. degree are required to complete a minimum of two consecutive semesters in residence during an academic year.

The communication and foreign language requirements for the Ph.D. degree may be satisfied by options selected from foreign languages, statistics, computer science, logic, or other research methodologies deemed acceptable by the candidate's doctoral committee.

At the end of the program of study, each student must take a written and oral comprehensive examination that will cover the student's major areas of study.

Other Relevant Information

Upon admission, each student will be assigned to a faculty adviser whose specialization best coincides with the student's background or academic interest. For the master's degree, the adviser and student together will plan the program of study. For doctoral students, the adviser and student will plan the early aspects of study, but an interdisciplinary committee will be formed, soon after the student is admitted to candidacy, to supervise completion of a program of study.

Student Aid

Graduate assistantships available to doctoral students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Joint Degree Program between The Pennsylvania State University Dickinson School of Law (J.D.) and the Educational Theory And Policy Program (M.A., & Ph.D.)

Joint Degree Program: The Pennsylvania State University Dickinson School of Law (DSL) and the Educational Theory and Policy (EDTHP) Program are offering a joint degree program leading to a Juris Doctor (J.D.); and a Master of Arts (M.A.), or a Doctor of Philosophy (Ph.D) in Educational Theory and Policy.

Admission Requirements

The number of openings in the joint degree J.D./M.A. or Ph.D. program will be limited to students with an outstanding academic record who have successfully completed two semesters at the Dickinson School of Law.

Applicants to the joint degree program:

1. must have been admitted to the Dickinson School of Law
2. should have successfully completed two semesters of course work at the Dickinson School of Law with a grade-point average of 3.0
3. must submit two letters of recommendation from the Dickinson School of Law faculty
4. must submit a career statement

Note: Students are eligible to start taking courses in the EDTHP program after successfully completing two semesters of law school work.

College-Specific Admission Requirements

DSL: A bachelor's or equivalent degree from an accredited college is a prerequisite for admission; however, there is no standard prescribed undergraduate curriculum. An applicant should have acquired significant oral and written communication skills before entering law school. The following are required of applicants: a completed application form for DSL; submission of the results of the law school admission test (LSAT); completion of an LSDAS report; a one-page personal statement; employment records since high school; and two letters of recommendation.

EDTHP: The following are required of all applicants: a completed application form to EDTHP; submission of the results of the Graduate Record Examination (GRE), or LSAT; an official undergraduate transcript or transcripts; a personal statement; employment records since high school; and three letters of recommendation.

The best qualified students will be accepted for admission into the doctoral programs up to the number of spaces available. Students with a 2.75 grade-point-average (GPA) will be considered to the master's program, and with a 3.0 GPA at the master's level for the Ph.D. program. Exceptions to the minimum GPA may be made for students with special backgrounds, abilities, and interests.

All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the Test of English as a Second Language (TOEFL) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test or a score of 213 on the computer-based test, or 80 points on the new Internet-based test with a minimum of 23 points on the new speaking portion; or the International English Language Testing System (IELTS) with a minimum composite score of 6.5 is required for admission.

Residency: Students will normally spend four semesters in residence at DSL and as many additional semesters in residence as needed to complete the additional requirements for the pertinent EDTHP degree. Ph.D. candidates must arrange the sequence of semesters to ensure that they are in residence as full-time students in the EDLDR program for at least two consecutive semesters (Fall-Spring or Spring-Fall) excluding summer in a single twelve-month period. D.Ed.

Liaisons: The department and faculty liaisons for DSL shall be the Associate Dean for Academic Affairs and the student advisor shall be the Associate Dean for Academic Affairs or such other faculty member(s) as may be designated by the Dean. The liaison for EDTHP shall be the Professor-in-Charge (PIC) or such faculty member(s) as may be designated by the PIC.

PRESCRIBED COURSES

DSL: All students are required to take the first-year curriculum in DSL. In the second or third year, students must take CORE 934 (Professional Responsibility). The fall curriculum for the first year consists of the following courses:

CORE COURSES (CORE)

- 900. Civil Procedure (4)
- 910. Criminal Law (3)
- 912. Legal Analysis, Research & Writing I (3)
- 925. Torts (4)

The spring curriculum of the first year consists of the following courses:

One 3-credit Elective

CORE COURSES (CORE)

- 903. Constitutional Law (3)
- 905. Contracts (4)
- 914. Legal Analysis, Research & Writing II (3)
- 920. Property (4)

EDTHP: A minimum of 36 credits is required for the M.A. in EDTHP. At least 27 credits must be at the 500 level or above; at least 18 credits must be in EDTHP. At least 6 credits of thesis research (EDTHP 600 or 610) must be taken to fulfill the Graduate School's requirements. Only 3 credits of EDTHP 596 (Independent Study) may be counted toward the M.A. requirements. Students who wish to transfer credits from other programs must receive prior approval from the EDTHP faculty. The required course is EDTHP 500 (Proseminar).

Ph.D. requirements

Introduction to the EDTHP Program (3 credits)

EDTHP 500 Proseminar

Research Methods (12 credits)
EDTHP/EDLDR/HI ED 585: Research Design
EDTHP/EDLDR/HI ED 586: Qualitative Methods

Two quantitative methods courses.

Research Courses: 6 credits

These are research method courses specifically related to the student's thesis.

Theory Foundations: 12 credits*

Four theory-based 500-level EDTHP courses are required. At least one course must be a 500-level EDTHP course in the area of history or philosophy of education (e.g., EDTHP 533, 536, 540, or 541), and another must be a 500-level EDTHP course in the area of sociology or demography of education (e.g., EDTHP 516, 557, or 597 classes such as Sociology of Education or Sociology of Adolescence). After a student has consulted with his or her advisor, one 400-level course may be substituted for EITHER one 500-level Theory course OR one 500-level Policy course, depending on the nature of the 400-level course. Students who take advantage of this option will need to do additional work beyond the 400-level requirements and should make arrangements with the instructor ahead of time.

Policy Foundations: 12 credits*

EDTHP/EDLDR/HI ED 587: Policy and Politics

In addition, three 500-level EDTHP courses in educational policy (e.g., EDTHP 516, 518, 520, 527, or 597 classes such as Comparative Analysis of Education Policy) are required. After a student has consulted with his or her advisor, one 400-level course may be substituted for EITHER one 500-level Theory course OR one 500-level Policy course, depending on the nature of the 400-level course. Students who take advantage of this option will need to do additional work beyond the 400-level requirements and should make arrangements with the instructor ahead of time.

*Note: Some EDTHP courses may be counted as either a Theory course or a Policy course, but they may not be double-counted.

Other: 21 credits

These include credits for minor or dual-title requirements, electives, and thesis research. A maximum of 9 professional credits and 15 academic transfer credits may be counted.

EDTHP independent study courses (EDTHP 596) will be counted only as electives unless the student consults with his or her advisor and then petitions the EDTHP faculty.

INTERPROGRAM TRANSFER OF CREDITS

DSL: A maximum of twelve credits for EDTHP course work may be transferred for credit toward the J.D. degree at DSL. Students must obtain a grade satisfactory to DSL for the course work to be credited toward the J.D. degree. The following EDTHP courses may qualify for credit in DSL: (1) EDTHP 518 (Analysis of U.S. Educational Policy); EDTHP 520 (Theoretical Perspectives on School Reform); (3) EDTHP 533 (Social History and Educational Policy); (4) EDTHP 541 (Contemporary Philosophies of Education); and (5) EDTHP 587 (Education Policy and Politics).

EDTHP: What courses may be credited will be determined by the student's degree program. Normally a maximum of twelve credits of DSL course work will be counted for credit for the minimum requirements for a master's degree, subject to approval by the student's advisory committee. Normally, a maximum of 30 credits from a master's degree program will be counted for credit for the minimum requirements for a Ph.D. degree.

Sequence: The sequence of courses will be determined by the students and their advisors.

Recommended Program of Study and Advising: All students in the program will have two advisors, one from DSL and one from EDTHP. Periodic interaction between the two advisors will be encouraged. A program of study will be developed for each student, taking into account the fact that some courses are offered on a rotating or intermittent basis. Many courses are offered every year but some are offered every two or three years. Advisors will have available a list of projected relevant courses or educational experiences in order to work with the student on an individualized program of study. The standard committee structure will apply to the EDTHP programs.

Tuition: Students will be charged the applicable DSL tuition to cover the J.D. program and the applicable graduate tuition to cover the EDLDR degree program. DSL tuition will be paid for the semesters in which the student is registered for DSL courses, and graduate tuition will be paid for the semesters in which the student is registered for graduate courses. A student may take up to one course (3 credit hours) per semester in the program where the student is not primarily registered without any change in tuition, but must pay additional tuition to the program that the student is not primarily registered if he or she wishes to take additional course work pursuant to that program during the semester.

Financial Aid and Assistantships: Decisions on financial aid and assistantships will be made by each school according to that school's procedures.

Fulfillment of Degree Requirements and Graduation: All courses in one program that will count toward meeting the requirements of the other program must be completed before the awarding of either degree. Students will be required to fulfill all requirements for each degree in order to be awarded that degree, subject to the interprogram transfer of credits. With respect to EDTHP program requirements for a thesis or paper, work done while at DSL under the supervision of a DSL faculty member may be appropriate for incorporation into the thesis or paper with the approval of the EDTHP degree program committee (in such cases, the committee should consider whether the credits afforded such work will be subject to the twelve credit maximum for interprogram transfers). A DSL faculty member must be a member of the committee).

If for some reason the student cannot complete the requirements of the J.D., the student will still be allowed to count DSL courses already taken toward the pertinent EDTHP degree, even if he or she is no longer in the joint degree program.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

EDUCATIONAL LEADERSHIP PROGRAM (EDLDR) course list

EDUCATIONAL THEORY AND POLICY (EDTHP) course list

HIGHER EDUCATION (HI ED) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 04/12/04
Last Revised by the Department: Fall Semester 2007
Blue Sheet Item #: 35-07-431
Review Date: 6/12/07
Date last updated by Publications: 8/21/09

Electrical Engineering (E E)

Program Home Page

W. KENNETH JENKINS, *Head of the Department of Electrical Engineering*
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Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- William S. Adams, Ph.D. (Penn State) Professor Emeritus of Electrical Engineering
- Osama O. Awadelkarim, Ph.D. (Reading, England) Professor of Engineering Science and Mechanics
- Kultegin Aydin, Ph.D. (METU, Ankara) Professor of Electrical Engineering
- Sven G. Bilén, Ph.D. (Michigan) Associate Professor of Electrical Engineering
- Nirmal K. Bose, Ph.D. (Syracuse) HRB Systems Professor of Electrical Engineering
- James K. Breakall, Ph.D. (Case Western Reserve) Professor of Electrical Engineering
- John L. Brown, Jr., Ph.D. (Brown) Professor Emeritus of Electrical Engineering
- Larry C. Burton, Ph.D. (Penn State) Associate Dean for Administration and Planning; Professor of Electrical Engineering
- Lynn A. Carpenter, Ph.D. (Illinois) P.E. Associate Professor of Electrical Engineering
- Lee D. Coraor, Ph.D. (Iowa) Associate Professor of Electrical Engineering, and Computer Science and Engineering
- Leslie E. Cross, Ph.D. (Leeds) Evan Pugh Professor Emeritus of Electrical Engineering
- Chitaranjan Das, Ph.D. (S.W. Louisiana) Professor of Computer Science and Electrial Engineering
- Suman Datta, Ph.D. (Cincinatti) Associate Professor of Electrical Engineering
- John F. Doherty, Ph.D. (Rutgers) Professor of Electrical Engineering
- John E. Dzielski, Ph.D. (MIT) Research Engineer; Assistant Professor of Acoustics
- Anthony J. Ferraro, Ph.D. (Penn State) Professor Emeritus of Electrical Engineering
- Richard A. Goldberg, Ph.D. (Penn State) Adjunct Professor of Electrical Engineering
- Craig A. Grimes, Ph.D. (Texas at Austin) Professor of Electrical Engineering
- Dale M. Grimes, Ph.D. (Michigan) Professor Emeritus of Electrical Engineering
- Ruyan Guo, Ph.D. (Penn State) Professor of Electrical Engineering and Materials
- David L. Hall, Ph.D. (Penn State) Associate Dean for Research and Graduate Studies, School of Information Sciences and Technology; Professor of Information Sciences and Technology, and Electrical Engineering
- Randy Haupt, Ph.D. (Michigan) Senior Scientist
- William E. Higgins, Ph.D. (Illinois) Professor of Electrical Engineering
- Heath F. Hofmann, Ph.D. (California, Berkeley) Associate Professor of Electrical Engineering
- Ali R. Hurson, Ph.D. (Florida) Professor of Computer Science and Engineering
- Mary Jane Irwin, Ph.D. (Illinois) Noll Chair; Professor of Computer Science and Engineering
- Thomas N. Jackson, Ph.D. (Michigan) Robert E. Kirby Chair; Professor of Electrical Engineering
- W. Kenneth Jenkins, Ph.D. (Purdue) Department Head; Professor of Electrical Engineering
- Timothy J. Kane, Ph.D. (Illinois) Professor of Electrical Engineering
- Mohsen Kavehrad, Ph.D. (Polytechnic Univ) William L. Weiss Chair; Professor of Electrical Engineering
- George Kesidis, Ph.D. (California, Berkeley) Professor of Electrical Engineering, and Computer Science and Engineering
- Iam-Choon Khoo, Ph.D. (Rochester) William E. Leonard Chair; Distinguished Professor of Electrical Engineering
- Stewart K. Kurtz, Ph.D. (Ohio State) Murata Professor of Materials Research and Professor Emeritus of Electrical Engineering
- Constantino M. Lagoa, Ph.D. (Wisconsin, Madison) Associate Professor of Electrical Engineering
- Thomas F. LaPorta, Ph.D. (Coumbia) Distinguished Professor of Computer Science and Engineering
- Ji-Woong Lee, Ph.D. (Michigan) Assistant Professor of Electrical Engineering
- Kwang Y. Lee, Ph.D. (Michigan State) Professor Emeritus of Electrical Engineering
- Yanxi Liu, Ph.D. Associate Professor of Electrical Engineerg and Computer Science and Engineering
- Zhiwen Liu, Ph.D. (California Inst of Tech) Assistant Professor of Electrical Engineering
- John D. Mathews, Ph.D. (Case Western Reserve) Professor of Electrical Engineering
- Jeffrey S. Mayer, Ph.D. (Purdue) P.E. Associate Professor of Electrical Engineering
- Theresa S. Mayer, Ph.D. (Purdue) Professor of Electrical Engineering
- George J. McMurtry, Ph.D. (Purdue) Professor Emeritus of Electrical Engineering
- John J. Metzner, Eng. Sc. D. (New York) Professor of Computer Science and Engineering, and Electrical Engineering
- David J. Miller, Ph.D. (California, Santa Barbara) Associate Professor of Electrical Engineering
- John D. Mitchell, Ph.D. (Penn State) Professor of Electrical Engineering
- Raj Mittra, Ph.D. Professor of Electrical Engineering
- Suzanne Mohney, Ph.D. (Wisconsin, Madison) Professor of Materials and Science Engineering
- Ram Narayanan, Ph.D. (UMass, Amherst) Professor of Electrical Engineering
- Vijay Krishnan Narayanan, Ph.D. (South Florida, Tampa) Professor of Computer Science and Engineering, and Electrical Engineering
- John S. Nisbet, Ph.D. (Penn State) Alumni Professor Emeritus of Electrical Engineering
- Victor P. Pasko, Ph.D. (Stanford) Associate Professor of Electrical Engineering
- C. Russell Philbrick, Ph.D. (North Carolina State) Professor of Electrical Engineering
- Shashi Phoha, Ph.D. (Michigan State) Head of Information Sciences and Technology Division, ARL; Professor of Electrical Engineering
- Michael Piovosi, Ph.D. (Delaware) P.E. Associate Professor of Electrical Engineering (Penn State Great Valley)
- Asok Ray, Ph.D. (Northeastern) Distinguished Professor of Mechanical Engineering
- Joan M. Redwing, Ph.D. (Wisconsin, Madison) Professor of Materials Science and Engineering, and Electrical Engineering
- Sal Riggio, Ph.D. (Florida Atlantic) Associate Professor of Electrical Engineering
- James W. Robinson, Ph.D. (Michigan) Professor Emeritus of Electrical Engineering
- William J. Ross, Ph.D. (New Zealand) Professor Emeritus of Electrical Engineering
- David W. Russell, Ph.D. (CNAA, London) Professor of Electrical Engineering
- Jerzy Ruzyllo, Ph.D. (Technical U of Warsaw) Professor of Electrical Engineering
- Jeffrey L. Schiano, Ph.D. (Illinois) Associate Professor of Electrical Engineering
- Srinivas Tadigadapa, Ph.D. (Cambridge) Associate Professor of Electrical Engineering
- Richard L. Tutwiler, Ph.D. (Penn State) Senior Research Associate

- Kenji Uchino, Ph.D. (Tokyo Institute of Technology) Professor of Electrical Engineering
- Julio V. Urbina, Ph.D. (Illinois) Assistant Professor of Electrical Engineering
- Vijay K. Varadan, Ph.D. (Northwestern) Distinguished Alumni Professor of Engineering Science and Mechanics and Electrical Engineering
- Douglas H. Werner, Ph.D. (Penn State) Professor of Electrical Engineering
- Pingjuan L. Werner, Ph.D. (Penn State) Associate Professor of Electrical Engineering
- Christopher R. Wronski, Ph.D. (Imperial College, London) P.E. Professor Emeritus of Electrical Engineering
- Aylin Yener, Ph.D. (Rutgers) Associate Professor of Electrical Engineering
- Stuart (Shizhuo) Yin, Ph.D. (Penn State) Professor of Electrical Engineering
- Randy Young, Ph.D. (Penn State) Senior Research Associate
- Francis T. S. Yu, Ph.D. (Michigan) Evan Pugh Professor Emeritus of Electrical Engineering
- Qiming Zhang, Ph.D. (Penn State) Professor of Electrical Engineering

The general areas of graduate research in Electrical Engineering are electromagnetics and optics; electronics and photonics; communications, computers, networking, and signal processing; and control and power systems. Specializations available within these areas include microwaves, antennas, and propagation; electro-optics and nonlinear optics; remote sensing and space systems; materials and devices; circuits and networks; VLSI; communications; networking; signal and image processing; computer vision and pattern recognition; control systems; and power systems.

For information about areas of specialization, laboratory and research facilities, fellowships, assistantships, and other sources of financial assistance, write directly to the Graduate Program Coordinator, Department of Electrical Engineering, 121 Electrical Engineering East, University Park, PA 16802-2705, or review the Web pages at www.ee.psu.edu.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*. Applicants are required to submit scores from the general portions of the Graduate Record Examinations, three letters of reference, and a personal statement of relevant experience and goals, a resume, undergraduate transcripts, and a supplemental application.

Master of Science Degree Requirements

The Master of Science requirements include the general requirements of the Graduate School as listed under Master's Degree Requirements in the *Graduate Bulletin.*

Specific course requirements: (1) Thesis option--24 course credits, including a broad selection of 500-level courses, 2 colloquium credits, 6 thesis credits, and a satisfactory thesis; (2) Paper option--30 course credits, including a broad selection of 500-level courses, 2 colloquium credits, 2 paper credits, and a satisfactory paper.

Doctoral Degree Requirements

The Doctor of Philosophy requirements include the general requirements of the Graduate School as listed under Doctoral Degree Requirements in the *Graduate Bulletin.*

Specific requirements: The communication requirement is met by adequacy in both spoken and written English. The candidacy examination consists of both written and oral parts; the oral comprehensive examination is preceded by the writing of a thesis proposal. The program requires a minimum of 39 course credits and 2 colloquium credits beyond the B.S. degree.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

PAUL F. ANDERSON GRADUATE FELLOWSHIP
MELVIN P. BLOOM MEMORIAL GRADUATE FELLOWSHIP
LUTHER B. AND PATRICIA A. BROWN GRADUATE FELLOWSHIP
JOSEPH R. AND JANICE M. MONKOWSKI GRADUATE FELLOWSHIP
JAMES R. AND BARBARA R. PALMER FELLOWSHIP
PONTANO FAMILY SCHOLARSHIP IN ELECTRICAL ENGINEERING
SOCIETY OF PENN STATE ELECTRICAL ENGINEERS (SPSEE) GRADUATE FELLOWSHIP
FRED C. AND M. JOAN THOMPSON GRADUATE FELLOWSHIP
BESS L. AND MYLAN R. WATKINS GRADUATE FELLOWSHIP

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ELECTRICAL ENGINEERING (E E) course list

Last Revised by the Department: Spring Semester 2010

Blue Sheet Item #: 38-06-136

Review Date: 04/13/2010

Last updated by Publications: 12/22/09

Electrical Engineering

Program Home Page

PETER IDOWU, *Program Coordinator*
Penn State Harrisburg
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W211 Olmsted Building
Middletown, PA 17057
717-948-6110
meee@psu.edu

Degrees Conferred:

M. Eng., M.S.

The Graduate Faculty

- Sedig S. Agili, Ph.D. (Marquette) *Associate Professor of Electrical Engineering*
- Omid Ansary, Ph.D. (Akron) *Director, School of Science, Engineering, and Technology; Professor of Engineering*
- Kerwin Foster, Ph.D. (Florida State); Ph.D. (UNC) *Assistant Professor of Physics*
- Robert Gray, Ph.D. (Ohio) *Associate Professor of Electrical Engineering*
- Peter Idowu, Ph.D. (Toledo) *Associate Professor of Electrical Engineering*
- Hossein Jula, Ph.D. (Southern California) *Assistant Professor of Electrical Engineering*
- Aldo W. Morales, Ph.D. (SUNY) *Professor of Electrical Engineering*
- Jerry F. Shoup, Ph.D. (Penn State) *Associate Professor of Engineering*
- Mohammad-Reza Tofighi, Ph.D. (Drexel) *Assistant Professor of Electrical Engineering*
- Seth Wolpert, Ph.D. (Rutgers) *Associate Professor of Electrical and Computer Engineering*

M. Eng. E E

Admission Requirements

A prospective graduate student in Electrical Engineering at Penn State Harrisburg must fulfill the admission requirements as set forth by the Graduate School, and have a bachelor of science degree in electrical engineering or its equivalent from an institution that is accredited by the Accreditation Board of Engineering and Technology (ABET). An undergraduate cumulative grade-point average of 3.0 or better on a 4.0 scale is required for admission. Exceptions to this will be based on professional experience and other factors such as GRE scores. In addition, a student who does not meet the overall 3.0 grade-point average may be considered for admission if the student has a 3.0 junior/senior grade-point average. Up to 15 credits earned in three semesters or fewer, as a special nondegree student, may be applied toward the master's degree. Those applying for admission as a master of engineering candidate without an electrical engineering degree may be admitted with the stipulation that deficiencies in background, if any, will be remedied early in the program and that these courses will be in addition to the required number of credits for the degree.

Applicants should submit the following:

- a graduate **online** application with the application fee;
- official copies of undergraduate transcripts;
- test scores from the Graduate Record Examinations (GRE) (preferable, but not required);
- three (3) letters of reference, especially those from faculty who can evaluate academic potential;
- a personal statement of technical interest, goals, and experience.

Test scores from the Graduate Record Examination (GRE) are required ONLY for those applicants indicating interest in an assistantship.

Degree Requirements

A total of 33 credits is required for a Master of Engineering degree, of which at least 24 must be taken through Penn State Harrisburg engineering graduate programs. Up to 9 credits of graduate work may be transferred from other institutions provided (a) credits are suitable for the particular engineering discipline, and (b) students have earned a grade of B or better. At least 18 credits must be at the 500 level, which includes 3 credits of ENGR 594.

Generally, students enrolled in the program for the Master of Engineering degree in Electrical Engineering must earn 12 credits in the required core courses (i.e., courses with the E E prefix).

Master of Engineering Paper: A candidate for the master of engineering degree in Electrical Engineering must write a scholarly report or engineering paper and defend it before three faculty members. The paper is intended to be a relatively short document compared with a thesis. A published paper may be used to meet this requirement. The paper should be written according to the standards set for an IEEE publication.

The engineering paper may be initiated by taking the 1-credit ENGR 594 course. This should be done approximately halfway through the program. Once the proposal is approved and the work well under way, the student should register for ENGR 594 with his/her paper adviser. Work will proceed as planned under the direction of the paper adviser, though changes may be made with the consent of the master's paper committee.

Up to 9 credits of graduate work may be transferred from other institutions provided (a) credits are suitable for the particular engineering discipline, and (b) students have earned a grade of B or better.

Students must have a 3.00 grade-point average in both prescribed and supporting courses approved by the program to graduate. Students pursue the program on a part-time basis. A student can complete the program within two years, based on completion of two courses a semester.

M. S. E E

Admission Requirements

Admission into the Master of Science (M.S.) Electrical Engineering program will be granted only to candidates who demonstrate high potential for success in graduate studies.

Applicants should have undergraduate degrees in engineering or technology-related fields from an accredited university and must meet the admission requirements as set by Penn State's Graduate School. An applicant must hold either (1) a bachelor's degree from a U.S. regionally accredited institution or (2) a postsecondary degree that is equivalent to a U.S. baccalaureate degree earned from an officially recognized degree-granting international institution.

An undergraduate cumulative grade-point average of 3.0 or better on a 4.0 scale, and scores from the GRE are required for admission.

Applicants should submit the following:

- a completed Graduate School online application with the application fee;
- official copies of undergraduate transcripts;
- three (3) letters of professional recommendations from individuals who can evaluate the applicant's potential;
- a personal statement of technical interest, goals, and experience;
- test scores from the Graduate Record Examination (GRE); and
- statement of interest in graduate assistantship, if desired.

Degree Requirements

All graduate students in Electrical Engineering are required to adhere to the requirements of the Graduate School, as found in the Graduate Degree Programs Bulletin. The requirements of the Graduate School, however, are minimum requirements and the policies, procedures, and regulations listed below are additional and more specific for graduate students pursuing the MS in Electrical Engineering degree. Advisers will call pertinent regulations to the attention of their advisees, but it should be understood that it is the student's personal responsibility to see that all requirements are satisfied.

The MSEE program at Penn State Harrisburg is structured into two areas of concentration to fully take advantage of the specialty areas represented in the E E graduate faculty. The areas are Electronics- Electromagnetics-Optics (EEO) and Systems.The program requires 31-credits, including 24 course credits with at least 15 credits at the 500 level, one colloquium credit, and 6 thesis credits (600-level). All students are required to take a 500-level analysis course (EMCH 524A) in addition to prescribed courses in one of the two concentration areas. The prescribed courses are intended to establish the fundamentals of the technical areas. To incorporate some breadth into the program, students are required to take at least one course in the second concentration area. A maximum of three 400-level courses (9 credits) may be taken for the MSEE degree

Original research, usually requiring at least two semesters of work (nominal 6 credits), is expected for a thesis. The work should be an in-depth investigation intended to extend the state of knowledge in some specialty area.

The E E program has established a six-year time limit for completion of the M.S. degree. Any extension beyond six years requires the approval of the E E program Graduate Faculty.

The student must maintain a minimum grade point average (GPA) of 3.00 or better on a 4.00 scale in 500- and 400-level courses listed on his/her Plan of Study.

Penn State Harrisburg's MSEE program is distinct and independent of the MSEE program offered at the University Park campus.

English Proficiency— The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. Specific graduate programs may have more stringent requirements.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

Completed International Application material must be submitted by the following deadlines: May 31 for the fall semester; September 30 for the spring semester; February 28 for the summer session. Applications received after these deadlines will be processed for the following semester.

PLEASE NOTE: Each graduate program reserves the right to set earlier deadlines than those noted above.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ELECTRICAL ENGINEERING (E E) course list

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-05-149

Review Date: 02/23/2010

Last updated by Publications: 3/27/09

Energy and Geo-Environmental Engineering (EGEE)

Program Home Page

YAW D. YEBOAH, *Head of the Department of Energy and Mineral Engineering*
118 Hosler Building
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SEMIH ESER, *Associate Department Head*
101 Hosler Building
814-863-1392

DEREK ELSWORTH, *Graduate Program Chair*
231 Hosler Building
814-865-2225

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Michael A. Adewumi, Ph.D. (IIT) Professor of Petroleum and Natural Gas Engineering
- Shelton S. Alexander, Ph.D. (Cal. Tech) Professor of Geophysics
- John Andresen'Ph.D. (Strathclyde) Assistant Professor of Energy and Geo-Environmental Engineering
- André L. Boehman, Ph.D. (Stanford) Associate Professor of Fuel Science
- Susan L. Brantley, Ph.D. (Princeton) Professor of Geosciences
- Timothy Considine, Ph.D. (Cornell) Professor of Natural Resource Economics
- Derek Elsworth, Ph.D. (California, Berkeley) Professor of Geo-Environmental Engineering
- Turgay Ertekin, Ph.D. (Penn State) Professor of Petroleum and Natural Gas Engineering
- Semih Eser, Ph.D. (Penn State) Associate Professor of Energy and Geo-Environmental Engineering
- Peter B. Flemings, Ph.D. (Cornell) Professor of Geosciences
- Maochen Ge, Ph.D. (Penn State) Associate Professor of Mining Engineering
- Abraham S. Grader, Ph.D. (Stanford) Professor of Petroleum and Natural Gas Engineering
- Phillip M. Halleck, Ph.D. (Chicago) Associate Professor of Petroleum and Natural Gas Engineering
- Richard Hogg, Ph.D. (California, Berkeley) Professor Emeritus of Mineral Processing and Geo-Environmental Engineering
- M. Thaddeus Ityokumbul, Ph.D. (Univ. of Western Ontario) Associate Professor of Mineral Processing and Geo-Environmental Engineering
- Mark S. Klima, Ph.D. (Penn State) Associate Professor of Mineral Processing and Geo-Environmental Engineering
- Lee R. Kump, Ph.D. (South Florida) Professor of Geosciences
- Peter T. Luckie, Ph.D. (Penn State) Professor Emeritus of Mineral Processing
- Angela D. Lueking, Ph.D. (Michigan) Assistant Professor of Energy and Geo-Environmental Engineering
- Serguei Lvov, Ph.D. (St. Petersburg) Professor of Energy and Geo-Environmental Engineering
- Christopher J. Marone, Ph.D. (Columbia) Professor of Geosciences
- Mercedes M. Maroto-Valer, Ph.D. (Strathclyde) Assistant Professor of Energy and Geo-Environmental Engineering
- Jonathan Mathews, Ph.D. (Penn State) Assistant Professor of Energy and Geo-Environmental Engineering
- Andrew Nyblade, Ph.D. (Michigan) Associate Professor of Geosciences
- Kwadwo A. Osseo-Asare, Ph.D. (California, Berkeley) Professor of Metallurgy
- Richard R. Parizek, Ph.D. (Illinois) Professor of Geology and Geo-Environmental Engineering
- Sarma Pisupati, Ph.D. (Penn State) Associate Professor of Fuel Science
- Ljubisa R. Radovic, Ph.D. (Penn State) Professor of Energy and Geo-Environmental Engineering
- Alan W. Scaroni, Ph.D. (Penn State) Professor of Energy and Geo-Environmental Engineering
- Harold H. Schobert, Ph.D. (Iowa State) Professor of Fuel Science
- Chunshan Song, Ph.D. (Osaka) Professor of Fuel Science
- Robert W. Watson, Ph.D. (Penn State) Associate Professor of Petroleum and Natural Gas Engineering
- William B. White, Ph.D. (Penn State) Professor of Geochemistry
- John C. Wyngaard, Ph.D. (Penn State) Professor of Meteorology, Mechanical Engineering, and Geo-Environmental Engineering
- Yaw D. Yeboah, Sc.D. (MIT) Professor of Energy and Geo-Environmental Engineering
- George S. Young, Ph.D. (Colorado State) Associate Professor of Meteorology and Geo-Environmental Engineering

The Department of Energy and Mineral Engineering provides a vertically integrated approach to research and education in all aspects of the energy and mineral industries, including scientific and engineering issues, health and safety and maintenance of high environmental standards. The department's mission is to forge an intellectual and scientific cohesiveness in energy and mineral resource technology. This objective is achieved by exploiting the natural synergy between the exploration, extraction, processing and utilization of energy and mineral resources so as to cater to the emerging needs of society.

The Department of Energy and Mineral Engineering offers advanced degrees in six programmatic areas (Energy and Geo-Environmental Engineering, Industrial Health and Safety, Mineral Processing, Mining Engineering, Oil and Gas Engineering Management, and Petroleum and Natural Gas Engineering). Each academic degree program has specific faculty associated with it and a professor who serves as the graduate program chair. The Department of Energy and Mineral Engineering has overall requirements for the M.S., M.Eng., and Ph.D. degrees with specific requirements associated with each program.

Energy and Geo-Environmental Engineering Program

The graduate program in Energy and Geo-Environmental Engineering is an interdisciplinary program providing comprehensive study and education in the environmental sciences and engineering. Students take classes in a common core of materials, with subsequent specialization determined by the student and adviser, in consideration of the selected research topic.

Admission Requirements

Scores for the Graduate Record Examinations (GRE) are required. The best-qualified applicants will be accepted up to the number of spaces available for new students. Students will be accepted by the academic programs and at the discretion of a graduate program, a student may be granted provisional admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Admission to the academic programs in the Department of Energy and Mineral Engineering is competitive. Entering students must hold a bachelor's degree in engineering or physical sciences. Students with 3.00 or better (out of 4.00) junior/senior cumulative grade-point averages and appropriate course backgrounds will be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Entering graduate students in Energy and Geo-Environmental Engineering for whom English is not the first language are required to have a score of at least 550 on the Test of English as a Foreign Language (TOEFL) examination. Letters of recommendation and a statement of purpose written by the applicant are also required.

Master's Degree Requirements

The M.S. degree programs in the Department of Energy and Mineral Engineering are designed for students to gain advanced knowledge for research, analysis, and design in Energy and Geo-Environmental Engineering, Industrial Health and Safety, Mineral Processing, Mining Engineering, and Petroleum and Natural Gas Engineering. Students pursuing an M.S. degree will be required to complete 24 course credits and submit a thesis (6 credits) to the Graduate School. Graduate committees in each academic program play an important role in formulating individual course and research schedules.

The Mining Engineering and Oil and Gas Engineering programs also offer an M.Eng. degree. Students pursuing an M.Eng degree are required to present a scholarly written report on a suitable project, the topic of which may be suggested by the industry. The report must be a scholarly achievement, relating a developmental study that involves an appropriate, significant subject in the discipline. The report must be approved by a committee of the faculty composed of report adviser, report reader, and chair of the program.

The specific credit requirements and other specifics of the master's programs in Energy and Geo-Environmental Engineering are available upon request.

Doctoral Degree Requirements

The Ph.D. programs in the Department of Energy and Mineral Engineering emphasize scholarly research and help students prepare for research and related careers in industry, government and academe. Acceptance into the Ph.D. degree programs in the Department of Energy and Mineral Engineering is based on the student's performance on the Ph.D. candidacy examination administered by the faculty of a specific academic program. A comprehensive examination is required of all Ph.D. candidates and should be taken after substantial completion of course work. The comprehensive examination is the responsibility of the candidate's doctoral committee and administered according to the rules specified by the Graduate School. The Ph.D. programs in Energy and Geo-Environmental Engineering are quite flexible, with minimum formal requirements. The communication and foreign language requirements for the Ph.D. degree may be satisfied by intermediate knowledge of one foreign language. The general requirements for graduation are outlined in the GENERAL INFORMATION section of the Graduate Bulletin. The specific credit requirements of the Ph.D. programs in Energy and Geo-Environmental Engineering are available upon request.

Other Relevant Information

All graduate students are expected to attend general department seminars and seminars in their programmatic areas. Graduate students may be asked to contribute to the instructional programs of the department by assisting with laboratory and lecture courses.

Students in Mining Engineering and Petroleum and Natural Gas Engineering may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (See also Operations Research.)

Student Aid

Graduate students are supported by a variety of government and industry fellowships, and research and teaching assistantships. Stipends vary depending on the source. Please see the STUDENT AID section of the *Graduate Bulletin* to learn other forms of the student aid.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ENERGY AND GEO-ENVIRONMENTAL ENGINEERING (EGEE) course list

FUEL SCIENCE (F SC) course list

GEO-ENVIRONMENTAL ENGINEERING (GEOEE) course list

Last Revised by the Department: Fall Semester 2004

Blue Sheet Item #: 32-07-020

Review Date: 6/15/04

Date last updated by Publications: 1/28/08

Energy and Mineral Engineering (EME)

Program Home Page (Opens New Window)

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Email: ydy1@psu.edu

R. Larry Grayson, *Graduate Program Officer*
103A Hosler Building
814-863-1644
Email: rlg19@psu.edu
www.eme.psu.edu

Degrees Conferred:

Ph.D., M.S. (with or without options in Petroleum and Natural Gas Engineering; Mining and Mineral Process Engineering; Environmental Health and Safety Engineering; Fuel Science; and Energy Management and Policy)

The Graduate Faculty

- Michael A. Adewumi, Ph.D. (IIT) Professor of Petroleum and Natural Gas Engineering
- Luis Ayala, Ph.D. (Penn State), Assistant Professor of Petroleum and Natural Gas Engineering
- André L. Boehman, Ph.D. (Stanford) Associate Professor of Fuel Science
- Seth Blumsack, Ph.D. (Carnegie Mellon), Assistant Professor of Energy and Mineral Engineering
- Jeffrey Brownson, Ph.D. (Wisconsin), Assistant Professor of Energy and Mineral Engineering
- Yongsheng Chen, Ph.D. (Hehigh), Assistant Professor of Energy and Mineral Engineering
- Caroline B. Clifford, Ph.D. (Penn State), Senior Research Associate, Energy Institute
- Timothy Considine, Ph.D. (Cornell) Professor of Natural Resource Economics
- Derek Elsworth, Ph.D. (California, Berkeley) Professor of Geo-Environmental Engineering
- Turgay Ertekin, Ph.D. (Penn State) Professor of Petroleum and Natural Gas Engineering
- Semih Eser, Ph.D. (Penn State) Associate Professor of Energy and Geo-Environmental Engineering
- Maochen Ge, Ph.D. (Penn State) Associate Professor of Mining Engineering
- Abraham S. Grader, Ph.D. (Stanford) Professor of Petroleum and Natural Gas Engineering
- R. Larry Grayson, Ph.D. (West Virginia), Professor of Energy and Mineral Engineering
- William A. Groves, Ph.D. (Michigan) Associate Professor of Industrial Health and Safety
- Joel M. Haight, Ph.D. (Auburn), Associate Professor of Energy and Mineral Engineering
- Phillip M. Halleck, Ph.D. (Chicago) Associate Professor of Petroleum and Natural Gas Engineering
- Richard Hogg, Ph.D. (California, Berkeley) Professor Emeritus of Mineral Processing and Geo-Environmental Engineering
- M. Thaddeus Ityokumbul, Ph.D. (Univ. of Western Ontario) Associate Professor of Mineral Processing and Geo-Environmental Engineering
- Zuleima Karpyn, Ph.D. (Penn State), Assistant Professor of Petroleum and Natural Gas Engineering
- Vladislav Kecojevic, Ph.D. (Belgrade), Associate Professor of Mining Engineering
- Andrew Kleit, Ph.D. (Yale), Professor of Energy and Environmental Economics
- Mark S. Klima, Ph.D. (Penn State) Associate Professor of Mineral Processing and Geo-Environmental Engineering
- Angela D. Lueking, Ph.D. (Michigan) Assistant Professor of Energy and Geo-Environmental Engineering
- Peter T. Luckie, Ph.D. (Penn State), Professor Emeritus of Mineral Processing
- Serguei Lvov, Ph.D. (St. Petersburg) Professor of Energy and Mineral Engineering
- Xiaoliang Ma, Ph.D. (Kyushu, Japan), Senior Research Associate, Energy Institute
- Christopher J. Marone, Ph.D. (Columbia) Professor of Geosciences
- Jonathan Mathews, Ph.D. (Penn State) Assistant Professor of Energy and Mineral Engineering
- Kwadwo A. Osseo-Asare, Ph.D. (California, Berkeley) Professor of Metallurgy and Energy and Mineral Engineering
- Sarma Pisupati, Ph.D. (Penn State) Associate Professor of Energy and Mineral Engineering
- Mark Radomsky, Ph.D. (Penn State), Senior Lecturer
- Ljubisa R. Radovic, Ph.D. (Penn State) Professor of Energy and Mineral Engineering
- Raja V. Ramani, Ph.D. (Penn State) Professor Emeritus of Mining and Geo-Environmentatl Engineering
- Jamal Rostami, Ph.D. (Colorado School of Mines), Assistant Professor of Energy and Mineral Engineering
- Alan W. Scaroni, Ph.D. (Penn State) Professor of Energy and Mineral Engineering and Associate Dean for Graduate Education and Research
- Harold H. Schobert, Ph.D. (Iowa State) Professor of Fuel Science
- Chunshan Song, Ph.D. (Osaka) Professor of Fuel Science
- Robert W. Watson, Ph.D. (Penn State) Associate Professor of Petroleum and Natural Gas Engineering and Geo-Environmental Engineering
- Yaw D. Yeboah, Sc.D. (MIT) Professor and Head of Energy and Mineral Engineering
- Fan Zhang, Ph.D. (Harvard), Assistant Professor of Energy and Mineral Engineering

The Department of Energy and Mineral Engineering provides a vertically integrated approach to research and education in all aspects of the energy and mineral industries, including scientific and engineering issues, health and safety and maintenance of high environmental standards. The Department's mission is to forge an intellectual and scientific cohesiveness in energy and mineral resource technology. This objective is achieved by exploiting the natural synergy between the exploration, extraction, processing and utilization of energy and mineral resources so as to cater to the emerging needs of society.

The Department offers advanced degrees in Energy and Mineral Engineering (M.S. and Ph.D.) and an online professional Master of Engineering (M. Eng.) degree in Oil and Gas Engineering Management. The Department has overall requirements for the M.S., M. Eng., and Ph.D. degrees with specific requirements associated with each program.

Energy and Mineral Engineering Program

The Energy and Mineral Engineering (EME) program is a single graduate program with a focus on the production of energy and minerals in an economic, safe and efficient manner. The program provides flexible education of students in energy and mineral sciences and

engineering, with focus on both non-renewable and renewable resource and energy industries. The program is designed to resolve the sometimes competing goals of flexible education of requisite breadth while still providing in-depth study; students are required to follow a focused curriculum that combines the requisite rigor with flexibility in a rapidly changing field of endeavor. Participating students take core program and required option courses and additional courses from a broad array of courses to meet the total credit requirements. Students are not required to choose an option. However, a student who desires disciplinary identity may choose from among the five available options: petroleum and natural gas engineering, mining and mineral process engineering, environmental health and safety engineering, fuel science, and energy management and policy.

Admission Requirements

Scores for the Graduate Record Examinations (GRE) are required for admission, though this may be waived at the discretion of the Energy and Mineral Engineering graduate program. The best-qualified applicants will be accepted by the Energy and Mineral Engineering graduate program up to the number of spaces available for new students. At the discretion of the Energy and Mineral Engineering graduate program, a student may be granted provisional admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Admission to the Energy and Mineral Engineering graduate program in the Department of Energy and Mineral Engineering is competitive. Entering students must hold a bachelor's degree in a science or engineering discipline . Students with 3.00 or better (out of 4.00) junior/senior cumulative grade-point averages and appropriate course backgrounds will be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Undergraduate students from the Department of Energy and Mineral Engineering with sixth semester standing, minimum grade-point average of 3.3, and excellent faculty recommendations may be admitted for a five-year B.S./M.S. dual degree.

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the internet-based test (iBT). Applicants with iBT speaking scores between 15 and 19 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. Specific graduate programs may have more stringent requirements. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a masters degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British west Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, The United States, and Wales.

Letters of recommendation and an applicant's statement of purpose are also required.

Master's Degree Requirements

The M.S. degree program in Energy and Mineral Engineering is designed for students to gain advanced knowledge for research, analysis, and design in Energy and Mineral Engineering. Students pursuing an M.S. degree will be required to complete 24 course credits and submit a thesis (6 credits) to the Graduate School. Graduate committees in the graduate program in the Department of Energy and Mineral Engineering play an important role in formulating individual course and research schedules. At least 18 of the total course credits must be at the 500 level.

Doctoral Degree Requirements

The Ph.D. program in Energy and Mineral Engineering emphasizes scholarly research and help students prepare for research and related careers in industry, government and academe. Acceptance into the Ph.D. degree program in Energy and Mineral Engineering is based on the student's performance on the Ph.D. candidacy examination administered by the faculty of the EME graduate program. A comprehensive examination is required of all Ph.D. candidates and should be taken after substantial completion of course work. The comprehensive examination is the responsibility of the candidate's doctoral committee and administered according to the rules specified by the Graduate School. The Ph.D. program in Energy and Mineral Engineering is quite flexible, with minimum formal requirements. A minimum of 12 post M.S. course credits is required. At least 18 course credits for the graduate program must be at the 500 level. For students entering the program with an M.S. degree, 500-level courses already taken either at Penn State or other institutions may be accepted in partial fulfillment of the Ph.D. 18 credits of 500-level course requirements if the are found to be appropriate. The communication and foreign language requirements for the Ph.D. degree may be satisfied by intermediate knowledge of one foreign language. The general requirements for graduation are outlined in the GENERAL INFORMATION section of the Graduate Bulletin.

Other Relevant Information

All graduate students are expected to attend general Department seminars. Graduate students may be asked to contribute to the instructional programs of the Department by assisting with laboratory and lecture courses.

Students in Energy and Mineral Engineering may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (See also Operations Research.)**Student Aid**

Graduate students are supported by a variety of government and industry fellowships, and research and teaching assistantships. Stipends vary depending on the source. Please see the STUDENT AID section of the *Graduate Bulletin* to learn other forms of the student aid.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ENERGY AND MINERAL ENGINEERING (EME) course list

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-06-188

Review Date: 4/15/08

Last updated by Publications: 1/28/08

Engineering Management (E M)

PETER B. IDOWU, Coordinator
Penn State Harrisburg
School of Science, Engineering, and Technology
777 W. Harrisburg Pike
W211 Olmsted Building
Middletown, PA 17057-4898
717-948-6110
www.hbg.psu.edu

Degree Conferred:

M.P.S.

The Graduate Faculty

School of Science, Engineering, and Technology

Ma'moun Abu-Ayyad, Ph.D. (New Brunswick) Assistant Professor of Mechanical Engineering
Issam Abu-Mahfouz, Ph.D. (Case Western Reserve) Associate Professor of Engineering
Sedig S. Agili, Ph.D. (Marquette) Associate Professor of Electrical Engineering
Omid Ansary, Ph.D. (Akron) Director, School of Science, Engineering, and Technology; Professor of Engineering
Ganesh P. Bal, Ph.D. (Virginia Tech) Assistant Professor of Engineering
Amit Banerjee, Ph.D. (New Jersey Institute of Technology) Assistant Professor of Mechanical Engineering
Joseph J. Cecere, Ph.D. (North Texas State) Associate Professor of Engineering
Yen-Chih Chen, Ph.D. (Purdue) Assistant Professor of Environmental Engineering
Y. Frank Chen, Ph.D. (Minnesota) Professor of Engineering
Richard Ciocci, Ph.D. (Maryland) Assistant Professor of Mechanical Engineering
Shirley E. Clark, Ph.D. (Alabama) Assistant Professor of Environmental Engineering
Ram P. Goel, Ph.D. (Michigan State) Assistant Professor of Mechanical Engineering
Robert Gray, Ph.D. (Ohio) Associate Professor of Electrical Engineering
Peter Idowu, Ph.D. (Toledo) Associate Professor of Engineering
Harris Imadojemu, Ph.D. (North Carolina State) Associate Professor of Engineering
Hossein Jula, Ph.D. (Southern California) Assistant Professor of Electrical Engineering
Jubum Kim, Ph.D. (Washington) Assistant Professor of Civil Engineering
Seroj Mackertich, Ph.D. (Penn State) Assistant Professor of Engineering
Shashi Marikunte, Ph.D. (Michigan State) Assistant Professor of Civil Engineering
Aldo Morales, Ph.D. (SUNY) Professor of Electrical Engineering
Gautam Ray, Ph.D. (Penn State) Professor of Engineering
Jerry F. Shoup, Ph.D. (Penn State) Associate Professor of Electrical Engineering
Mohammad Tofighi, Ph.D. (Drexel) Assistant Professor of Electrical Engineering
Sofia Vidalis, Ph.D. (Florida) Assistant Professor of Civil Engineering
Seth Wolpert, Ph.D. (Rutgers) Associate Professor of Engineering
Yuefeng Xie, Ph.D. (Tshinghua) Associate Professor of Environmental Engineering

School of Business Administration

Thomas Amlie, Ph.D. (Maryland) Assistant Professor of Accounting
Nihal Bayraktar, Ph.D. (Maryland) Associate Professor of Economics
Melvin Blumberg, Ph.D. (Penn State) Professor of Management
Stephan Brady, Ph.D. (Penn State) Assistant Professor of Operations and Supply Chain Management
Terence A. Brown, D.B.A. (Maryland) Associate Professor of Transportation and Marketing
Thomas Buttross, Ph.D. (Mississippi) Associate Professor of Professional Accountancy
Keunsuk Chung, Ph.D. (Washington) Assistant Professor of Economics
Refik Culpan, Ph.D. (NYU) Professor of Management and International Business
Patrick Cusatis, Ph.D. (Penn State) Assistant Professor of Finance
Douglas C. Friedman, Ph.D. (Michigan) Assistant Professor of Marketing
Jean E. Harris, Ph.D. (Virginia Tech) Associate Professor of Accounting
Rhoda Joseph, Ph.D. (Baruch) Assistant Professor of Information Systems
Erdener Kaynak, Ph.D. (Cranfield, Bedford, England) Professor of Marketing
Mukund S. Kulkarni, Ph.D. (Kentucky) Senior Associate Dean for Academic Affairs; Professor of Finance
David A. Morand, Ph.D. (Cornell) Professor of Management
Parag C. Pendharkar, D.B.A. (Southern Illinois) Professor of Information Systems
Robert D. Russell, Ph.D. (Pittsburgh) Assistant Professor of Management
Stephen P. Schappe, Ph.D. (Ohio State) Director, School of Business Administration; Associate Professor of Management
Girish Subramanian, Ph.D. (Temple) Professor of Information Systems
Peter Swan, Ph.D. (Michigan) Assistant Professor of Logistics and Operations Management
Oranee Tawatnuntachai, Ph.D. (New Orleans) Associate Professor of Finance
Premal P. Vora, Ph.D. (Penn State) Associate Professor of Finance
Gayle J. Yaverbaum, Ph.D. (Temple) Professor Emerita of Information Systems
Ji Wu, Ph.D. (Drexel) Assistant Professor of Economics
Richard Young, Ph.D. (Penn State) Professor of Supply Chain Management
Ugur Yucelt, Ph.D. (New School) Associate Professor of Marketing
Lu Zhang, Ph.D. (George Washington) Assistant Professor of Management

The Master of Professional Studies (M.P.S.) Engineering Mangement degree program is a graduate professional degree program that integrates engineering with business and management principles. The program provides engineers with business and management

perspectives and enhances their capabilities in the management of major projects, business initiatives, policies, and other activities in both the public and private sectors. Furthermore, it highlights the importance of technology strategy and intellectual properties management, and offers an environment for personal and professional networking that could hold significant future dividend.

The program is offered at Penn State Harrisburg as a partnership between the School of Science, Engineering, and Technology and the School of Business Administration, which is accredited at the undergradute and graduate levels by AACSB International---the Association to Advance Collegiate Schools of Business International.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin. Admission into the Master of Professional Studies program will be granted only to candidates who demonstrate high potential for success in graduate studies.

Applicants should have undergraduate degrees in engineering or technology from an accredited university and are expected to have completed undergraduate course work in calculus and economics.

An undergraduate cumulative grade-point average of 3.0 or better on a 4.0 scale, and scores from the Graduate Management Admission Test (GMAT) are required for admission. Students demonstrating high potential but failing to meet the minimum GMAT score requirements may be considered on the basis of professional accomplishments and other criteria that may predict success in the program.

Applicants should submit the following:
---a graduate online application with the application fee
---official copies of undergraduate transcripts
---three (3) letters of reference, especially from faculty who can evaluate academic potential
---a personal statement of technical interest, goals, and experience
---test scores from the Graduate Management Admission Test (GMAT)
---test scores from the Graduate Record Examination (GRE) are required for those indicating interest in an assistantship

English Proficiency—The language of instruction at Penn State is English. All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System) and submit the results of that test with the application for admission. Departments and programs may have more stringent requirements and may require all international applicants to submit a TOEFL or IELTS score regardless of their academic background. A TOEFL score of at least 550 (paper-based test), 213 (computer-based test) or a total score of 80 on the Internet-based test (iBT), with a minimum of 19 points on the speaking section, is required for admission. Graduate programs may require a higher score. The International English Language Testing System (IELTS) module provides an exam to test four mandatory skill areas: listening, reading, writing and speaking. All four modules are equally weighted in the evaluation process. The International English Language Testing System has been approved by the Graduate Council as an alternative exam to the TOEFL for international students applying to Penn State. A minimum composite score of 6.5 on the IELTS test is required for admission.

Degree Requirements

All graduate students in Engineering Management are required to adhere to the requirements of the Graduate School, as listed in the Graduate Degree Programs Bulletin. The requirements of the Graduate School, however, are minimum requirements and the policies, procedures, and regulations listed below are additional and more specific for graduates students pursuing the M.P.S. degree in Engineering Management. Advisers will call pertinent regulations to the attention of their advisees, but it should be understood that it is the student's personal responsibility to see that all requirements listed are satisfied.

The M.P.S. in Engineering Management is a 34-credit graduate program that integrates engineering with business and management principles. The multidisciplinary, broadly based M.P.S. program provides engineers with business and management perspectives to enhance capabiiities in management of large projects.

All M.P.S. students are required to take eight core courses (21 credits) focusing on economic analysis, communication and teamwork, management processes, corporate finance, energy and the environment, and engineering analysis.

The curriculum requires the completion of two free electives (6 credits) in any of the engineering disciplines, and a culminating experience through a three-course sequence (7 credits) on strategic management of new ventures and innovations. Of the 34 credits required for the degree, 31 must be earned in 500-level graduate courses.

Courses

Please refer to the graduate program home page for a complete list of available courses.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Last updated by Publications: 2/15/10

Engineering Management (ENGMT)

JAMES A. NEMES, Academic Division Head, Engineering
School of Graduate Professional Studies
Penn State Great Valley
30 E. Swedesford Road
Malvern, PA 19355-1443
610-725-5365; www.sgps.psu.edu/mem

Degree Conferred:

M.E.M.

The Graduate Faculty

Adrian Barb, M.B.A., Ph.D. (Missouri, Columbia) *Assistant Professor in Information Science*
Joanna Defranco, Ph.D. (NJIT) *Senior Lecturer in Information Science*
Kathryn W. Jablokow, Ph.D. (Ohio State) *Associate Professor of Mechanical Engineering and STS*
Phillip A. Laplante, M.B.A., Ph.D. (Stevens Institute of Tech) *Distinguished Professor of Systems Engineering*
John I. McCool, Ph.D. (Temple) *Distinguished Professor of Systems Engineering*
Colin J. Neill, Ph.D. (Wales) *Associate Professor of Software Engineering*
James A. Nemes, D.Sc. (George Washington) *Professor of Mechanical Engineering*
Michael J. Piovoso, Ph.D. (Delaware) *Professor of Electrical Engineering*
Robin G. Qiu, Ph.D. (Penn State) *Associate Professor of Information Science*
David W. Russell, Ph.D. (CNAA, London) *Professor of Electrical Engineering*
Raghvinder Sangwan, Ph.D. (Temple) *Assistant Professor of Information Science*
Kailasam Satyamurthy, M.B.A., Ph.D., (Clemson) *Senior Lecturer of Engineering and Management*

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*. The Master of Engineering Management is developed for students with a background in engineering or science. Applicants with a four year undergraduate degree in engineering, mathematics, physics, computer science, or a related discipline will be considered. Test scores from the GMAT or BRE exams are not required, but will be considered by the admissions committee if submitted. Jr/Sr GPA of 3.0 or better on a 4.0 scale is required. Students must have three years or more work experience in an engineering or engineering-related position. Applicants must submit a letter of reference, and a one page personal statement of relevant experience and goals.

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the Internet-based test (iBT). Applicants with iBT speaking scores between 15 and 19 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or master's degree from a college /university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

Degree Requirements

All students in the Master of Engineering Management program must complete a minimum of 33 credits.
The courses must include the required core courses of 18 credits:

ENGMT 501: Engineering Management Science (3)
ENGMT 510: Economics and Financial Studies for Engineers (3)
SYSEN 505: Technical Project Management (3)
SYSEN 536: Decision and Risk Analysis in Engineering (3)
SYSEN 550: Creativity and Problem Solving I (3)
SYSEN 552: Creativity and Problem Solving II (3)

as well as the capstone course:

ENGMT 539: Engineering Management Strategy (3)

Student Aid

Graduate Assistantships available to students in the program and other forms of student aid are described in the STUDENT AID section of the *Gradate Bulletin.*

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 38-02-029

Review Date: 10/6/09

Engineering Science (E SC)

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Degree Conferred:

M.Eng.

The Graduate Faculty, Penn State Harrisburg

- Ma'moun Abu-Ayyad, Ph.D. (New Brunswick) Assistant Professor of Mechanical Engineering
- Issam Abu-Mahfouz, Ph.D. (Case Western Reserve) Associate Professor of Engineering
- Sedig S. Agili, Ph.D. (Marquette) Associate Professor of Electrical Engineering
- Omid Ansary, Ph.D. (Akron) Director, School of Science, Engineering, and Technology; Professor of Engineering
- Katherine Baker, Ph.D. (Delaware) Associate Professor of Environmental Microbiology
- Ganesh P. Bal, Ph.D. (Virginia Tech) Assistant Professor of Engineering
- Amit Banerjee, Ph.D. (New Jersey Institute of Technology) Assistant Professor of Mechanical Engineering
- Jeremy Blum, Ph.D. (George Washington) Assistant Professor of Computer Science
- Eugene Boman, Ph.D. (Connecticut) Associate Professor of Mathematics
- Thang N. Bui, Ph.D. (MIT) Associate Professor of Engineering
- Joseph J. Cecere, Ph.D. (North Texas State) Associate Professor of Engineering
- Sukmoon Chang, Ph.D. (Rutgers) Assistant Professor of Computer Science
- Yen-Chih Chen, Ph.D. (Purdue) Assistant Professor of Environmental Engineering
- Yohchia Frank Chen, Ph.D. (Minnesota) Professor of Engineering
- Balwant Chohan, Ph.D. (UMass Amherst) Assistant Professor of Chemistry
- Richard Ciocci, Ph.D. (Maryland) Assistant Professor of Mechanical Engineering
- Shirley E. Clark, Ph.D. (Alabama) Assistant Professor of Environmental Engineering
- Xianghua Deng, Ph.D. (Kansas State) Assistant Professor of Computer Science
- Thomas Eberlein, Ph.D. (Wisconsin—Madison) Associate Professor of Chemistry
- Kerwin Foster, Ph.D. (Florida State); Ph.D. (UNC) Assistant Professor of Physics
- Ram P. Goel, Ph.D. (Michigan State) Assistant Professor of Mechanical Engineering
- Robert Gray, Ph.D. (Ohio) Associate Professor of Electrical Engineering
- Peter Idowu, Ph.D. (Toledo) Associate Professor of Engineering
- Harris Imadojemu, Ph.D. (North Carolina State) Associate Professor of Engineering
- Hossein Jula, Ph.D. (Southern California) Assistant Professor of Electrical Engineering
- Jubum Kim, Ph.D. (Washington) Assistant Professor of Civil Engineering
- Seroj Mackertich, Ph.D. (Penn State) Assistant Professor of Engineering
- Anita Mareno, Ph.D. (Cornell) Assistant Professor of Mathematics
- Aldo Morales, Ph.D. (SUNY) Professor of Electrical Engineering
- Shashi Marikunte, Ph.D. (Michigan State) Assistant Professor of Civil Engineering
- Linda M. Null, Ph.D. (Iowa State) Assistant Professor of Computer Science
- Gautam Ray, Ph.D. (Penn State) Professor of Engineering
- Winston A. Richards, Ph.D. (Western Ontario) Associate Professor of Mathematics
- Sairam Rudrabhatla, Ph.D. (Osmania) Assistant Professor of Biology
- Howard G. Sachs, Ph.D. (Clark) Professor of Biology
- Jerry F. Shoup, Ph.D. (Penn State) Associate Professor of Electrical Engineering
- Ilya Shvartsman, Ph.D. (Wayne State) Assistant Professor of Mathematics
- Mohammad-Reza (Soheil) Tofighi, Ph.D. (Drexel) Assistant Professor of Electrical Engineering
- Sofia Vidalis, Ph.D. (Florida) Assistant Professor of Civil Engineering
- Clifford Wagner, Ph.D. (New York, Albany) Associate Professor of Math & Computer Science
- Ronald Walker, Ph.D. (Michigan) Assistant Professor of Mathematics
- Seth Wolpert, Ph.D. (Rutgers) Associate Professor of Engineering
- Yuefeng Xie, Ph.D. (Tshinghua) Associate Professor of Environmental Engineering
- Junjia Zhu, Ph.D. (Wyoming) Assistant Professor of Mathematics

A program leading to the degree of Master of Engineering with a major in Engineering Science is offered at Penn State Harrisburg. The program is designed to provide a broad, advanced education in the engineering sciences with some specialization permitted in the area of the student's major interest. It is offered specifically to permit practicing engineers to pursue advanced studies through evening classes while in full-time employment in industry in the area. Courses offered for the program are all established and authorized by the resident departments at the University Park campus.

Admission Requirements

Scores from the graduate Record Examinations (GRE) are not required for students holding baccalaureate degrees from accredited U.S. educational institutions. At the discretion of a graduate program, students may be admitted for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements state in the GENERAL INFORMATION section of the *Graduate Bulletin.*

Students may be admitted to the program from a wide variety of disciplines. Students applying for admission are expected to have completed the following core courses: (1) physics through modern physics; (2) mathematics through differential equations; (3) one course in engineering thermodynamics; (4) one course in electrical circuits; (5) basic courses in engineering statics, dynamics, and strength of

materials; and (6) computer programming. Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

English Proficiency—The language of instruction at Penn State is English. All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System) and submit the results of that test with the application for admission. Departments and programs may have more stringent requirements and may require all international applicants to submit a TOEFL or IELTS score regardless of their academic background. A TOEFL score of at least 550 (paper-based test), 213 (computer-based test) or a total score of 80 on the Internet-based test (iBT), with a minimum of 19 points on the speaking section, is required for admission. Graduate programs may require a higher score. The International English Language Testing System (IELTS) module provides an exam to test four mandatory skill areas: listening, reading, writing and speaking. All four modules are equally weighted in the evaluation process. The International English Language Testing System has been approved by the Graduate Council as an alternative exam to the TOEFL for international students applying to Penn State. A minimum composite score of 6.5 on the IELTS test is required for admission.

Completed International Application material must be submitted by the following deadlines: May 31 for the fall semester; September 30 for the spring semester; February 28 for the summer session. Applications received after these deadlines will be processed for the following semester.

Applicants should submit the following:
—A graduate **online** application with the application fee;
—Official copies of undergraduate transcripts;
—Three (3) letters of reference, especially those from faculty who can evaluate academic potential;
—A personal statement of technical interest, goals, and experience.

NOTE: Test scores from the Graduate Record Examination (GRE) are required ONLY for those applicants indicating interest in an assistantship.

Degree Requirements

The credit requirements in this major will be satisfied by an appropriate combination of core courses and elective courses. The core courses include offerings in mathematics and in several branches of engineering that have been selected because of their general character and breadth of applicability to all fields of engineering. A minimum of 30 credits is required, of which at least 18 must be at the 500 level. Of the 30 credits, 6 credits of mathematics and a scholarly written report (3 credits) must be completed.

This program should be distinguished from the graduate program in Engineering Science at University Park campus, which offers the M.S. degree.

Other Relevant Information

More details regarding admission requirements are available from the directors of the graduate centers offering the program.

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin.*

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Last updated by Publications: 12/22/09

Engineering Science and Mechanics (E SC; E MCH)

Program Home Page (Opens New Window)

JUDITH A. TODD, *Head of the Department of Engineering Science and Mechanics*
212 Earth-Engineering Sciences Building
814-863-4586

ALBERT E. SEGALL, *In Charge*
212 Earth-Engineering Sciences Building
814-865-7829

Degrees Conferred:

- Ph.D. in Engineering Science and Mechanics
- M.S. in Engineering Mechanics
- M.S. in Engineering Science
- M.Eng. in Engineering Mechanics
- Integrated Undergraduate/Graduate Study - B.S. in Engineering Science - M.S. in Engineering Science
- Integrated Undergraduate/Graduate Study - B.S. in Engineering Science - M.S. in Engineering Mechanics

The Graduate Faculty

- Dinesh Agrawal, Ph.D. Professor of Engineering Science
- S. Ashok, Ph.D. (Rensselaer) Professor of Engineering Science
- Osama O. Awadelkarim, Ph.D. (Reading, England) Professor of Engineering Science and Mechanics
- Charles Bakis, Ph.D. (Virginia Tech) Distinguished Professor of Engineering Science and Mechanics
- Chantel Binet, Ph.D. (U Québec, Chicoutimi) Research Associate, Center for Innovative Sintered Products
- Jeffrey M. Catchmark, Ph.D. (Lehigh) Research Associate, Penn State Nanofabrication Facility
- Francesco Costanzo, Ph.D. (Texas A&M) Associate Professor of Engineering Science and Mechanics
- Joseph P. Cusumano, Ph.D. (Cornell) Professor of Engineering Science and Mechanics
- Melik C. Demirel, Ph.D. (Carnegie Mellon) Associate Professor of Engineering Science and Mechanics
- Corina Drapaca, Ph.D. (Waterloo, Canada) Assistant Professor of Engineering Science and Mechanics
- Renata S. Engel, Ph.D. (South Florida) Professor of Engineering Graphics, and Engineering Science and Mechanics; Associate Dean for Academic Programs
- Stephen J. Fonash, Ph.D. (Pennsylvania) Bayard D. Kunkle Chair in Engineering; Director, Center for Nanotechnology Education and Utlization
- Bruce J. Gluckman, Ph.D. (Pennsylvania) Associate Professor of Engineering Science and Mechanics, and Neurosurgery
- Gary L. Gray, Ph.D. (Wisconsin, Madison) Associate Professor of Engineering Science and Mechanics
- Robert E. Harbaugh, M.D. (Penn State) Chair, Department of Neurosurgery; Professor of Engineering Science and Mechanics
- S. I. Hayek, Dr.Eng.Sci. (Columbia) Distinguished Professor Emeritus of Engineering Mechanics
- Donald F. Heaney Jr. (Penn State) Research Associate, Center for Innovative Sintered Products; Associate Professor of Engineering Science and Mechanics
- Mark W. Horn, Ph.D. (Penn State) Associate Professor of Engineering Science and Mechanics
- Jun (Tony) Huang, Ph.D. (UCLA) Assistant Professor of Engineering Science and Mechanics
- Kevin L. Koudela, Ph.D. (Penn State) Head, Composites Materials Division, Applied Research Lab
- Akhlesh Lakhtakia, D.Sc. (Banaras Hindu U) Charles Godfrey Binder Professor in Engineering Science and Mechanics
- Michael T. Lanagan, Ph.D. (Penn State) Associate Director, Materials Research Institute; Associate Professor of Engineering Science and Mechanics, and Materials Science and Engineering
- Patrick M. Lenahan, Ph.D. (Illinois) Distinguished Professor of Engineering Science and Mechanics
- Herbert H. Lipowsky, Ph.D. (California, San Diego) Professor of Bioengineering
- Clifford J. Lissenden, Ph.D. (Virginia) Associate Professor of Engineering Science and Mechanics
- Christine B. Masters, Ph.D. (Penn State) Assistant Professor of Engeineering Science and Mechanics
- R. P. McNitt, Ph.D. (Purdue) Professor Emeritus of Engineering Science and Mechanics; Department Head Emeritus
- Robert N. Pangborn, Ph.D. (Rutgers) Professor of Engineering Mechanics; Vice President and Dean for Undergraduate Education
- Andrew Pytel, Ph.D. (Penn State) Professor Emeritus of Engineering Mechanics
- Jean Landa Pytel, Ph.D. (Penn State) Associate Professor of Engineering Mechanics; Assistant Dean, Student Services
- Joseph L. Rose, Ph.D. (Drexel) Paul Morrow Professor of Engineering Science and Mechanics in Design and Manufacturing
- Nicholas J. Salamon, Ph.D. (Northwestern) Professor Emeritus of Engineering Mechanics
- Steven J. Schiff, M.D., Ph.D. (Duke School of Medicine) Brush Chair Professor of Engineering in the Departments of Neurosurgery, Engineering Science and Mechanics, and Physics
- Albert E. Segall (Penn State) Professor of Engineering Science and Mechanics
- Vladimir V. Semak, Ph.D. (Moscow Inst of Physics and Tech) Senior Research Associate; Associate Professor of Engineering Science and Mechanics
- Barbara A. Shaw, Ph.D. (Johns Hopkins) Professor of Engineering Science and Mechanics
- Elzbieta Sikora, Ph.D. (Polish Academy of Science) Research Associate
- Ivica Smid, Ph.D. (U Vienna) Associate Professor of Engineering Science and Mechanics
- Samia A. Suliman, Ph.D. (Penn State) Assistant Professor of Engineering Science and Mechanics
- Bernhard R. Tittmann, Ph.D. (California, Los Angeles) Schell Professor of Engineering Science and Mechanics
- Judith A. Todd, Ph.D. (Cambridge) P. B. Breneman Department Head
- Mirna Urquidi-Macdonald, Ph.D. (U Paris, Sud) Professor of Engineering Science and Mechanics
- Eduard Ventsel, D.Sc. (Moscow Civil Engineering Inst) Professor of Engineering Science and Mechanics
- Jian Xu, Ph.D. (Michigan) Assistant Professor of Engineering Science and Mechanics
- S. Y. Zamrik, Ph.D. (Penn State) Professor Emeritus of Engineering Mechanics
- Sulin Zhang, Ph.D. (Illinois) Assistant Professor of Engineering Science and Mechanics

Opportunity for graduate studies are available in interdisciplinary and multidisciplinary research areas including: biomechanics; composite materials; continuum mechanics; electrical, magnetic, electromagnetic, optical, thermal, and mechanical properties of thin films; experimental mechanics; lithography; MEMS and MOEMS; micromechanics; molecular beam epitaxy; numerical methods; photovoltaic materials and devices; nanotechnology and nanobiotechnology; properties of materials; shock, vibration acoustics and nonlinear dynamics; structural health monitoring; structural mechanics; wave-material interaction; non-destructive evaluation and

testing; and failure analysis.

Admission Requirements

The minimum departmental requirements for admission to graduate standing include a baccalaureate degree from an approved institution, either in an accredited engineering curriculum or in some other program in mathematics, physical science, or engineering science. For regular admission, the student's grade-point average in the junior and senior undergraduate years must be 3.00 or better. Graduate Record Examinations (GRE) Aptitude Test scores must also be submitted. International students are required to submit TOEFL scores as well.

M. Eng. (E MCH) Degree Requirements

At least 30 graduate credits must be earned, of which 22 must be from lecture/laboratory courses approved by the department. Fifteen credits must be earned from E SC/E MCH courses as follows: 3 credits are required in the area of Analysis; 3 credits in the area of Fields; 3 credits in the area of Motion; 3 credits in the areas of Materials Performance/Reliability or Materials Processing/Structure/Characterization; and 3 credits from any one of the four categories. Additionally, 1 credit of graduate seminar (E SC/MCH 514) must be earned. A scholarly written report on a developmental study involving at least one area represented in the course work must be written, for which 3 credits of E SCI/E MCH 596 can be granted. This report must be comparable in the level of work and quality to a graduate thesis. Graduate GPA must be 3.0 or higher after admission and thereafter.

M.S. (E MCH) Degree Requirements

At least 32 graduate credits must be earned, of which 24 credits must be from lecture/laboratory 400- and 500-level courses approved by the department. No more than 6 credits may be earned from 400-level courses. Three credits are required in the area of Analysis; 3 credits in the area of Fields; 3 credits in the area of Motion; and 3 credits in the areas of Materials Performance/Reliability or Materials Processing/Structure/Characterization. Additionally, 2 credits of graduate seminar (E SC/E MCH 514) must be earned. A graduate thesis on an appropriate topic must also be submitted. It must be a well-organized account of research undertaken by the student, and must show initiative and originality. For the work leading to this thesis, 6 credits of E MCH 600 can be granted. Graduate GPA must be 3.0 or higher after admission and thereafter.

M.S. (E SC) Degree Requirements

At least 32 graduate credits must be earned, of which 24 credits must be from lecture/laboratory 400- and 500-level courses approved by the department. No more than 6 credits may be earned from 400-level courses. 6 credits are required in the area of Engineering Analysis; 6 credits in the area of Materials; 6 credits in the area of Basic Sciences; and 6 credits in the areas of Engineering Sciences. Additionally, 2 credits of graduate seminar (E SC/E MCH 514) must be earned. A graduate thesis on an appropriate topic must also be submitted. It must be a well-organized account of research undertaken by the student, and must show initiative and originality. For the work leading to this thesis, 6 credits of E SC 600 can be granted. Graduate GPA must be 3.0 or higher after admission and thereafter.

Ph.D. (ESMCH) Degree Requirements

Students may enter the Ph.D. program after completing an M.S. degree or directly from the B.S. degree. The student must have completed an appropriate M.S. degree prior to admission, or all course work requirements of the B.S. (E SC), M.S. (E SC), or M.S. (E MCH) degree must be satisfied before eligibility for the Ph.D. program can be established. In addition, (1) at least 18 graduate credits must be earned in lecture/laboratory 400- and 500-level courses approved by the department and (2) 3 credits of graduate seminar (E SC/E MCH 514) must be earned beyond the M.S. degree requirements. The student is required to pass a candidacy examination, an English competency examination (non-U.S. students), and a comprehensive examination. A doctoral thesis on an appropriate topic must also be submitted. It must be a well-organized account of research undertaken by the student, and must show initiative and originality. For the work leading to this thesis, 12 credits of E SC/E MCH 600 can be granted. Graduate GPA must be 3.0 or higher after admission and thereafter.

Integrated Undergraduate/Graduate Study - B.S. in Engineering Science - M.S. in Engineering Science

Introduction

The flexibility and strength in fundamentals of the Engineering Science curriculum provides an opportunity for Engineering Science undergraduate students to participate in the ESM Integrated Undergraduate Graduate (IUG) program. Application for IUG status may be made in the fifth or subsequent semesters.

IUG status permits students to take on the rigors and research challenges of graduate study at Penn State, coordinating and combining them with their baccalaureate studies. Because some credits earned as an undergraduate may be applied to both degree programs, the time required for completion of integrated undergraduate/graduate studies is normally less than that required to complete separate degree programs. The actual time required is determined by the individual student's objectives, needs, and diligence.

Integrated Undergraduate/Graduate Study - B.S. in Engineering Science - M.S. in Engineering Mechanics

Engineering Mechanics students, because of the flexibility of the curriculum and their strength in fundamentals, have a unique opportunity to take advantage of the ESM Integrated Undergraduate Graduate (IUG) program. Application for IUG status may be made in the fifth or subsequent semesters.

IUG status permits students to take on the rigors and research challenges of graduate study at Penn State, coordinating and combining them with their baccalaureate studies. Because some credits earned as an undergraduate may be applied to both degree programs, the time required for completion of integrated undergraduate/graduate studies is normally less than that required to complete separate

degree programs. The actual time required is determined by the individual student's objectives, needs, and diligence.

Other Relevant Information

Continuous registration is required for all students until the thesis or engineering report is approved.

Student Aid

Research and Teaching Assistantships (half time) are granted to a majority of graduate students in good academic standing. Financial supported is ordinarily limited to three semesters for full-time master's degree students, and six semesters for full-time Ph.D. students.

In addition to the fellowships, traineeships, graduate assistantships, or other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin,* the following awards typically have been available to graduate students in this program.

THEODORE HOLDEN THOMAS, Jr., MEMORIAL SCHOLARSHIP-Available to undergraduate or graduate students who display outstanding ability and have enrolled in the Department of Engineering Science and Mechanics. Apply to the Department of Engineering Science and Mechanics, 212 Earth-Engineering Sciences Building. Deadline is February 1.

SABIH AND GÜLER HAYEK GRADUATE SCHOLARSHIP IN ENGINEERING SCIENCE AND MECHANICS-Provides recognition and financial assistance to outstanding graduate students enrolled or planning to enroll in the Department of Engineering Science and Mechanics. Apply to the Department of Engineering Science and Mechanics, 211 Earth-Engineering Sciences Building. Deadline is February 1.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ENGINEERING MECHANICS (E MCH) course list

ENGINEERING SCIENCE (E SC) course list

Last Revised by the Department: Summer Session 2005

Blue Sheet Item #: 33-04-270, 33-04-271

Review Date: 1/18/05

Last updated by Publications: 12/22/09

English (ENGL)

Program Home Page

MARK MORRISSON, *Director of Graduate Studies*
136 Burrowes Building
814-863-3069; Fax: 814-863-7285

Degrees Conferred:

Ph.D., M.A., M.F.A.

The Graduate Faculty

- Michael Anesko, Ph.D. (Harvard) *Associate Professor of English and American Studies*
- Robin Becker, M.A. (Boston) *Professor of English and Women's Studies*
- Bernard W. Bell, Ph.D. (Massachusetts) *Professor of English*
- Kevin J. H. Berland, Ph.D. (McMaster) *Associate Professor of English*
- Michael Berube, Ph.D. (Virginia) *Paterno Family Professor of Literature*
- Hester Blum, Ph.D. (University of Pennsylvania) *Assistant Professor of English*
- Robert E. Burkholder, Ph.D. (South Carolina) *Associate Professor of English*
- Athelstan Suresh Canagarajah, Ph.D. (University of Texas at Austin) *Kirby Professor of Language Learning*
- Barbara Cantalupo, A.B. (Rochester) *Associate Professor of English*
- Charles Cantalupo, Ph.D. (Rutgers) *Professor of English, Comparative Literature, and African Studies*
- Robert L. Caserio, Ph.D. (Yale) *Professor of English*
- Christopher Castiglia, Ph.D. (Columbia University) *Professor of English*
- Patrick G. Cheney, Ph.D. (Toronto) *Professor of English*
- Margaret Christian, Ph.D. (California, Los Angeles) *Associate Professor of English*
- William J. Cobb, Ph.D. (Houston) *Associate Professor of English*
- Phyllis B. Cole, Ph.D. (Harvard) *Professor of English*
- Claire M. Colebrook, Ph.D. (University of Edinburgh) *Edwin Erle Sparks Professor of English*
- Mary G. DeJong, Ph.D. (South Carolina) *Associate Professor of English and Women's Studies*
- Richard M. Doyle, Ph.D. (California, Berkeley) *Associate Professor of English*
- Jonathan P. Eburne, Ph.D. (University of Pennsylvania) *Assistant Professor of English*
- Caroline D. Eckhardt, Ph.D. (Michigan) *Professor of English and Comparative Literature; Head, Comparative Literature*
- Robert R. Edwards, Ph.D. (California, Riverside) *Distinguished Professor of English*
- William Ellis, Ph.D. (Ohio State) *Associate Professor of English*
- Richard C. Frushell, Ph.D. (Duquesne) *Professor of English and Comparative Literature*
- Keith Gilyard, Ph.D. (NYU) *Professor of English*
- Cheryl Glenn, Ph.D. (Ohio State) *Associate Professor of English*
- Sean Goudie, Ph.D. (University of California, Berkeley) *Associate Professor of English and Asian Studies*
- Caroline K. B. Hall, Ph.D. (Brown) *Associate Professor of English and American Studies*
- Emily Harrington, Ph.D. (University of Michigan) *Assistant Professor of English*
- John T. Harwood, Ph.D. (Nebraska) *Associate Professor of English; Senior Director of Teaching and Learning with Technology, Information Technology Services*
- Clement Hawes, Ph.D. (Yale) *Associate Professor of English*
- Charlotte Holmes, M.F.A. (Columbia) *Associate Professor of English*
- Evelyn Hovanec, Ph.D. (Pittsburgh) *Associate Professor of English*
- Kathryn Hume, Ph.D. (Pennsylvania) *Distinguished Professor of English*
- Robert D. Hume, Ph.D. (Pennsylvania) *Evan Pugh Professor of English*
- Nicholas A. Joukovsky, D.Phil. (Oxford) *Professor of English*
- Julia Kasdorf, Ph.D. (NYU) *Associate Professor of English*
- Michael Kiernan, Ph.D. (Harvard) *Associate Professor of English*
- Lovalerie King, Ph.D. (university of North Carolina, Chapel Hill) *Assistant Professor of English*
- Laura L. Knoppers, Ph.D. (Harvard) *Professor of English*
- Jeanne E. Krochalis, Ph.D. (Harvard) *Associate Professor of English*
- Brian Lennon, Ph.D. (Columbia University) *Assistant Professor of English and Comparative Literature*
- Robert E. Lougy, Ph.D. (California, Davis) *Associate Professor of English*
- Janet Lyon, Ph.D. (Virginia) *Associate Professor of English*
- Ian Marshall, Ph.D. (Delaware) *Associate Professor of English*
- James E. May, Ph.D. (Maryland) *Associate Professor of English*
- William B. McCarthy, Ph.D. (Indiana) *Professor of English*
- Linda Patterson Miller, Ph.D. (Delaware) *Professor of English*
- Shirley Moody, Ph.D. (University of Maryland) *Assistant Professor of English*
- Mark Morrisson, Ph.D. (Chicago) *Associate Professor of English*
- J. Philip Mosley, Ph.D. (East Anglia) *Associate Professor of English and Comparative Literature*
- Carla J. Mulford, Ph.D. (Delaware) *Associate Professor of English*
- Leonard Mustazza, Ph.D. (SUNY) *Professor of English*
- Jeffrey Nealon, Ph.D. (Loyola) *Professor of English*
- Aldon Nielsen, Ph.D. (George Washington) *George and Barbara Kelly Professor of English*
- Marcy North, Ph.D. (University of Michigan) *Associate Professor of English*
- Josip Novakovich, M.A. (Texas at Austin) *Associate Professor of English*
- Jon Olson, Ph.D. (USC) *Assistant Professor of Writing*
- Paul Orlov, Ph.D. (Toronto) *Associate Professor of English*
- Iyunolu F. Osagie, Ph.D. (Cornell) *Associate Professor of English*
- Beverly Peterson, Ph.D. (William and Mary) *Assistant Professor of English*
- R. Alan Price, Ph.D. (Rochester) *Associate Professor of English*
- Steven D. Putzel, Ph.D. (Toronto) *Associate Professor of English*
- Christopher Reed, Ph.D. (Yale University) *Associate Professor of English and Visual Culture*
- Mike Riley, Ph.D. (Ohio) *Associate Professor of English*
- Benjamin Schreier, Ph.D. (Brandeis University) *Assistant Professor English and Jewish Studies*

- Robin G. Schulze, Ph.D. (Michigan) *Professor of English*
- Sanford Schwartz, Ph.D. (Princeton) *Associate Professor of English*
- Stuart Selber, Ph.D. (Michigan Tech U) *Associate Professor of English*
- John L. Selzer, Ph.D. (Miami) *Professor of English*
- Linda Selzer, Ph.D. (The Pennsylvania State University) *Assistant Professor of English and American Studies*
- Gayle L. Smith, Ph.D. (Massachusetts) *Associate Professor of English*
- James F. Smith, Ph.D. (Penn State) *Professor of English*
- Scott Smith, Ph.D. (University of Notre Dame) *Assistant Professor of English and Comparative Literature*
- Thomas Smith, Ph.D. (Rutgers) *Assistant Professor of English*
- Adam J. Sorkin, Ph.D. (North Carolina) *Distinguished Professor of English*
- Sandra Spanier, Ph.D. (Penn State) *Professor of English and Women's Studies*
- Susan Squier, Ph.D. (Stanford) *Julia Gregg Brill Professor of English and Women's Studies*
- Ryan Stark, Ph.D. (Texas Christian University) *Assistant Professor of English*
- Lisa Sternlieb, Ph.D. (Princeton University) *Associate Professor of English*
- Suzanne Stutman, Ph.D. (Temple) *Professor of English*
- Garrett Sullivan, Ph.D. (Brown) *Associate Professor of English*
- Toby Thompson, M.A. (Virginia) *Associate Professor of English*
- Tramble Turner, Ph.D. (North Carolina) *Associate Professor of English*
- Anthony Vallone, M.F.A. (Indiana) *Associate Professor of English*
- James L. W. West III, Ph.D. (South Carolina) *Edwin Erle Sparks Professor of English*
- Linda Woodbridge, Ph.D. (UCLA) *Distinguished Professor of English*
- Xiaoye You, Ph.D. (Purdue University) *Assistant Professor of English and Asian Studies*
- Paul Youngquist, Ph.D. (Virginia) *Professor of English*

Candidates for the M.A., M.F.A., and Ph.D. in English may choose from a variety of courses in English literature and language, rhetoric and composition, and theory/cultural studies. The M.F.A. in English helps prepare candidates for professional careers as writers of fiction, poetry, or nonfiction, or for careers in academia.

The department offers a strong college-level teacher-training program, and most graduate students in English have the opportunity to serve as teaching assistants. Students usually begin by teaching basic composition courses, but there are opportunities for advanced students to teach courses in business writing, technical writing, fiction writing, poetry writing, literature, and humanities, and to serve as tutors in the Writing Center.

Admission Requirements

Requirements listed in this section are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

English Proficiency--The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test; or a minimum composite score of 6.5 on the IELTS.

Applicants should have a junior/senior grade-point average of 3.50 (on a 4.00 scale), although exceptions may be made for students with special backgrounds, abilities, and interests. Scores from the Graduate Record Examinations (GRE) Aptitude Tests (verbal and quantitative) are required for admission. Applicants must also submit three letters of recommendation, a writing sample indicating their ability to do analytical or original work, and a statement of their professional goals.

For admission, M.A. students should have strong backgrounds in English courses: 18 credits beyond freshman composition are a minimum, but the department prefers at least 24 credits.

For admission into the M.F.A. program, students must have a baccalaureate degree (with substantial work in English), a portfolio of publishable student writing, and the intention to pursue a career as a professional writer.

To be considered for the doctoral program, students must have completed an M.A. in English, M.F.A. or its equivalent. The records of potential students should indicate promise of superior work in doctoral study.

Master's Degree Requirements

Candidates for the M.A. take at least 30 credits of course work. M.A. candidates must fulfill the language requirement in one foreign language. All master's candidates are required to take ENGL 501, one course in literary or rhetorical theory, two courses in periods prior to 1800, and two courses in periods after 1800. Students are also required to complete a Writing Project that will demonstrate mastery of the field.

For admission into the M.F.A. program, students must have a baccalaureate degree (with substantial work in English), a portfolio of publishable student writing, and the intention to pursue a career as a professional writer.

M.F.A. candidates are required to take 42 credits, distributed as follows:

- 3 credits ENGL 501
- 12 credits in ENGL 512, ENGL 513, or ENGL 515, at least 9 of which must be in the student's area of specialization (ENGL 512, 513, and 515 can be repeated for credit)
- 12 credits in ENGL 596 for the final project, or at least 6 credits of ENGL 596 and 6 credits of English Department graduate seminars
- 3 credits in electives (400 or 500-level courses)
- 12 credits in literature at the 500 level
- Candidates will complete a book-length manuscript of publishable quality in their area of specialization.

Doctoral Degree Requirements

The Ph.D. degree does not require a specific number of credits although all candidates are required to have completed English 501 (or the equivalent), one course in rhetoric or theory, two courses in periods before 1800, and two in periods after 1800. With the help of departmental graduate advisers, students select a program of seminars or reading courses. To complete their programs, students must show reading proficiency in one foreign language, pass written comprehensive examinations, and write and defend a doctoral dissertation.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

EDWIN ERLE SPARKS FELLOWSHIPS IN THE HUMANITIES (8)

Available to beginning and continuing graduate students in one of the following graduate programs: Comparative Literature, English, French, German, History, Linguistics, Philosophy, Spanish, and Speech Communication; stipend $12,560 plus waiver of tuition. Apply to department before February 1.

KATEY LEHMAN FELLOWSHIP

Provides approximately $13,000 plus tuition for a year's study in poetry or fiction writing leading toward an M.F.A. in English. The Lehman Fellow will teach one course during the fellowship year. Fellowship holders are eligible for graduate assistantships with a similar stipend and tuition grant during the second year of study.

WILMA EBBITT AWARD

Funding to support research in rhetoric. Number and amount of awards to be determined.

BEN EUWEMA MEMORIAL SCHOLARSHIP

Travel funding for graduate degree candidates; consideration will be given to all currently enrolled graduate students in English. Preference will be given to students at the Ph.D. thesis stage, particularly those who need to travel to complete their research; number of awards and amount of each will be determined each year.

FOLGER INSTITUTE FELLOWSHIPS

Penn State is a member of the Folger Institute of Renaissance and Eighteenth-Century Studies. Graduate students in English are eligible for Folger Institute Fellowship to study in seminars and workshops at the Folger Library, Washington, D.C.

PHILIP YOUNG MEMORIAL AWARD

Funding to support research in American Literature. Number and amount of awards will be determined.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ENGLISH (ENGL) course list

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 37-07-030

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Date last reviewed by Publications: 7/9/07 (link check)

Entomology (ENT)

Program Home Page (Opens New Window)

GARY W. FELTON, *Head of the Department*
501 Agricultural Sciences and Industries Building
814-863-7789

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Tom Baker, Ph.D. (Michigan State) Professor of Entomology
- Mary E. Barbercheck, Ph.D. (California, Davis) Professor of Entomology
- Ottar N. Bjornstad, Ph.D. (Oslo) Associate Professor of Entomology
- Dennis D. Calvin, Ph.D. (Kansas State) Professor of Entomology
- Diana Cox-Foster, Ph.D. (Illinois) Professor of Entomology
- Liwang Cui, Ph.D. (Kentucky) Professor of Entomology
- Consuelo M. De Moraes, Ph.D. (Georgia) Assistant Professor of Entomology
- Gary W. Felton, Ph.D. (California, Davis) Professor of Entomology
- Shelby J. Fleischer, Ph.D. (Auburn) Professor of Entomology
- James L. Frazier, Ph.D. (Ohio) Professor of Entomology
- Christina Grozinger, Ph.D. (Harvard) Associate Professor of Entomology
- Paul R. Heller, Ph.D. (Ohio State) Professor of Entomology
- Kelli Hoover, Ph.D. (California, Davis) Associate Professor of Entomology
- Larry A. Hull, Ph.D. (Penn State) Professor of Entomology
- Ke Chung Kim, Ph.D. (Minnesota) Professor Emeritus of Entomology
- George Krawczyk, Ph.D. (Michigan State) Research Associate
- Bruce A. McPheron, Ph.D. (Illinois) Professor of Entomology
- Mark Mescher, Ph.D. (U of Georgia) Assistant Professor of Entomology
- Christopher A. Mullin, Ph.D. (Cornell) Professor of Entomology
- Nancy Ostiguy, Ph.D. (Cornell) Associate Professor of Entomology
- Edwin G. Rajotte, Ph.D. (Rutgers) Professor of Entomology
- Andrew Read, Ph.D. (Oxford, UK) Professor of Biology and Entomology, Eberly College of Science Distinguished Senior Scholar
- Michael C. Saunders, Ph.D. (Georgia) Professor of Entomology
- Matthew Thomas, Ph.D. (U of Southampton, UK) Professor of Entomology
- Jim Tumlinson, Ph.D. (Mississippi State) Professor of Entomology, Ralph O. Mumma Endowed Professor of Chemical Ecology

Graduate study in the Entomology program seeks to develop students to assume leadership roles in science upon graduation. Students are encouraged to write research proposals, give professional presentations, and publish research articles. Emphasis is placed upon the professional development of the student. Part of the student's training is participation in professional development activities. These are selected by the student from course preparation/delivery, experience in insect identification clinics, experience in museum collection, preparation of multimedia educational materials, and entrepreneurial activities. Students are able to specialize in the research program areas of insect-plant interactions, environmental and developmental regulation of genes, artificial intelligence and modeling, population biology, ecology and biodiversity, integrated pest management, and environmental quality and application technology. Additional specialization is available to students performing research with insects in the intercollege degree programs in genetics, ecology, and plant physiology.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

For admission a student should have a strong background in biological sciences. Courses in chemistry through organic, physics, mathematics through calculus, statistics, and computer application are recommended.

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. Specific graduate programs may have more stringent requirements.

Master's Degree Requirements

The master of science degree in Entomology is an intermediate degree leading toward the development of special knowledge in entomology. It provides training for prospective doctoral candidates. A minimum of 30 graduate credits (400 and 500 level) are required, with at least 20 credits earned in residence. At least 18 credits in the 500 and 600 series must be included in the program. A minimum of 12 credits in coursework (400 and 500) must be completed in the major program.

The program requires all students to take (or have the equivalent of) ENT 410, 412, and 457, Professional Development and Ethics, Insect Ecology, Natural History, Insect Genomics, Proteomics, and Bioinformatics, and a minimum of 3 credits of statistics. Additional courses may be selected by the student in consultation with his/her graduate committee. Each student must present the results of thesis research at a departmental seminar, and the student may register for 1 credit of ENT 590 that semester. A thesis equivalent to 6 credits (ENT 600) is required. A final oral examination covering the general field of entomology, with emphasis in the student's area of specialization, is required by the department. This is to be administered by the student's committee. A favorable vote of a two-thirds majority is necessary for passing.

The Thesis Guide is available electronically, visit www.etd.psu.edu.

Doctoral Degree Requirements

The degree of doctor of philosophy signifies high scholastic achievement and demonstrated capability in independent research. Although there is no formal credit requirement, it will normally require at least three years of graduate work. Some of the work may be completed off campus or on a part-time basis, but between the time of acceptance as a candidate and completing the degree requirements the student must spend two academic sessions in residence within a twelve-month period. The department requires that all students have ENT 410, 412, and 457, Professional Development and Ethics, Insect Ecology, Natural History, Insect Genomics, Proteomics, and Bioinformatics, or their equivalent. Other course requirements are dependent on the student's program of study. The results of the dissertation research must be presented at a departmental seminar. In addition, students must take and pass a comprehensive and final oral examination. A minor is not required, but a student may elect a minor in general studies or a related field. This consists of no fewer than 15 credits.

There is no foreign language requirement for the Ph.D. degree. However, depending on the nature of the thesis research and with the advice and consent of the Doctoral Committee, competency in a foreign language may be required as a part of the doctoral studies of certain students.

Students are not formally admitted to the doctoral candidacy until they have passed a candidacy examination. A favorable vote by two-thirds of the committee members is necessary for acceptance of a candidate.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Dual-Title Graduate Degree in Entomology (ENT) and Comparative and International Education (CI ED)

Graduate student with research and educational interests in international education may apply to the Entomology/CI ED Dual-Title Degree Program. The goal of the dual-title degree Entomology and CI ED graduate program is to enable graduate students from Entomology to acquire the knowledge and skill of their primary area of specialization in Entomology, while at the same time gaining the perspective and methods of comparative and international education.Graduate Dual-Title degree program in Entomology and CI ED study in this program seeks to prepare students to assume leadership roles in science, science education, outreach, and project management anywhere in the world. Students are required to write research proposals and expected to write grants to support their research activities, reflecting the dual-title degree. As part of their professional development, presentations, publication of research articles, and active participation in professional societies is expected. Emphasis is placed upon the professional development of the student. Students are able to specialize in the research program areas of chemical ecology, disease ecology and biology, ecology, genomics and pest management. Additional specialization is available to students performing research with insects in the inter-college degree programs in genetics, ecology, and plant biology. At the same time they will acquire a broad perspective about how to apply their research findings in the context of the broader international community. Thus, the dual-title will allow students to master their field of specialization from an international perspective so that they can compare practices and outcomes between countries and regions.

This dual-title graduate degree program does not duplicate any other degree program at the University.

Admission Requirements

For admission to the dual-title degree under this program, a student must first apply and be admitted to the Entomology graduate program. Once accepted into the Entomology program, the student can apply to the Admissions Committee on the Comparative and International Education program. The CI ED admissions committee reviews applications and recommends students for admission to the dual-title degree program to the Graduate School. Scores from the Graduate Records Examinations (GRE) are required for admission. In addition, students are to provide a written personal statement indicating the career goals they hope to accomplish by earning a dual-title Entomology/CI ED degree. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Degree Requirements

To qualify for a dual-title degree, students must satisfy the requirements of the Entomology program in which they are primarily enrolled. In addition, they must satisfy the requirements described below, as established by the CI ED program committee. Within this framework, final course selection is determined by the student, their CI ED adviser, and their Entomology program adviser.

Upon a student's acceptance by the CI ED admissions committee, the student will be assigned a CI ED academic adviser in consultation with the CI ED program chair. As students develop specific scholarly interests, they may request that a different CI ED faculty member serve as their adviser. The student and adviser will discuss a program of study that is appropriate for the student's professional objectives and that is in accord with the policies of The Graduate School, the Entomology program and the CI ED program.

Requirements for Entomology/CI ED Dual-Title M.S.

The master's in Entomology and CI ED is a dual-title degree awarded only to students who are admitted to the Entomology master's program and admitted to the dual-title degree in CI ED. In addition to the requirements for the Entomology degree, dual-title students must:

Complete a minimum of 12 CI ED credits with study in the following curriculum categories:
3 credits, CI ED Proseminar (CI ED 500)
6 credits, advanced comparative and international education content courses
3 credits, advanced or focused comparative and international education content courses
Write a master's thesis on a topic that reflects both the graduate program in Entomology and the dual-title offering in Comparative and International Education.

The thesis committee for the dual-title M.S. degree will consist of two graduate faculty members from Entomology and one graduate

faculty member from CI ED.

Candidates for the dual-title master's degree in Entomology and CI ED will also be required to pass a final oral examination covering the general field of Entomology and CI ED , with emphasis on the student's area of specialization. The oral exam (thesis defense) is to be administered by the student's thesis committee. A favorable vote of a two-thirds majority is necessary for passing.

Some courses may satisfy both the graduate primary program requirements and those of the CI ED program. Final course selection is determined by the students in consultation with their CI ED advisers and their major program advisers. Students and advisers should maintain the CI ED Master's Degree Plan of Study, which must be submitted to the CI ED program office two months before the student files the "Intent to Graduate" via eLion.

Requirements for the Entomology/CI ED Dual-Title Ph.D.

The doctoral degree in Entomology and CI ED is a dual-title degree awarded only to students who are admitted to the Entomology doctoral program and admitted to the dual-title degree in CI ED. The minimum course requirements for the dual-title Ph.D. degree in Entomology and CI ED, in addition to the Entomology Department requirements, are as follows:

Complete a minimum of 27 graduate credits
3 credits of Proseminar in Comparative and International Education (CI ED500);
6 credits in advanced-Comparative and International Education courses;
12 credits in Comparative and International Education content courses or courses with comparative or international content;
6 credits in research methods.

A minimum of 18 of the 27 credits must be taken at the 500-level, and particular courses may satisfy both the Entomology Department requirements and those in the Comparative and International Education program. Final course selection is determined by the student in consultation with their CI ED advisers and their major program advisers. Students who already hold a master's degree from another institution may petition to have equivalent course credits accepted.

Ph.D. Minor in CI ED

A Ph.D. (or D.Ed.) minor program in Comparative and International Education is available to doctoral students who find it desirable to include the perspectives and methodologies of Comparative and International Education in the Entomology program and have been approved to do so by their doctoral committees. To qualify for a minor in Comparative and International Education, students must satisfy the requirements of the Entomology Department, and meet the following minimum requirements:

3 credits in the Proseminar in Comparative and International Educations (CI ED 500);
3 credits in a Comparative and International Education courses;
9 credits in Comparative and International Education content courses (or advanced courses) or in courses with comparative or international content outside the College of Education.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ENTOMOLOGY (ENT) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/12/04

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Blue Sheet Item #: 37-07-031

Review Date: 06/16/2009

Last updated by Publications: 10/27/06

Environmental Engineering (ENV E)

Program Home Page (Opens New Window)

PEGGY JOHNSON, *Professor and Head of the Department of Civil and Environmental Engineering*
212 Sackett Building
814-863-3085

Degrees Conferred:

Ph.D., M.S., M.Eng.

The Graduate Faculty

- Rachel A. Brennan, Ph.D. (Illinois, Urbana-Champaign) Assistant Professor of Civil Engineering
- William D. Burgos, Ph.D. (Virginia Tech) Associate Professor of Environmental Engineering
- Fred S. Cannon, Ph.D. (Illinois, Urbana-Champaign) P.E. Associate Professor of Environmental Engineering
- Brian A. Dempsey, Ph.D. (North Carolina) Professor of Environmental Engineering
- Christopher J. Duffy, Ph.D. (New Mexico Institute of Mining and Technology) P.H. Professor of Civil Engineering
- Peggy A. Johnson, Ph.D. (Maryland) Professor of Civil Engineering
- Bruce E. Logan, Ph.D. (California, Berkeley) Kappe Professor of Environmental Engineering
- Jack V. Matson, Ph.D. (Rice) P.E. Professor of Environmental Engineering
- Arthur C. Miller, Ph.D. (Colorado State) P.E., P.L.S. Professor of Civil Engineering
- Raymond W. Regan, Sr., Ph.D. (Kansas) P.E. Professor of Environmental Engineering

This specialty prepares students for careers in the design of treatment facilities, environmental monitoring, process development for water quality control, industrial waste treatment, management of hazardous and toxic substances, monitoring and management of environmental quality, air pollution control, and water resource systems.

Admission Requirements

The requirements listed here are in addition to the general requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Candidates should possess a baccalaureate degree from a regionally accredited institution. Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and appropriate course backgrounds may be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

International applicants must submit OFFICIAL transcripts, degree, and diploma certificates in both English and their native language. These documents must contain the “red stamp” or have the raised notary stamp. Photocopies will NOT be accepted. Applicants must provide the department with official transcripts of all of their previous course work (in duplicate), a statement of objectives, and three letters of recommendation AT THE TIME OF APPLICATION. Résumés are encouraged, but not required. In addition, all applicants must submit scores from the General Graduate Record Examination Aptitude Test (verbal, quantitative, and analytical).

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the internet-based test. The minimum composite score for the IELTS is 6.5. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a masters degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British west Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, The United States, and Wales.

Applicants for fall admission who wish to be considered for financial aid should have COMPLETED applications on file by DECEMBER 1 of the preceding year.

Degree Requirements

The M.Eng. degree is a nonthesis professional master's degree. The program provides training for advanced professional practice. A minimum of 30 graduate credits (400 level and above) of course work and a writing portfolio are required. It should be noted that 20 credits must be earned at an established graduate campus of the University. At least 15 credits must be earned in graduate courses (500 level). Students are no permitted to count audited credits toward the minimum credits required for the degree. The writing portfolio may consist of the following types of writing samples: a semester paper, a report that documents a semester design project, an applied research paper, or professional papers. The writing sample must demonstrate in-depth knowledge of an engineering topic presented in a format typical of professional practice.

The M.S. degree program is strongly oriented toward research. A minimum of 30 graduate credits (400 level and above) is required, of which 20 must be earned at an established graduate campus of the University. At least 18 credits in the 500 and 600 series, combined, must be included in the program. A minimum of 12 credits of course work (400 and 500 level), as contrasted with research, must be completed in the major (courses prefixed C E). Students are not permitted to count audited credits toward the minimum credits required for the degree. A thesis is required, and at least 6 credits of thesis research (C E 600 or 610) must be included in the candidate's academic course plan.

A minimum of 24 credits of graduate course work (400 level and above) is required beyond the master's degree. A candidate for the Ph.D. degree must pass the English proficiency and candidacy examinations, prepare and defend the thesis proposal as part of the oral comprehensive examination, and pass the final oral examination (thesis defense). In addition, Ph.D. candidates must satisfy the University residency requirement by registering for two consecutive semesters as a full-time student.

Continuous registration is required for all graduate students until the thesis or writing portfolio has been approved.

Biogeochemistry Dual-Title Degree Program

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree

Program. Students in the Biogeochemistry Dual Title program are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. Additional coursework from an approved list of courses is required. All students must pass a candidacy examination that includes an assessment of their potential in the field of biogeochemistry. A single candidacy examination that includes biogeochemistry will be administered for admission into the student's Ph.D. program, as well as the biogeochemistry dual-title. The structure and timing of this exam will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise in biogeochemistry. The field of biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of biogeochemistry is required.

Other Relevant Information

The following courses offered by the Department of Civil and Environmental Engineering are appropriate for students majoring in Environmental Engineering (course descriptions are given under Civil Engineering); C E 462, 465W, 472W, 475, 476, 479, 496, 497, 551, 555, 556, 561, 564, 566, 567, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 596, 597, and 598. Appropriate courses offered by other departments include, but are not limited to: B M B 401, 402; CHEM 406; GEOSC 452; M E 405, 470, 521; METEO 454; MICRB 400; NUC E 420.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. International applicants who wish to be considered for a teaching assistantship must present an acceptable score (250-300 or 55-60) on the Test of Spoken English (TSE). The TSE can be taken in many countries, or at Penn State after arrival.

CECIL M. PEPPERMAN MEMORIAL GRADUATE FELLOWSHIP
Available to a graduate student in civil or environmental engineering specializing in one of the following fields, listed in order of priority: waste treatment and management, water pollution control, environmental engineering, or related fields.

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/3/04

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-06-185C

Review Date: 4/15/08

UCA Revision #1: 8/4/06

Last updated by Publications: 7/1/05

Environmental Engineering (ENVE)

THOMAS H. EBERLEIN, *Coordinator, Environmental Programs*
Penn State Harrisburg
TL 177 Science and Technology Building
777 W. Harrisburg Pike
Middletown, PA 17057-4898

www.hbg.psu.edu (Opens New Window)

Degree Conferred:

M.Eng.

The Graduate Faculty:

- Katherine A. Baker, Ph.D. (Delaware) Associate Professor of Environmental Microbiology
- Yen-Chih (David) Chen, Ph.D. (Purdue) Assistant Professor of Environmental Engineering
- Balwant Chohan, Ph.D. (Massachusetts) Assistant Professor of Chemistry
- Shirley Clark, Ph.D. (Alabama, Birmingham) Assistant Professor of Environmental Engineering
- Sairam Rudrabhatla, Ph.D. (Osmania, India) Assistant Professor of Biology
- Howard G. Sachs, Ph.D. (Clark) Professor of Biology
- Yuefeng Xie, Ph.D. (Tsinghua) Associate Professor of Environmental Engineering

This program, offered at the Harrisburg campus, is intended for the engineer who desires a part-time graduate environmental engineering program. Prospective students who do not have an undergraduate engineering degree, but rather hold a baccalaureate degree in a related scientific field (such as chemistry, microbiology, environmental science) may be admitted to the program but may need to take some prerequisite undergraduate engineering courses. This degree program complements the Environmental Pollution Control graduate programs (M.E.P.C. and M.S. in EPC) offered by the same faculty.

A variety of civil and environmental engineering courses are regularly offered, as well as specialty courses in environmental policy, other engineering areas, computer science, and other policy-related areas.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin.*

Applicants are strongly encouraged to present an undergraduate degree in engineering from an accredited program. However, those who possess an undergraduate degree in a related scientific field may be considered for admission; those students will need to take additional engineering courses in order to be adequately prepared.

All students are expected to have an undergraduate junior/senior grade-point average of 3.0 on a 4.0-point system. Exceptions to this minimum may be made for students with special backgrounds or abilities, or other qualifications.

All applicants must provide two copies of all official transcripts of all their previous course work. In addition, applicants must supply a statement of objectives and three letters of recommendation.

For those students for whom English is not their native language, scores on the Test of English as a Foreign Language (TOEFL) are required; an acceptable score of 560 on the paper-based version or 220 on the computer-based test is required.

International applicants should be aware that processing of transcripts and other application-related information may take considerable time. Applicants must ensure that materials arrive at least three months prior to the start of the semester they first intend to begin studies.

Degree Requirements

A minimum of 30 credits is required for the degree. All candidates are required to take a core course in each of the four environmental areas: air, water, solid waste management, and policy/risk. The program suggests that students take the following courses to meet the first three area requirements:

MECHANICAL ENGINEERING (M E)

- M E 433 Air Pollution Control (3)

CIVIL ENGINEERING (C E)

- CE 472 Water Pollution Control (3)
- CE 476 Solid Waste Management (3)

The college regularly offers several courses that meet the policy/risk area requirement, including:
ENVE 487 Environmental Law, ENVE 569 Environmental Risk Assessment, and P ADM 531 Environmental Policy.

Courses in the degree program may be taken at the 400 or 500 level, but a minimum of 18 credits must be at the 500 level. All students must take at least 1 credit of EPC 590 Seminar and complete a scholarly master's paper. The seminar and the paper count toward the 500-level requirement. All students must complete a total of 30 credits in order to earn the degree.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A

graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

CIVIL ENGINEERING (C E) course list

CIVIL ENGINEERING (C ENG) course list

ENVIRONMENTAL ENGINEERING (ENVE) course list

MECHANICAL ENGINEERING (M E) course list

Last Revised by the Department: Summer Session 2003

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Environmental Pollution Control (E P C)

Program Home Page (Opens New Window)

THOMAS EBERLEIN, *Coordinator*
TL177 Science and Technology Building
Penn State Harrisburg
717-948-6358

Degrees Conferred:

M.S., M.E.P.C. (Penn State Harrisburg, Penn State University Park)

The Graduate Faculty--Penn State Harrisburg

- Katherine H. Baker, Ph.D. (Delaware) *Associate Professor of Environmental Microbiology*
- Melvin Blumberg, Ph.D. (Penn State) *Professor of Management*
- Yen-Chih (David) Chen, Ph.D. (Purdue) *Assistant Professor of Environmental Engineering*
- Balwant Chohan, Ph.D. (Massachusetts) *Assistant Professor of Chemistry*
- Beverly A. Cigler, Ph.D. (Penn State) *Professor of Public Administration and Public Policy*
- Robert F. Munzenrider, Ph.D. (Georgia) *Associate Professor of Public Administration*
- Sairam Rudrabhatla (Osmania, India) *Assistant Professor of Biology*
- Howard G. Sachs, Ph.D. (Clark) *Professor of Biology*
- Yuefeng Xie, Ph.D. (Tshinghua) *Associate Professor of Environmental Engineering*

The Graduate Faculty--Penn State University Park

- David G. Abler, Ph.D. (Chicago) *Professor of Agricultural Economics and Demography*
- Michael A. Adewumi, Ph.D. (Illinois Institute of Tech) *Professor of Petroleum and Natural Gas Engineering*
- Christopher J. Bise, Ph.D. (Penn State) *Centennial Professor of Mining Engineering*
- Andre L. Boehman, Ph.D. (Stanford) *Associate Professor of Fuel Science*
- William H. Brune, Ph.D. (Johns Hopkins) *Professor of Meteorology*
- Fred S. Cannon, Ph.D. (Illinois, Urbana-Champaign) *Associate Professor of Civil and Environmental Engineering*
- Hunter Carrick, Ph.D. (Michigan) *Assistant Professor of Aquatic Ecology*
- Rick L. Day, Ph.D. (Penn State) *Assistant Professor of Soil Science and Environmental Information Systems*
- Jerzy Dec, Ph.D. (Inst of Organic Industry, Poland) *Research Associate in Soil Biochemistry*
- Brian A. Dempsey, Ph.D. (North Carolina) *Professor of Environmental Engineering*
- David R. DeWalle, Ph.D. (Colorado State) *Professor of Forest Hydrology*
- Herschel A. Elliott, Ph.D. (Delaware) *P.E. Professor of Agricultural Engineering*
- Derek Elsworth, Ph.D. (California, Berkeley) *Professor of Geo-Environmental Engineering*
- Ann N. Fisher, Ph.D. (Connecticut) *Professor of Agricultural and Environmental Economics*
- Richard L. Gordon, Ph.D. (MIT) *Professor of Mineral Economics*
- William A. Groves, Ph.D. (Michigan) *Assistant Professor of Industrial Health and Safety*
- Michael W. Grutzeck, Ph.D. (Penn State) *Senior Research Associate and Associate Professor of Materials*
- James M. Hamlett, Ph.D. (Iowa State) *Associate Professor of Agricultural Engineering*
- Albert R. Jarrett, Ph.D. (Penn State) *P.E. Professor of Agricultural Engineering*
- Dennis Lamb, Ph.D. (Washington) *Professor of Meteorology*
- Hangsheng Lin, Ph.D. (Texas A&M) *Assistant Professor of Hydropedology/Soil Hydrology*
- James A. Lynch, Ph.D. (Penn State) *Professor of Forest Hydrology*
- Jack V. Matson, Ph.D. (Rice) *P.E. Professor of Civil Engineering*
- Arthur C. Miller, Ph.D. (Colorado State) *P.E.. P.L.S. Professor of Civil Engineering*
- Dennis J. Murphy, Ph.D. (Penn State) *C.S.P. Professor of Agricultural Engineering*
- Richard R. Parizek, Ph.D. (Illinois) *Professor of Geology*
- Gary W. Petersen, Ph.D. (Wisconsin) *Distinguished Professor of Soil and Land Resources*
- Sarma V. Pisupati, Ph.D. (Penn State) *Assistant Professor of Fuel Science*
- Raymond W. Regan, Sr., Ph.D. (Kansas) *P.E. Professor of Environmental Engineering*
- Paul D. Robillard, Ph.D. (Cornell) *Associate Professor of Agricultural Engineering*
- Adam Z. Rose, Ph.D. (Cornell) *Professor of Energy, Environmental, and Mineral Economics*
- Barry F. Scheetz, Ph.D. (Penn State) *Senior Scientist and Professor of Materials*
- Robert D. Shannon, Ph.D. (Indiana) *Associate Professor of Agricultural Engineering*
- William E. Sharpe, Ph.D. (West Virginia) *Professor of Forest Hydrology*
- James Shortle, Ph.D. (Iowa State) *Professor of Agricultural Economics*
- John M. Skelly, Ph.D. (Penn State) *Professor of Plant Pathology*
- Dennis W. Thomson, Ph.D. (Wisconsin) *Professor of Meteorology*
- David G. Wagner, Ph.D. (Colorado State) *Assistant Professor and Extension Specialist for Precision Agriculture*
- Grace A. Wang, Ph.D. (Minnesota) *Assistant Professor of Natural Resource Policy*
- John C. Wyngaard, Ph.D. (Penn State) *Professor of Meteorology*

This intercollege master's degree program, available at Penn State Harrisburg and Penn State University Park, deals with the various aspects of air, land, and water pollution control. Graduate instruction is under the direction of an interdisciplinary faculty committee and the departments participating in the program. The EPC faculty have teaching and research interests in the area of environmental pollution control, and where projects are being funded, support opportunities may be available. Currently, faculty from sixteen departments in four colleges are participating in the program at University Park and faculty from four graduate programs participate at Penn State Harrisburg. A student is affiliated with one of these departments on the basis of his/her specific area of interest and is advised by an EPC faculty member in that department. Maximum flexibility is maintained by the program in an effort to meet both the needs of the individual student and the pollution control activity in which he/she wants to participate.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad*

Graduate Bulletin.

The EPC program is designed for students with backgrounds in science or engineering. Admission will be granted if the applicant has the necessary program prerequisites and a faculty member in the student's interest area agrees to serve as adviser. Normal admission requirements include mathematics through integral calculus plus two courses each in both general chemistry and physics.

Students with a 3.00 junior/senior average and with appropriate backgrounds in mathematics and science will be considered for admission. The best-qualified applicants will be admitted up to the number of places that are available for new students. Applicants to the Environmental Pollution Control program are required to provide a statement of objectives, three letters of recommendation, and scores from the Graduate Record Examination (GRE) Aptitude Test (verbal, quantitative, analytical) to complete the admission process. Entering graduate students for whom English is not their first language are required to have a score of at least 560 on the TOEFL (Test of English as a Foreign Language) examination. There is no foreign language requirement.

Degree Requirements

All candidates are required to take a core course in each of four environmental areas--air, water, solid waste, hazardous waste management, and policy/risk--and 1 credit of the E P C 590 seminar for a minimum core requirement of 12 credits. All but 6 of the total 30 credits required must be selected from a recommended course list. If the option to prepare a thesis is selected (M.S. only), students must schedule at least 12 credits at the 500 level, take at least 6 credits of 600-level thesis research in their thesis adviser's academic department, and write a thesis on an area concerned with environmental pollution. Only 6 credits of 600-level course work may count toward the 30-credit minimum degree requirement. Students who select the nonthesis option must schedule at least 18 credits at the 500 level, which may include 1 credit of E P C 590 and a maximum of 3 paper-writing credits. The M.E.P.C. E P C degree require submission of a scholarly master's paper.

Watershed Stewardship Option

The Graduate Option in Watershed Stewardship is a graduate option intended to provide enhanced educational opportunities for students with an interest in water resources management who are enrolled in a graduate degree program within Environmental Pollution Control at the University Park campus. The objective of the Graduate Option in Watershed Stewardship is to educate students to facilitate team-oriented, community-based watershed management planning directed at natural resources conservation and environmental problems encountered in Pennsylvania communities, especially non-point source water pollution. The Graduate Option in Watershed Stewardship requires 22 credits of graduate coursework: 12 credits of breadth courses, 2 credits of Watershed Stewardship Seminar courses (FOR 591A and FOR 591B or LARCH 510.2), and 8 credits of Watershed Stewardship Practicum I and II courses (FOR 570 and FOR 571 or LARCH 540.2 and LARCH 550.2). Breadth courses will consist of three graduate credits of coursework from each of four subject matter areas: 1) water resources science, 2) social science, public policy and economics, 3) humanities, and 4) communications and design. In the watershed stewardship practicum courses students work in teams with community, government and business leaders to analyze and understand natural resources and environmental pollution problems and creatively synthesize appropriate solutions in the form of a written watershed management plan.

A representative pattern of scheduling for the Graduate Option in Watershed Stewardship in addition to a student?s other degree requirements might be:

First Year:

Fall Semester
Breadth electives?6 credits
FOR 591A or LARCH 510.2
Watershed Stewardship Issues
Colloquium, 1 credit

Spring Semester
Breadth electives?6 credits
FOR 591B or LARCH 510.2
Watershed Stewardship
Planning Colloquium, 1 credit

Second Year:

Fall Semester
FOR 570 or LARCH 540.2?3 credits
Keystone Project

Spring Semester
FOR 571 or LARCH 550.2?5 credits
Keystone Project

A list of acceptable breadth courses from each category is provided in the Graduate Option in Watershed Stewardship Handbook. Students will be allowed to petition to the Center for Watershed Stewardship to substitute higher level or equivalent courses in a major field to suit their specific backgrounds and goals. Courses taken for the Graduate Option in Watershed Stewardship may be used to satisfy other EPC degree requirements with concurrence of their adviser and graduate committee and only if such courses are approved EPC core requirements or are on the currently approved list of additional 400- and 500-level course for the EPC major. The graduate committee for a student enrolled in the Option in Watershed Stewardship must include a faculty representative from the Center for Watershed Stewardship.

Students enrolled in M.E.P.C. or M.S. degree program within Environmental Pollution Control may apply to participate in the Graduate Option in Watershed Stewardship. EPC students may prepare their thesis or paper on a topic related to their watershed management plan, but the thesis or paper must reflect independent thought and scholarly effort above and beyond the requirements of FOR 570 and FOR 571 or LARCH 540.2 and LARCH 550.2.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

ENVIRONMENTAL POLLUTION CONTROL (E P C)
590. COLLOQUIUM (1)

EPC Concurrent degree offering with the Penn State Dickinson School of Law

Penn State Harrisburg School of Science, Engineering, and Technology
Penn State Dickinson School of Law

Degrees Conferred:

J.D. (Dickinson) M.E.P.C., M.S. (Penn State Harrisburg)

Degrees

The Penn State Dickinson School of Law and the Intercollege Graduate Program in Environmental Pollution Control (EPC) offer a coordinated program leading to the degrees of Juris Doctor (J.D.) and Master of Environmental Pollution Control (M.E.P.C.), or Master of Science in EPC (M.S.).

The EPC programs are interdisciplinary, dealing with all aspects of controlling air, water, and solid waste pollution and disposal. The master of engineering degree is designed for those with an undergraduate degree in engineering, while the master of environmental pollution control degree is for those with science or nontechnical backgrounds. The master of science degree is intended for those students who wish to intensively pursue a research area as part of their master's degree work.

Admission to the Program

In order to be admitted to the program, students must first be admitted to Dickinson under its regular admission procedures. Students are admitted to begin classes in the fall only. Dickinson will screen potential program candidates, and need not forward applications of all Dickinson admittees who have expressed an interest in the EPC programs. Dickinson can withhold support for some admittees until they have demonstrated proficiency in their legal studies and a capacity for dual-degree study. The EPC program at Penn State Harrisburg will make an independent admission decision as to all dual-degree applicants.

Admission Requirements

Dickinson

A bachelor's or equivalent degree from an accredited college is a prerequisite for admission. However, there is no standard prescribed undergraduate curriculum. An applicant should have acquired significant oral and written communication skills before entering law school. The following are required of applicants: complete application form for Dickinson; taking of the Law School Admission Test (LSAT); completion of an LSDAS report; a one-page personal statement; employment record since high school; two recommendations.

EPC

A bachelor's degree in engineering from an accredited program is required for the Master of Engineering degree program. For the Environmental Pollution Control program, a bachelor's degree is required, including courses in mathematics through integral calculus and two courses each in both general physics and chemistry. If the applicant has not had experience with aspects of environmental engineering or science, completion of ENVE 397 Introduction to Environmental Engineering and Science or C E 297B Water Pollution Control is strongly suggested prior to the start of the graduate course work in the program. A completed Graduate School application form also is required.

Sequence

Students complete the first year of the J.D. program before beginning the EPC program. (While students might take courses in the EPC program prior to enrollment at Dickinson, credit for those courses may not count toward the J.D. degree.) Thereafter, students may concurrently enroll in courses in the J.D. and the EPC programs provided that they abide by the requirements of each program.

Interprogram Transfer of Credits

J.D.

A maximum of 12 credits for EPC course work may be transferred for credit toward the J.D. degree at Dickinson. Courses for which such credit may be applied shall be subject to approval by the Dickinson faculty. Students must obtain a grade satisfactory to Dickinson for the course work to be credited toward the J.D. degree.

M.E.P.C.

A maximum of 12 credits of Dickinson course work may be counted for credit toward this degree, subject to EPC approval based on the relevance to the MEPC degree program. No course work at Dickinson may be used to satisfy the master's paper requirement of the MEPC degree program. However, a member of the Penn State graduate faculty from Dickinson may be designated as a reader for the master's project.

M.S. in EPC

A maximum of 8 credits of Dickinson course work may be counted for credit toward this degree, subject to EPC approval based on relevance to the degree program. No course work at Dickinson may be used to satisfy the master's paper requirement of the M.Eng. degree program or the thesis requirement of the M.S. degree. However, a member of Penn State graduate faculty from Dickinson may be designated as a reader for the master's project.

Recommended Program of Study and Advising

All students in the program have two advisers, one from Dickinson and one from EPC (Penn State Harrisburg). Periodic interaction between the two advisers is encouraged. A program of study is developed for each student, taking into account the fact that some courses at both locations are offered on a rotating basis. Many courses are offered every year, but some are offered every two or three years. Advisers will have available a list of projected relevant offerings in order to work with the student on an individualized program of study.

Tuition

Students will be charged the applicable Dickinson tuition to cover the J.D. program and graduate tuition on a per credit (in-state) rate of the EPC courses.

Graduation

A student in the program may complete the requirements for one of the degrees, and be awarded that degree, prior to completing all the requirements for the other degree. All courses in one program that will count toward meeting the requirements of the other program must be completed before awarding the first degree.

Last Revised by the Department: Summer Session 2005

Blue Sheet Item #: 33-03-311

Review Date: 11/23/04

Date last updated by Publications: 8/21/09

Finance (FINAN)

DANIEL C. INDRO, *Academic Division Head*
School of Graduate Professional Studies
Penn State Great Valley
30 East Swedesford Road
Malvern, PA 19355-1443
610-648-3229
www.sgps.psu.edu (Opens New Window)

Degree Conferred:

Master of Finance (M.Fin.)

The Graduate Faculty

- Andrew J. Felo, Ph.D., CMA, CRM (SUNY, Binghamton) Associate Professor of Accounting
- Daniel Indro, Ph.D. (Indiana University) Associate Professor of Finance
- Pornsit Jiraporn, Ph.D. (Southern Illinois, Carbondale) Assistant Professor of Finance
- John Mason, Ph.D. (Michgan State) Associate Professor of Management and Organization
- John I. McCool, Ph.D. (Temple) Professor of Systems Engineering
- Simon J. Pak, Ph.D. (California, Berkeley) Associate Professor of Finance
- Kailasam Satyamurthy, Ph.D. (Clemson) Senior Lecturer in Engineering and Management

The Master of Finance (M.Fin.) at Penn State Great Valley is a graduate degree program designed for intensive and focused study in finance. The M.Fin. is a cohort-based program with a small class size. Students will move in lockstep throughout the program. Classes will be taught on the weekends at the Penn State Great Valley campus, in a schedule convenient for working professionals with demanding time commitments. The time required to complete the program is fifteen months.

The program will provide an advanced and specialized graduate education in finance for individuals with career interests as finance professionals in financial management, or investment management. The curriculum for the M.Fin. program reflects a balanced combination of advanced financial theory and practical business applications. Major emerging concepts and practices in the finance field will be introduced and discussed throughout the program. The program will help the graduates to become proficient in technical and analytical skills in finance and to develop expertise in financial problem solving and financial decision-making preparing them to advance their finance careers in organizations such as investment and commercial banking firms, mutual funds, other financial firms, non-financial businesses, consulting firms, government agencies and non-profit organizations. In addition, students will find a substantial number of courses in the M.Fin. program helpful in preparing for tests required for various professional certifications in finance, such as the Chartered Financial Analyst (CFA) Program.

Admission Requirements

Requirements listed here are in addition to the Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Graduate Bulletin*. All international applicants whose first language is not English or who have not received a baccalaureate or graduate degree from an institution in an English-speaking country must take the TOEFL (Test of English as a Foreign Language) and submit the results of the test with the application for admission. A minimum TOEFL score of 550 (paper test) or 213 (electronic test) is required on tests taken prior to September 2005. A minimum TOEFL score of 80 overall and 23 speaking is required beginning September 2005.

Applicants should:

1. Submit a completed application.
2. Hold a baccalaureate degree earned at a regionally accredited institution whose credit and residence conditions are substantially equivalent to those required by Penn State.
3. Have a 3.0 or better (on a 4.0 scale) junior/senior grade-point average.
4. Submit a GMAT or GRE score. Applicants holding an MBA, JD, Ph.D., CPA, or CFA are not required to submit standardized test scores.
5. Submit a statement of intent or career objective (one page).
6. Submit two confidential recommendation form letters.
7. Submit two official transcripts from all post-secondary institutions attended.
   International applicants must submit official university records (transcripts/marksheets and diploma if date conferred does not appear on transcripts/marksheets), with attested English translations if the record is not in English.
8. Submit a current resume.
9. Submit a visa application document if they are in the U.S. on a student or work visa.
10. Complete an admissions interview (by telephone or in person).

Admission decisions are based on the quality of the applicant's credentials and an interview in relation to those of other applicants who meet the requirements for admission outlined above.

Application Filing Dates: Applications to the Penn State Great Valley's M.Fin. are reviewed on a rolling basis. Students may be admitted to a cohort starting in early January.

Pre-Program Requirements:

The applicants are expected to have a working knowledge of a spreadsheet program, financial management, statistics and microeconomics. The pre-program requirements may be satisfied with academic work prior to matriculation in the M.Fin. program through college-level course credits in the following areas:

1. Financial Management/Corporate Finance: Topics include time value of money, basic theories of bond and stock valuation, capital budgeting, capital asset pricing model, market efficiency, and capital structure
2. Introductory Business Statistics: Topics include probability theory, sampling, inference, quality assurance, regression, forecasting, and simulation
3. Microeconomics: Topics include allocation of resources and distribution of income with in various market structures

The professor-in-charge will examine academic transcripts of each student to determine if and how requirements are met. If a requirement is not met, the deficiency must be corrected through earned credit.

Degree Requirements:

Thirty (30) credits are required to complete the M.Fin. degree. The course work in the Master of Finance (M.Fin.) program will have six required core courses (18 credit hours), three elective courses (9 credit hours), and a capstone course (3 credit hours). The required courses provide a quantitative and analytical foundation in finance. They include:

CORE COURSES:

- ACCTG 512 Financial Accounting Theory and Reporting Problems
- BUSAD 525 Quantitative Methods in Finance
- BUSAD 526 Current Issues in Corporate Finance
- FIN 505 Multinational Managerial Finance
- FIN 508 Analysis of Financial Markets
- FIN 513 Speculative Markets

The capstone course, BUSAD 585 Research in Security Valuation, provides a culminating experience for students to develop their analytical ability to identify strategies that enhance value creation, building upon their knowledge acquired from the core courses.

The electives allow students to focus in a selected field of finance such as corporate financial management or investment management. The exact elective courses to be offered for a cohort will be determined by the professor-in-charge based on polls taken from each cohort class and on consultation with the faculty who are teaching elective courses.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. Additional information is available from the Financial Aid Office at Penn State Great Valley.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ACCOUNTING (ACCTG) course list

BUSINESS ADMINISTRATION (BUSAD) course list

FINANCE (FIN) course list

Last Revised by the Department: Summer Session 2006

Blue Sheet Item #: 34-06-360

Review Date: 12/15/06

Date last updated by Publications: 8/21/09

Food Science (FD SC)

Program Home Page (Opens New Window)

JOHN D. FLOROS, *Head of the Department*
202 Food Science Building
814-865-5444
foodsci@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Ramaswamy C. Anantheswaran, Ph.D. (Cornell) Professor of Food Science
- Robert B. Beelman, Ph.D. (Ohio State) Professor of Food Science
- J. Lynne Brown, Ph.D. (MIT) Associate Professor of Food Science
- John N. Coupland, Ph.D. (Leeds) Associate Professor of Food Science
- Catherine N. Cutter, Ph.D. (Clemson) Associate Professor of Food Science
- Stephanie Doores, Ph.D. (Maryland) Associate Professor of Food Science
- Edward Dudley, Ph.D. (Wisconsin-Madison) Assistant Professor of Food Science
- Ryan J. Elias, Ph.D. (Massachusetts) Assistant Professor of Food Science
- John D. Floros, Ph.D. (Georgia) Professor of Food Science
- Hassan Gourama, Ph.D. (Nebraska) Associate Professor of Food Science
- John E. Hayes, Ph.D. (Connecticut) Assistant Professor of Food Science
- Stephen J. Knabel, Ph.D. (Iowa State) Professor of Food Science
- Luke F. LaBorde, Ph.D. (Wisconsin-Madison) Associate Professor of Food Science
- Joshua D. Lambert, Ph.D. (Arizona) Assistant Professor of Food Science
- Robert F. Roberts, Ph.D. (Minnesota) Associate Professor of Food Science
- Robert D. Steele, Ph.D. (Wisconsin-Madison) Professor of Food Science
- Donald B. Thompson, Ph.D. (Illinois) Professor of Food Science
- Gregory R. Ziegler, Ph. D. (Cornell) Professor of Food Science

Graduate work leading to the M.S. and Ph.D. degrees in Food Science is directed toward a multidisciplinary and integrated approach to teaching and research relevant to processing and manufacture of value-added foods from agricultural commodities. Through integration of the disciplines of chemistry, microbiology, engineering, and nutrition, students learn to ensure that consumers can make healthful choices from an abundant supply of affordable, safe, nutritious, and appealing foods.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Students with a 3.00 junior/senior average (on a 4.00 scale) will be considered for admission to the program. Exceptions may be made for students with special backgrounds, abilities, and interests.

Best preparation for graduate work would be the completion of an undergraduate degree in food science, biochemistry, microbiology, or other related areas. The undergraduate program must include calculus, organic chemistry, microbiology, and general physics. Students may be admitted with deficiencies but are required to make them up without degree credit.

Students are generally admitted directly to a master's program unless they have previously earned an M.S. degree in food science or an appropriate related area; in such cases, admission can be made directly to the doctoral program by approval of the graduate program committee.

Master's Degree Requirements

The requirements for the M.S. program are detailed in the Department of Food Science's "Graduate Program Handbook." Minimum course requirements for the M.S. degree are as follows:

Fundamentals of Food Science (FD SC 500), 4 credits; Research Methods in Food Science (FD SC 501), 2 credits; Supervised Experience in College Teaching (FD SC 602), 1 credit; Statistics (STAT 500 or equivalent), Biochemistry (B M B 401 or equivalent); research (FD SC 600), 6 credits.

Doctoral Degree Requirements

The requirements for the Ph.D. program are detailed in the Department of Food Science's "Graduate Program Handbook." Minimum course requirements for the Ph.D. degree are as follows: FD SC 500 Fundamentals of Food Science, 4 credits; FD SC 501 Research Methods in Food Science, 2 credits; FD SC 602 Supervised Experience in College Teaching, 2 credits; STAT 500 or equivalent, B M B 401 or equivalent.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

FOOD SCIENCE (FD SC) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/30/04

Last update by Publications: 10/06/09

Forensic Science (FRNSC)

Program Home Page (Opens New Window)

ROBERT C. SHALER, *Chair*
MITCHELL M. HOLLAND, Co-*Chair*
DANIEL G. SYKES, Co-*Chair*

Program Office:
107 Whitmore Laboratory
814-863-6758

Degree Conferred:

Master of Professional Studies in Forensic Science

The Graduate Faculty

- Mitchell M. Holland, Ph.D. (Maryland, College Park) Associate Professor of Biochemistry and Molecular Biology
- Ke Chung Kim, Ph.D. (Minnesota) Professor of Entomology
- John H. Kramer, Ph.D. (Iowa) Professor of Sociology, and Crime, Law, and Justice
- Kateryna Makova, Ph.D. (Texas Tech) Assistant Professor of Biology
- George R. Milner, Ph.D. (Northwestern) Professor of Anthropology
- Robert B. Mitchell, Ph.D. (Penn State) Professor of Biology
- Kevin R. Murphy, Ph.D. (Penn State) Department Head, Professor of Psychology
- Stephan C. Schuster, Ph.D. (University of Munich) Associate Professor of Biochemistry and Molecular Biology
- Ayusman Sen, Ph.D. (Chicago) Professor of Chemistry
- Robert C. Shaler, Ph.D. (Penn State) Professor of Biochemistry and Molecular Biology
- Mark D. Shriver, Ph.D. (Texas) Associate Professor of Anthropology
- Daniel G. Sykes, Ph.D (Alberta) Lecturer, Department of Chemistry

The Master of Professional Studies (MPS) in Forensic Science is an inter-college degree program housed in the Eberly College of Science and is offered through a collaboration of the Departments of Anthropology, Biochemistry and Molecular Biology, Biology, Chemistry, Entomology, Psychology, and Sociology. The program is offered by Penn State graduate faculty members, with enrichment by mentors from the academic faculty, public crime laboratories, and private forensic laboratories. The curriculum is designed to provide students with innovative, hands-on, and multidisciplinary learning approaches to educate and train them in crime scene investigation, the science behind forensics, courtroom proceedings, and the ethical and social issues that they will be exposed to when they join the forensic community. In addition, the program will develop teamwork and communication skills, which will be important when working actual cases in a crime laboratory.

Admission Requirements and the Application Process

Applications will be considered in accordance with the requirements of the Graduate School as described in the GENERAL INFORMATION section of the *Graduate Bulletin*. The MPS in Forensic Science program is appropriate for students with a baccalaureate degree in the biological sciences, chemistry, or a related field of study. Applicants for the MPS program are required to have a minimum cumulative GPA of 3.00 (on a 4.00 scale) in their undergraduate degree. In addition, each applicant is asked to provide a personal statement of interests and objectives, as well as two letters of reference. Letters of reference can be submitted by the student's undergraduate advisor, research advisor, and/or an instructor for an upper level course taken as part of their major. An applicant may be asked to go through an interview process conducted by members of the forensic science faculty. Admission to the program is based upon a thorough review of all applicant qualifications, and the best-qualified applicants will be accepted up to the number of spaces available for new students.

Applicants are referred to the program web site for guidance on how to submit their applications, the deadline for submitting applications, and when decisions on acceptance into the program will be announced: www.forensics.psu.edu.

Degree Requirements

A minimum of 30 graduate credits is required for completion of the program, at least 18 credits from courses at the 500 and 800-level. Students are required to take 16 credits from the core courses listed below. Additional credits are from elective courses (which are determined based on interest and career track). FRNSC 801 will serve as the capstone experience for completion of the MPS degree in Forensic Science.

Core Courses (16 credits)

FORENSIC SCIENCE (FRNSC)

- 500. Principles of CSI and Criminalistics I (6)
- 501. Criminalistics II (4)
- 541. Forensic Seminar Series (1)
- 561. Ethics in Forensic Science (1)
- 801. Criminalistics III (4)

Electives (Select at least 14 credits)

A minimum of 30 graduate credits will be required for completion of the program, with at least 18 credits from courses at the 500 and 800-level. The elective courses are chosen in consultation with the student's advisor from offerings in various academic departments based on the student's interest and career objectives to provide interdisciplinary breadth and perspective. Some examples are;

ANTHROPOLOGY (ANTH)

- 411. Skeletal Forensic Anthropology (3)
- 413. Molecular Forensic Anthropology (3)

BIOLOGY (BIOL)

- 422. Advanced Genetics (3)
- 505. Statistical Methods in Evolutionary Genetics (3)
- 514. Topics in Systematics and Evolution (2)

BIOCHEMISTRY AND MOLECULAR BIOLOGY (B M B)

- 400. Molecular Biology of the Gene (3)
- 401. General Biochemistry (2)

BIOCHEMISTRY, MICROBIOLOGY, AND MOLECULAR BIOLOGY (BMMB)

- 597A. Concepts in Biomedical Sciences (5)

CHEMISTRY (CHEM)

- 427. Forensic Chemistry (4)
- 525. Analytical Separations (3)
- 526. Spectroscopic Analysis (3)

CRIME, LAW AND JUSTICE (CLJ)

- 501. Criminal Justice Organizations and Institutions (3)
- 585. Law Enforcement Process and Policy (3)

ENTOMOLOGY (ENT)

- 412. Insect Taxonomy (3)

FORENSIC SCIENCE (FRNSC)

- 421. Forensic Molecular Biology (3)
- 821. Forensic Molecular Biology II (4)
- 831. Forensic Chemistry II (3)
- 832. Forensic Drug Chemistry (3)
- 833. Forensic Toxicology (3)
- 894. Research Projects in Forensic Science (1-12)
- 895. Internship (1-6)

INTEGRATIVE BIOSCIENCES (IBIOS)

- 593. Molecular Biology Laboratory (3)

NURSING (NURS)

- 409. Introduction to Forensic Nursing (3)

PHARMACOLOGY (PHARM)

- 501. Pharmacology (4)

PSYCHOLOGY (PSYCH)

- 464. Behavior Genetics (3)
- 470. Abnormal Psychology (3)
- 445. Forensic Psychology (3)

SOCIOLOGY (SOC)

- 413. Advanced Criminological Theory (3)
- 512. Criminological Theories (3)
- 515. Research Methods in Criminology and Deviance (3)

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ANTHROPOLOGY (ANTH) course list

BIOLOGY (BIOL) course list

BIOCHEMISTRY, MICROBIOLOGY, and MOLECULAR BIOLOGY (BMMB) course list

BIOCHEMISTRY, MICROBIOLOGY, AND MOLECULAR BIOLOGY (BMMB) course list

CHEMISTRY (CHEM) course list

Last Revised by the Department: Fall Semester 2006
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Forest Resources (FOR R)

Program Home Page (Opens New Window)

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Degrees Conferred:

Ph.D., M.S., M.Agr., M.F.R.

The Graduate Faculty

- Marc D. Abrams, Ph.D. (Michigan State) Professor of Forest Ecology and Physiology
- Paul Blankenhorn, Ph.D. (Penn State) Professor of Wood Technology
- Nicole Brown, Ph.D. (Virginia Tech) Assistant Professor of Wood Chemistry
- John E. Carlson, Ph.D. (Illinois) Associate Professor of Molecular Genetics
- William F. Elmendorf, Ph.D. (Penn State) Assistant Professor of Urban and Community Forestry
- James C. Finley, Ph.D. (Penn State) Professor of Forest Resources
- Michael G. Jacobson, Ph.D. (North Carolina State) Assistant Professor of Forest Resources
- John Janowiak, Ph.D. (Washington State) Professor of Wood Products Engineering
- Margot Kaye, Ph.D. (Colorado State) Assistant Professor of Forest Ecology
- Marc E. McDill, Ph.D. (Virigina Tech) Associate Professor of Forest Resource Management
- Judd Michael, Ph.D. (Penn State) Associate Professor of Wood Products Business Management
- Wayne L. Myers, Ph.D. (Michigan) Professor of Forest Biometrics
- Charles Ray, Ph.D. (Texas A&M) Assistant Professor of Wood Products Operations
- Paul M. Smith, Ph.D. (Virginia Tech) Professor of Forest Products Marketing
- Sanford Smith, Ph.D. (Penn State) Lecturer in Forest Resources
- Kim C. Steiner, Ph.D. (Michigan State) Professor of Forest Biology
- Charles H. Strauss, Ph.D. (Penn State) Professor of Forest Economics
- Harry V. Wiant, Jr., Ph.D. (Yale) Joseph E. Ibberson Chair in Forest Resources Management
- Eric Zenner, Ph.D. (Oregon State) Associate Professor of Silviculture

The Doctor of Philosophy and the Master of Science degree programs are oriented toward research, education, and scientific technology in the professions of forest products and forestry. The Master of Forest Resources (M.F.R.) is a professional degree designed for students who want to specialize in fields of wood products marketing or industries, forest management, silviculture, urban forestry, watershed management, or wildlife and fisheries management. This degree differs from the research-oriented Master of Science degree programs in the School of Forest Resources because the M.F.R. emphasizes applications, analysis, and synthesis of knowledge rather than creating new information through more traditional types of research. This program is especially attractive to returning students interested in gaining state-of-the-art information rather than thesis research in their specialized field. Students who have baccalaureate degrees in forestry, wood products, or wildlife and fisheries may complete the M.F.R. degree requirements in one year, whereas those with degrees in related fields generally require longer because of deficiencies in prerequisite undergraduate courses. The Master of Agriculture is intended to enable students to develop skills as professionals in the communication of technical knowledge.

Faculty expertise, laboratories, and outdoor facilities are available to support specialization in a variety of fields. Possibilities for specialization are indicated in part by the courses listed under forest products, forestry, and wildlife, and by related courses in agricultural economics, agronomy, animal nutrition, biology business administration, chemical engineering, computer science, ecology, economics, entomology, environmental pollution control, environmental resource management, genetics, horticulture, industrial engineering, landscape architecture, meteorology, physiology, plant pathology, polymer sciences, recreation and parks, regional planning, or statistics.

Students in this program may elect the dual-degree program option in Operations Research for the Ph.D. and M.S. degrees. (*See also* Operations Research.)

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. A student may be admitted provisionally without GRE scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Application materials should be submitted before February by those who want to begin in summer or fall. For admission, an applicant should have at least a 2.75 grade-point average, a 3.00 junior/senior average (on a 4.00 scale), and courses that are basic to the individual's field of specialization. Ordinarily, these include 12 credits in communication; 12 credits in social sciences and humanities; 10 credits in quantification, including calculus and statistics; 8 credits in chemistry and/or physics; 8 credits in biological sciences; and 18 credits in forest products, forestry, fish, wildlife, or related courses. Three reference letters and a brief statement describing the applicant's academic goals, career interests, and special qualifications are required. The best-qualified applicants will be accepted up to the number of spaces available. Exceptions to admission requirements may be made for students with special backgrounds, abilities, and interests.

Admission to the Ph.D. program in Forest Resources requires a master's degree in Forest Resources or a closely related field, or a bachelor's degree with a minimum grade-point average of 3.30 and demonstrated research ability.

Master's Degree Requirements

M.S.: In addition to Graduate School requirements, 6 credits of statistics and 2 credits of colloquium are required.

M.F.R.: A minimum of 30 graduate credits (400- to 500-level courses) is required, of which at least 20 must be earned at an established graduate campus of the University with at least 18 credits as formal courses (excluding paper writing, colloquia, and independent studies) related to forest resources, wood products, wildlife and fisheries. At least 12 credits must be at the 500 level, including 6 credits of formal courses. A paper (3-6 credits of FOR 596/FP 596/WFS 596) and formal presentation (1 credit for FOR 596/WP 596/WFS 596) is

required as part of the 30 credits that demonstrates ability to apply the knowledge gained during the program to the specialized field of interest. The program must also include 3 credits of statistics at the graduate level.

M.Agr.: Candidates will elect a minimum of 15 credits of graduate-level communications courses in majors such as Agricultural and Extension Education, English, Instructional Media, Journalism, Mass Communications, Recreation and Parks, Speech Communication, and Theatre. Any deficiencies in a student's resource specialty, as judged by his or her advisory committee, must be remedied. An acceptable paper on a selected professional problem or a report of internship training worth 3 credits or more also is required.

Doctoral Degree Requirements

An international communications or cultural requirement is required for the Ph.D. degree. This requirement may be satisfied by demonstrating competence in one foreign language equivalent to passing two or three college-level courses. It also may be met by two courses in one or two contemporary foreign cultures. With approval of the doctoral committee, a student may petition the graduate faculty of the school for waiver of the international communications or culture requirement.

Postbaccalaureate course work will include courses specified for the M.S. degree plus 2 credits of colloquium. The entire program of courses tailored to the student's objectives is subject to approval of the student's committee.

The comprehensive examination will consist of an oral and written portion, the written coming first. Copies of the student's thesis research proposal should be provided to the committee before the comprehensive examination.

WATERSHED STEWARDSHIP OPTION

The Graduate Option in Watershed Stewardship is a graduate option intended to provide enhanced educational opportunities for students with an interest in water resources management who are enrolled in a graduate degree program within Forest Resources. The objective of the Graduate Option in Watershed Stewardship is to educate students to facilitate team-oriented, community-based watershed management planning directed at water resources problems encountered in Pennsylvania communities, especially non-point source water pollution. The Graduate Option in Watershed Stewardship requires 22 credits of graduate course work: 12 credits of breadth courses, 2 credits of Watershed Stewardship Seminar courses (FOR 591A and FOR 591B or LARCH 510.2), and 8 credits of Watershed Stewardship Practicum I and II courses (FOR 570 and FOR 571, or LARCH 540.2 and LARCH 550.2). Breadth courses will consist of 3 graduate credits of course work from each of four subject matter areas: (1) water resources science, (2) social science, public policy and economics, (3) humanities, and (4) communications and design. In the watershed stewardship practicum course students work in teams with community, government, and business leaders to analyze and understand natural resources problems and creatively synthesize appropriate solutions in the form of a written watershed management plan.

A representative pattern of scheduling for the Graduate Option in Watershed Stewardship in addition to a student's other degree requirements is:

First Year:	**Second Year:**
Fall Semester	*Fall Semester*
Breadth electives--6 credits	FOR 570 or LARCH 540.2--3 credits
FOR 591A or LARCH 510.2, Watershed Stewardship Issues Colloquium--1 credit	Keystone Project
Spring Semester	*Spring Semester*
Breadth electives--6 credits	FOR 571 or LARCH 550.2--5 credits
FOR 591B or LARCH 510.2, Watershed Stewardship Planning Colloquium--1 credit	Keystone Project

A list of acceptable breadth courses from each category is provided in the Graduate Option in Watershed Stewardship Handbook. Students will be allowed to petition to the Center for Watershed Stewardship to substitute higher level or equivalent courses in a major field to suit their specific backgrounds and goals. Courses taken for the Graduate Option in Watershed Stewardship may be used to satisfy other equivalent (400- or 500-level) degree requirements with concurrence of adviser and graduate committee. The graduate committee for a student enrolled in the Option in Watershed Stewardship must include a faculty representative from the Center for Watershed Stewardship.

Students enrolled in M.F.R., M.Agr., M.S., or Ph.D. degree programs within the School of Forest Resources and other participating programs may apply to participate in the Graduate Option in Watershed Stewardship. Watershed Stewardship option students enrolled in an M.F.R. or M.Agr. degree program that requires a professional paper rather than a thesis could write their professional paper on a topic that directly contributes to their overall watershed management plan prepared as part of FOR 570 and FOR 571 or LARCH 540.2 and LARCH 550.2 classes.

Other Relevant Information

Each entering student receives individual guidance from an adviser, and later from his or her committee, in designing a program of studies and research based on his or her own interests. The student is responsible for conforming to all requirements summarized in the "Graduate Studies Handbook" of the School of Forest Resources, and for completing the degree program within a reasonable time, i.e., two years for a master's degree or three years for a Ph.D.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following award typically has been available to graduate students in this program:

FOREST RESOURCES: JESSE ROSSITER RAPP MEMORIAL SCHOLARSHIP

--Available to graduate students. Apply to the School of Forest Resources' Scholarships, Loans, and Awards Committee.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

FORESTRY (FOR) course list

See also Wildlife and Fisheries Science.

WOOD PRODUCTS (W P) course list

Joint Degree Programs between The Pennsylvania State University Dickinson School of Law (J.D.) and the School of Forest Resources (M.F.R., M.S., M.Agr., Ph.D.)

Joint Degree Program. The Pennsylvania State University Dickinson School of Law (DSL) and the School of Forest Resources (SFR) will offer coordinated programs of studies leading to the degrees of Juris Doctor (J.D.) and a Master of Forest Resources (M.F.R.), a Master of Science (M.S.), a Master of Agriculture (M.Agr.) or a Doctor of Philosophy (Ph.D.) in Forest Resources or Wildlife and Fisheries Sciences. The SFR programs are interdisciplinary. In the SFR programs, students may concentrate in Forest Resources, Wildlife and Fisheries Science, or Wood Products.

Admissions. In order to be admitted to the program, students may a) first be admitted and enrolled in either SFR or DSL, and be subsequently admitted to the other program, or b) be admitted to the joint degree program prior to commencing studies at Pennsylvania State University. Credits earned in the SFR program before admission to DSL cannot, however, be credited to the J.D. degree. Each program will make a separate admission decision. Students admitted to both programs will be admitted as joint degree candidates. Applications for transfer into the joint degree program from another law school or forestry/natural resources program at another University will be considered on a case-by-case basis.

Admission Requirements

DSL. A bachelor's or equivalent degree from an accredited college is a prerequisite for admission. However, there is no standard prescribed undergraduate curriculum. An applicant should have acquired significant oral, and written communications skills before entering law school. The following are required of applicants: a completed application form for DSL; taking of the Law School Admissions Test (LSAT); completion of an LSDAS report; a one-page personal statement; employment record since high school; and two recommendations.

School of Forest Resources: A Bachelor's or equivalent degree from an accredited college is a prerequisite for admission to a master's degree program, with a cumulative grade point average of 2.75 and junior-senior average of 3.0, based on a maximum 4.0 system. The following are also required of applicants to the joint degree program: taking of the Graduate Record Examination (GRE) or the LSAT; an official undergraduate transcript or transcripts; a personal statement; employment record since high school; and three recommendations. There is no prescribed undergraduate curriculum, and, because of the diversity of programs in the School, professional preparation may vary considerably. As a guide, SFR suggests having 8 credit hours in chemistry and/or physics; 12 in calculus, statistics, and/or computer science; 8 in biology, botany, and/or zoology; 12 in writing and speaking; 12 in economics, social sciences, and/or humanities; and 18 in forest science, wildlife and fisheries science, and/or wood products. Completed applications showing that a candidate is qualified for admission will be forwarded to potential faculty advisers in SFR, and admission of otherwise qualified candidates will depend upon the willingness of a faculty member to act as an adviser. Applicants are advised to contact potential advisers before applying and should contact the SFR liaison (the Goddard Chair), as well as the SFR Assistant Director of Graduate Studies, to identify potential advisers.

Admission to the Ph.D. program requires evidence of research ability, e.g., a master's degree thesis, paper, or equivalent publication and a grade point average of 3.3 or higher in graduate studies work, exclusive of thesis and special problem courses. Baccalaureate degree students graduating from an honors program with a required thesis, or who have authored a refereed publication, may be considered for admittance without a master's degree.

Residency: For master's programs, 5 semesters residence is required at the Law School and 3 semesters residence at the SFR at University Park, although additional time may be required to complete the M.S. thesis requirements. For Ph.D. programs, the same minimum number of semesters will be required, as well as the additional time as required to complete additional course work and a dissertation. In addition, Ph.D. candidates must arrange the sequence of semesters such that they are in residence at University Park as a full time student for at least two semesters in a single 12-month period. Although a student will normally take all courses at the campus where the student is in residence, a student may take up to one course (three credit hours) per semester at the campus where the student is not in residence. A Ph.D. joint degree student in residence at DSL will be considered to be "registered" at University Park for the purpose of satisfying any requirement of continuous registration and/or benchmarking in the Ph.D. program.

Liaisons: The respective liaisons for DSL and SFR shall be as follows: The Department and Faculty liaison for DSL shall be the Associate Dean for Academic Affairs and the student adviser will be the Director of the Agricultural Law Center or such other faculty member(s) as may be designated by the Dean. The liaison for SFR for the Joint Degree Program and the student contact for inquiries regarding the Joint Degree Program shall be the then current holder of the Maurice K. Goddard Chair in Forestry and Environmental Resources Conservation, or the Director of SFR when there is no current appointee to the Goddard Chair.

Interprogram Transfer of Credits

J.D. A maximum of 12 credits for SFR course work may be transferred for credit toward the J.D. degree at DSL. Students must obtain a grade satisfactory to DSL for the course work to be credited toward the J.D. degree. What courses may qualify for credit shall be determined by the DSL liaison. Because of the interdisciplinary nature of many SFR degrees, courses from other Departments and Colleges are credited towards an SFR degree with the approval of the SFR committee (e.g. courses in Economics, Agricultural Economics, Agricultural and Extension, Agronomy, Entomology, Geosciences, Landscape Architecture, Leisure Studies, Meteorology, Plant Pathology, Soil Science, EPC) and credits of these courses will be treated as SFR courses (i.e. may be credited to the DSL program with DSL approval, subject to the 12-credit limit).

SFR Degrees: The SFR programs are interdisciplinary programs and typically credits from other Departments and Colleges may be credited. What courses may be credited will be determined by the student's SFR committee. Normally, a maximum of 12 credits of DSL course work will be counted for credit toward the minimum requirements for an SFR Master's degree, subject to approval by the student's SFR committee.

Sequence. The sequence of courses will be determined by the students and their advisers. Generally, however, students will complete the first year of the DSL program before beginning the SFR program. Thereafter, students may concurrently enroll in courses in the DSL and SFR programs, provided that they abide by the requirements of each program. The ordinary expectation will be that students will spend entire semesters at one location or the other.

Recommended Program of Study and Advising. All students in the program will have two advisers, one from DSL and one from SFR (the committee chair). Periodic interaction between the two advisers will be encouraged. A program of study will be developed for each student taking into account the fact that some courses at both locations are offered on a rotating or intermittent basis. Many courses are offered every year, but some are offered every two or three years. Advisers will have available a list of projected relevant offerings in order to work with the student on an individualized program of study. The standard committee structure will apply to the SFR programs.

Tuition. Students will be charged the applicable DSL tuition to cover the J.D. program and the applicable SFR tuition to cover the SFR degree program. The DSL tuition will be paid for the semesters that the student is in residence at DSL and the SFR tuition will be paid for the semesters that the student is in residence at University Park. A student may take up to one course (3 credit hours) per semester at the campus where the student is not residence without, any change in tuition, but must pay additional tuition to the nonresidential campus if he or she wishes to take additional course work at that campus during that semester.*

Financial Aid and Assistantships. Decisions on financial aid and assistantships will be made by each school according to that school's procedures. Generally, SFR assistantships and financial aid will not apply to time spent at DSL.

Fulfillment of Degree Requirements and Graduation. A student in the program may complete the requirements for one of the degrees and be awarded that degree prior to completing all the requirements for the other degree, provided, however, that the student shall have successfully completed at least two semesters of work towards the other degree. All courses in one program that will count toward meeting the requirements of the other program must be completed before award of either degree. Students will be required to fulfill all requirements for each degree in order to be awarded that degree, subject to the interprogram transfer of credits. With respect to SFR's requirement for a thesis or paper, work done while at DSL under the supervision of a DSL faculty member may be appropriate for incorporation into the thesis or paper with the approval of the SFR committee (in such cases, the committee should consider whether credits afforded such work will be subject to the 12-credit maximum for interprogram transfers described in paragraph 6(b) and the DSL faculty member should be a member of the committee).

*After taking comprehensive examinations, a Ph.D. student must pay tuition for all courses taken at any campus where the Ph.D. student is not registered.

FOR R
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J.D./M.F.R., M.S., M.Agr., Ph.D.
Last Revised by the Department: Fall Semester 2003
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French (FR)

Program Home Page

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Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- J.-Marc Authier, Ph.D. (Southern California) Associate Professor of French and Applied Linguistics
- Barbara Bullock, Ph.D. (Delaware) Professor of French and Linguistics
- Christine Clark-Evans, Ph.D. (Bryn Mawr) Associate Professor of French and Women's Studies
- Meredith C. Doran, Ph.D. (Cornell) Assistant Professor of French and Applied Linguistics
- Kathryn M. Grossman, Ph.D. (Yale) Professor of French
- Thomas A. Hale, Ph.D. (Rochester) Edwin Erle Sparks Professor of African, French, and Comparative Literature
- Celeste Kinginger, Ph.D. (Illinois, Urbana-Champaign) Associate Professor of French and Applied Linguistics
- Norris J. Lacy, Ph.D. (Indiana) Edwin Erle Sparks Professor of French and Medieval Studies
- Vera Mark, Ph.D. (Texas, Austin) Assistant Professor of French and Linguistics
- Benedicte Monicat, Ph.D. (Maryland) Professor of French and Women's Studies
- Lisa Reed, Ph.D. (Université d'Ottawa) Associate Professor of French and Linguistics
- Willa Z. Silverman, Ph.D. (New York) Professor of French and Jewish Studies
- Allan Stoekl, Ph.D. (SUNY, Buffalo) Professor of French and Comparative Literature
- Jean-Claude Vuillemin, Ph.D. (Michigan State) Professor of French
- Monique Yaari, Ph.D. (Cincinnati) Associate Professor of French

This program offers training in French literature and civilization.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are generally required of all students educated (high school and college) in the continental United States. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Minimum qualifications for admission typically include a B.A. in French or the equivalent, a minimum of 3.20 grade-point average (on a 4.0 scale), and the ability to speak and write in both French and English (a speech sample demonstrating the applicant's ability to speak extemporaneously and coherently about his/her study and career goals in French for anglophones, in English for francophones, and in French and English for speakers of other foreign languages is required). A written text on a literary or cultural topic also must be submitted. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.20 GPA may be made for students with special backgrounds, abilities, and interests.

Master's Degree Requirements

Candidates for the master's degree in French complete a minimum of ten 3-credit graduate-level courses, plus a master's paper or a minimum of nine 3-credit courses, plus a thesis. A reading knowledge of a second foreign language plus oral and written examinations also are required. All candidates take FR 571 Introduction to Criticism, FR 502 Introduction to French Linguistics, FR 580 Approaches to French Civilization, and FR 581 Theory and Techniques of Teaching French. In addition to the four required courses designated here, all candidates take three 3-credit courses in French literature, plus three 3-credit elective courses. At least one elective course should be in the area of projected specialization at the Ph.D. level. The M.A. degree (or equivalent) is normally a prerequisite to doctoral candidacy.

Candidates for the Women's Studies and French dual-title master's degree complete a minimum 30 credits plus a master's paper. All candidates take FR 502 Introduction to French, FR 580 Approaches to French Civilization, FR 581 Theory and Techniques of Teaching French, FR 571 French Literary Theory and Criticism, WMNST 501 Feminist Perspectives in Research and Teaching, WMNST 502 Global Feminism, WMNST 507 Feminist Theory, and 9 credits in literature (6 of those credits in Women's Studies-approved courses).

Doctoral Degree Requirements

The Ph.D. degree prepares candidates for careers in teaching and research at the college or university level. Between 30 and 36 credits beyond the M.A. in French (or equivalent) is required in graduate course work. Credits must be distributed in one of two areas of specialization: civilization or literature.

Doctoral candidates must demonstrate either an advanced knowledge of one foreign language other than French or a reading ability of two foreign languages other than French (equivalent to the 12-credit level). All doctoral students must pass a candidacy examination, a comprehensive written and oral examination, and a final oral defense.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

*FR 121G. FUNDAMENTALS OF READING FRENCH
*FR 122G. PRACTICE IN READING FRENCH

*No graduate credit is given for this course.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

FRENCH (FR) course list

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Genetics (GENET)

Program Home Page (Opens New Window)

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Penn State College of Medicine
500 University Drive
Hershey, PA 17033
717-531-8098

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Sarah E. Ades, Ph.D. (MIT) Assistant Professor of Biochemistry and Molecular Biology
- Hiroshi Akashi, Ph.D. (Chicago) Assistant Professor of Biology
- Avery August, Ph.D. (Cornell) Assistant Professor of Immunology
- John E. Ayers, Ph.D. (Penn State) Professor of Plant Pathology
- Paul Babitzke, Ph.D. (Georgia) Associate Professor of Biochemistry and Molecular Biology
- Guy F. Barbato, Ph.D. (Virginia Tech) Associate Professor of Poultry Science
- David Blizard, Ph.D. (Wales) Senior Research Scientist, Center for Development and Health Genetics
- David M. Braun, Ph.D. (Missouri) Assistant Professor of Biology
- Sarah Kay Bronson, Ph.D. (Washington U) Assistant Professor of Cellular and Molecular Physiology (Hershey)
- Craig Cameron, Ph.D. (Case Western Reserve) Louis Martarano Associate Professor of Biochemistry and Molecular Biology
- John E. Carlson, Ph.D. (Illinois) Associate Professor of Molecular Genetics
- Laura Carrel, Ph.D. (Standford) Assistant Professor of Biochemistry and Molecular Biology (Hershey)
- Douglas R. Cavener, Ph.D. (Georgia) Professor of Biology
- Vincent Chau, Ph.D. (Virginia) Professor of Cellular and Molecular Physiology (Hershey)
- Keith C. Cheng, M.D. (NYU School of Medicine); Ph.D. (Washington) Professor of Pathology (Hershey)
- Hui-Ling Chiang, Ph.D. (Harvard) Associate Professor of Cellular and Molecular Physiology (Hershey)
- Surinder Chopra, Ph.D. (Vrije U, Brussels) Assistant Professor of Maize Genetics
- Barbara J. Christ, Ph.D. (British Columbia) Professor of Plant Pathology
- Gary Clawson, M.D., Ph.D. (Michigan State) Professor of Pathology, and Biochemistry and Molecular Biology (Hershey)
- Pamela H. Correll, Ph.D. (George Washington) Associate Professor of Immunology
- Diana Cox-Foster, Ph.D. (Illinois) Professor of Entomology
- Richard Craig, Ph.D. (Penn State) J. Franklin Styer Professor Emeritus of Horticultural Botany; Professor Emeritus of Plant Breeding
- Rebecca Craven, Ph.D. (Tennessee) Associate Professor of Microbiology and Immunology (Hershey)
- Liwang Cui, Ph.D. (Kentucky) Assistant Professor of Entomology
- Claude W. dePamphilis, Ph.D. (Georgia) Associate Professor of Biology
- Kristin A. Eckert, Ph.D. (Wisconsin) Associate Professor of Pathology (Hershey)
- Robert B. Eckhardt, Ph.D. (Michigan) Professor of Developmental Genetics and Evolutionary Morphology
- James G. Ferry, Ph.D. (Illinois) Stanley Person Professorof Biochemistry and Molecular Biology
- Joanna Floros, Ph.D. (Temple) Professor of Cellular and Molecular Physiology (Hershey)
- Majid R. Foolad, Ph.D. (California, Davis) Professor of Plant Genetics
- David Geiser, Ph.D. (Northwestern) Assistant Professor of Plant Pathology
- Henry D. Gerhold, Ph.D. (Yale) Professor of Forest Genetics
- David S. Gilmour, Ph.D. (Cornell) Associate Professor of Biochemistry and Molecular Biology
- Sergei Grigoryev, Ph.D. (Moscow State) Assistant Professor of Biochemistry and Molecular Biology (Hershey)
- Edward G. Gunther, Ph.D. (Yale) Assistant Professor, Jake Gittlen Cancer Research Institute (Hershey)
- Kyung-An Han, Ph.D. (SUNY, Buffalo) Assistant Professor of Biology
- Wendy Hanna-Rose, Ph.D. (Harvard) Assistant Professor of Biochemistry and Molecular Biology
- Ross C. Hardison, Ph.D. (Iowa) Professor of Biochemistry
- Eric T. Harvill, Ph.D. (California, Los Angeles) Assistant Professor of Microbiology and Infectious Disease
- Biao He, Ph.D. (SUNY Health Sciences Ctr, Brooklyn) Assistant Professor of Virology
- S. Blair Hedges, Ph.D. (Maryland) Professor of Biology
- Christopher R. Herzog, Ph.D. (Medical College of Ohio) Assistant Professor of Pharmacology
- Jianming Hu, Ph.D. (Penn State) Associate Professor of Microbiology and Immunology (Hershey)
- Seogchan Kang, Ph.D. (Wisconsin) Associate Professor of Plant Pathology
- Ralph L. Keil, Ph.D. (Cornell) Associate Professor of Biochemistry and Molecular Biology (Hershey)
- Kenneth Keiler, Ph.D. (MIT) Assistant Professor of Biochemistry and Molecular Biology
- Zhi-Chun Lai, Ph.D. (Albert Einstein College of Medicine) Associate Professor of Biology, and Biochemistry and Molecular Biology
- Philip Lazarus, Ph.D. (McGill) Professor of Pharmacology and Health Evaluation Science (Hershey)
- Robert Levenson, Ph.D. (SUNY, Stony Brook) Professor of Pharmacology (Hershey)
- David Liu, Ph.D. (CUNY) Assistant Professor of Neural and Behavioral Science
- Bernhard Lüscher, Ph.D. (Zurich) Associate Professor of Biology, and Biochemistry and Molecular Biology
- Hong Ma, Ph.D. (MIT) Professor of Biology
- Wojciech Makalowski, Ph.D. (Poznan, Poland) Associate Professor of Biology
- Kateryna Makova, Ph.D. (Texas Tech) Assistant Professor of Biology
- Gerald E. McClearn, Ph.D. (Wisconsin) Evan Pugh Professor of Health and Human Development
- Patricia McLaughlin, D.Ed. (Penn State) Professor of Neural and Behavioral Science (Hershey)
- Bruce A. McPheron, Ph.D. (Illinois) Professor of Entomology
- Paula C. McSteen, Ph.D. (East Anglia) Assistant Professor of Biology
- Pamela J. Mitchell, Ph.D. (Columbia) Associate Professor of Biochemistry and Molecular Biology

- David Mu, Ph.D., Associate Professor of Pathology, and Biochemistry and Molecular Biology (Hershey)
- Kathleen M. Mulder, Ph.D. (SUNY, Buffalo) Professor of Pharmacology (Hershey)
- Joshua Muscat, Ph.D. (New York University) Professor of Public Health Science (Hershey)
- Masatoshi Nei, Ph.D. (Kyoto, Japan) Evan Pugh Professor of Biology
- Davis T. W. Ng, Ph.D. (Northwestern) Associate Professor of Biochemistry and Molecular Biology
- B. Tracy Nixon, Ph.D. (MIT) Associate Professor of Biochemistry and Molecular Biology Pharmacology (Hershey)
- Curt Omiecinski, Ph.D. (Washington, Seattle) Professor of Veterinary Science; H. Thomas and Dorothy Willets Hallowell Chair
- Richard W. Ordway, Ph.D. (UMass Medical School) Associate Professor of Biology
- Leslie Parent, M.D. (Duke) Assistant Professor of Medicine, and Microbiology and Immunology (Hershey)
- Robert F. Paulson, Ph.D. (California, San Francisco) Associate Professor of Veterinary Science
- Anthony E. Pegg, Ph.D. (Cambridge) Evan Pugh Professor of Cellular and Molecular Physiology and
- Gary H. Perdew, Ph.D. (Oregon State) Professor of Veterinary Science
- Jeffrey M. Peters, Ph.D. (California, Davis) Assistant Professor of Environmental Toxicology
- C. Channa Reddy, Ph.D. (Indian Inst of Science) Distinguished Professor of Veterinary Science
- Joseph C. Reese, Ph.D. (Illinois) Associate Professor of Biochemistry and Molecular Biology
- Joan T. Richtsmeier, Ph.D. (Northwestern) Professor of Anthropology
- Gavin P. Robertson, Ph.D. (California, Riverside) Assistant Professor of Pharmacology and Pathology (Hershey)
- Daniel J. Royse, Ph.D. (Illinois) Professor of Plant Pathology
- Jeffery Sample, Ph.D. (South Florida) Professor of Micrbiology and Immunology (Hershey)
- Stephen W. Schaeffer, Ph.D. (Georgia) Associate Professor of Biology
- Robert A. Schlegel, Ph.D. (Harvard) Professor of Biochemistry and Molecular Biology
- Lisa Shantz, Ph.D. (Johns Hopkins) Associate Professor of Cellular and Molecular Physiology (Hershey)
- Cooduvalli S. Shashikant, Ph.D. (Osmania U, India) Associate Professor of Molecular and Developmental Biology
- Yuguang (Roger) Shi, Ph.D. (Australian Natl U) Assistant Professor of Cellular and Molecular Physiology
- Mark D. Shriver, Ph.D. (Texas, Houston) Assistant Professor of Anthropology
- Sharon P. Shriver, Ph.D. (Case Western Reserve) Assistant Professor of Biology
- Esther Siegfried, Ph.D. (Washington U) Assistant Professor of Biology, and Biochemistry and Molecular Biology
- David J. Spector, Ph.D. (Pennsylvania) Associate Professor of Microbiology and Immunology (Hershey)
- Graham H. Thomas, Ph.D. (Edinburgh) Associate Professor of Biology, and Biochemistry and Molecular Biology
- Chen-Pei David Tu, Ph.D. (Cornell) Professor of Biochemistry and Molecular Biology
- David J. Vandenbergh, Ph.D. (Penn State) Assistant Professor of Biobehavioral Health
- Michael F. Verderame, Ph.D. (Columbia) Associate Professor of Medicine; Assistant Professor of
- Microbiology and Immunology (Hershey)
- George P. Vogler, Ph.D. (Colorado) Associate Professor of Biobehavioral Health
- Kent E. Vrana, Ph.D. (Louisiana State) Elliot S. Vesell Professor of Pharmacology (Hershey)
- Kenneth M. Weiss, Ph.D. (Michigan) Evan Pugh Professor of Anthropology and Genetics
- John W. Wills, Ph.D. (Tennessee, Knoxville) Professor of Microbiology and Immunology (Hershey)
- Jin-Ming Yang, Ph.D. (Shanghai Medical, China) Professor of Pharmacology (Hershey)
- Ian S. Zagon, Ph.D. (Colorado) Professor of Neuroscience and Anatomy (Hershey)
- Samuel Shao-Min Zhang, Ph.D. (Tokyo, Japan) Assistant Professor of Neural and Behavioral Science (Hershey)
- Jiyue Zhu, Ph.D. (Dartmouth Medical School) Assistant Professor of Cellular and Molecular Physiology (Hershey)

The Intercollege Graduate Program in Genetics is designed to prepare graduates for rapidly expanding opportunities in genetics in academic institutions, biotechnology and pharmaceutical companies, private research institutes, governmental research laboratories, etc. The program includes faculty from eighteen departments in the Eberly College of Science and the Colleges of Agricultural Sciences, Health and Human Development, and the Liberal Arts at the University Park campus and the Penn State College of Medicine at The Milton S. Hershey Medical Center. Beginning and advanced graduate-level courses are taught by active research faculty members in their own areas of specialization. Fields available of study and research include molecular, biochemical, physiological, cellular, behavioral, developmental, pharmacological, genomics, bioinformatics, population, and evolutionary genetics; also applications in recombinant DNA technology, genetic engineering, breeding plants or animals, and genetic counseling of humans. Please see the list of faculty on the Web site www.genetics.psu.edu (Opens New Window) for the full range of areas represented.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Only under exceptional circumstances will an applicant be considered without these scores. In addition, applicants should have a cumulative undergraduate grade-point average of at least 3.00 and appropriate courses in biology (including genetics, organic chemistry or biochemistry), statistics, other sciences, and communications. The application must include three letters of reference and a statement describing and explaining interests in genetics, types of organism and research preferred, and goals during and after graduate studies.

All application materials should be submitted by January 31 for the best chance of admission and financial aid. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Master's Degree Requirements

The master's degree program can serve as an alternative for students who, for any number of reasons, do not proceed to the Ph.D. A committee appointed for each student, with the approval of the program chair, determines specific courses, communication skills, and research acceptable for satisfying M.S. degree requirements. Students must meet the M.S. degree requirements specified by the Graduate School in the Graduate Bulletin. In addition, specific genetics course requirements include 12 credits selected from a list of approved genetics courses, 3 credits in statistics, and 2 credits per year in genetics colloquium. A thesis is required of all candidates for the M.S. degree.

Doctoral Degree Requirements

The student's Ph.D. committee, appointed after a written and oral candidacy examination is passed, determines specific requirements for courses and research, and administers the comprehensive and final examinations. The Graduate School requires no specified number of credits for the attainment of the doctorate. However, the Genetics program requires 15 credits in approved genetics courses, 3 credits in statistics, and 2 credits per year in genetics colloquium. The requirement in communication and foreign language skills is the same as that of the thesis adviser's department or program. All Ph.D. students are required to prepare and formally defend a thesis involving independent research.

Other Relevant Information

Because the selection of the faculty adviser is one of the most important decisions that each student will make during their graduate

career, we offer a rotation program to allow students to do three laboratory rotations with different faculty during the first semester. At the end of the first semester, students choose their doctoral adviser in consultation with the faculty adviser and chair of the Genetics program. Although most students accepted into the Genetics graduate program are admitted to the rotation program, some students may be admitted to receive training by a specific faculty member. All admissions must be approved by the IGDP Genetics Admissions Committee.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. In most participating departments, Genetics applicants are eligible for departmental teaching or research assistantships, and other assistantships supported by grant funds of individual faculty who make these award decisions.

Applicants with a grade-point average above 3.60 and superior GRE scores are encouraged to request fellowship applications from the Graduate School before January 31.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

GENETICS (GENET) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/24/04

Date last updated by Publications: 8/11/09

Geographic Information Systems (GIS)

Program Home Page

Department of Geography, via World Campus

Degrees Conferred:

M.G.I.S.

The Graduate Faculty

Todd Bacastow, Ph.D. (Penn State) Professor of Practice for Geospatial Intelligence
Joseph A. Bishop, Ph.D. (Penn State) Research Associate
Cynthia A. Brewer, Ph.D. (Michigan State) Professor of Geography
Roberts P. Brooks, Ph.D. (UMass, Amherst) Professor of Geography
Mark W. Corson, Ph.D. (South Carolina) Associate Professor of Geography
Robert G. Crane, Ph.D. (Colorado) Professor of Geography
David W. DiBiase, M.S. (Wisconsin-Madison) Senior Lecturer of Geography
Mark Gahegan, Ph.D. (Curtin) Professor of Geography
Peter L. Guth, Ph.D. (MIT) Professor of Geography
Patrick J. Kennelly, Ph.D. (Oregon State) Associate Professor of Geography
Fritz C. Kessler, Ph.D. (Kansas) Associate Professor of Geography
Alexander Klippel, Ph.D. (Bremen, Germany) Assistant Professor of Geography
C. Gregory Knight, Ph. D. (Minnesota) Professor of Geography
Alan M. MacEachren, Ph.D. (Kansas) Professor of Geography
Douglas A. Miller, Ph.D. (Penn State) Associate Professor of Geography
Anthony C. Robinson, Ph.D. (Penn State) Research Associate
Adena B. Schutzbert, M.S. (Penn State) Senior Lecturer of Geography
Alan H. Taylor, Ph.D. (Colorado) Professor of Geography
Ian Turton, Ph.D. (Edinburgh) Senior Research Associate, Geography
Denise H. Wardrop, Ph.D. (Penn State) Associate Professor of Geography
Brenton M. Yarnal, Ph.D. (Simon Fraser) Professor of Geography

The Master of Geographic Information Systems (M.G.I.S.) degree is awarded to students who demonstrate mastery of the technical competencies and leadership skills required to design, manage, and use geographic information technologies successfully in a wide range of professional fields. The MGIS program is intended specifically for working professionals who are able to participate only on a part-time basis and at a distance. It is offered exclusively through World Campus. The MGIS complements, but does not replace, the Department of Geography's more research-focused Master of Science program, which is offered at the University Park campus. Students who expect to pursue the Ph.D. in Geography should apply for admission to the residential M.S. program.

Admission Requirements

Students who wish to pursue the M.G.I.S. degree must be admitted both to the MGIS program and to Penn State's Graduate School. The Graduate School requires applicants to possess any baccalaureate degree from a regionally accredited institution earned under residence and credit conditions substantially equivalent to those required by Penn State. It also requires official TOEFL or IELTS scores for students from countries in which English is not the primary language. Minimum TOEFL scores are 550 for the paper test or 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the Internet-based test (iBT). Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a masters degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

Additional requirements imposed by the Department of Geography include:

- Statement of professional experience and goals including documentation of a minimum two years of professional experience, preferably (but not necessarily) related to geographic information technologies. A résumé may be attached as a supplement, but the statement itself should be an essay (two to three pages) that demonstrates the applicant's verbal communication skills;
- Three letters of recommendation that attest to the applicant's readiness for graduate study and that he or she has the requisite minimum of two years of professional experience;
- Two official transcripts from each post-secondary institution attended, including the institution that conferred the applicant's baccalaureate degree (and any graduate degrees, if applicable). Applicants are expected to have earned a grade-point average of 3.0 (or equivalent) or better during their final two years of undergraduate work;
- Official Graduate Records Examinations (GRE) score reported directly from the testing center to Penn State. GRE scores are required: however, this requirement may be waived under certain circumstances. Please contact the graduate program directly.

A committee consisting of at least three Geography faculty members, including one faculty member not currently participating in the MGIS program, will meet three times annually to screen applications and identify applicants qualified for admission. Three cohorts of approximately twelve students each will be admitted during three annual admissions cycles. Applicants who are only able to participate part-time and at a distance while maintaining full-time professional responsibilities (and who are therefore effectively excluded from participation in the department's resident program) will be preferred. The best-qualified applicants will be admitted up to the number of spaces that are available for new students.

Prior to admission in the MGIS program, students may enroll in MGIS courses as nondegree graduate students. Nondegree graduate students who are subsequently admitted to the MGIS program may count up to 15 credits of course work accumulated in nondegree status toward the M.G.I.S. degree. Applicants for nondegree graduate status must submit transcripts that confirm they have received a baccalaureate degree from an accredited institution under residence and credit conditions substantially equivalent to those required by Penn State. Admission as a nondegree student neither guarantees nor implies subsequent admission to the MGIS degree program. Changing from nondegree status to regular graduate status requires a new admission application.

By Graduate School rules, a maximum of 10 credits of high-quality graduate work completed at a regionally accredited institution may be

applied toward the requirements for the M.G.I.S. degree. However, credits earned to complete a previous master's degree, whether at Penn State or elsewhere, may not be applied to a second master's degree program at Penn State. Approval to apply any transferred credits toward a degree program must be granted by the student's academic adviser or program and the Graduate School. Transferred academic work must have been completed within five years prior to the date of first degree registration at the Graduate School of Penn State, must be of at least B quality, and must appear on an official graduate transcript of an accredited university.

Degree Requirements

Students earn the M.G.I.S. degree by successfully completing 35 credits of graduate-level course work, including a supervised independent project. Course requirements include a minimum of 18 credits at the 500 level or above, 6 to 9 credits of which are earned through individual studies (GEOG 596). Students are encouraged to create and maintain personal e-portfolios that chronicle their achievements in the program, outline long-term professional development strategies, and foster meaningful interactions among students and faculty members. The independent project demonstrates the student's ability to apply advanced knowledge and skills related to geographic information systems in a way that makes a substantial contribution to his or her professional work. For most student, the project culminates in a formal public presentation, attended by a member of the graduate faculty associated with the MGIS program, which takes place at an appropriate professional conference (such as annual conferences of the Urban and Regional Information Systems Association, the American Congress on Surveying and Mapping, or ESRI). Alternative arrangements are made for students with special needs or contraints. For example, students who submit written reports of project aims and outcomes for publication in adviser-approved peer-reviewed journals are exempt from the public presentation requirement. Presentations and papers are preceded by dress rehearsals that are open to all students in the program through Web and audio conferencing. As part of his or her individual studies, every student is expected to contribute a formal peer review of one other student's rehearsal.

An Advisory Board consisting of accomplished GIS professionals in government and industry, as well as Penn State faculty members in a variety of disciplines who specialize in geographic information science and technology, guides the ongoing development of the MGIS curriculum. Designed for students who are able to participate only on a part-time basis and at a distance, the curriculum is spread over three years; however, students who are able to manage heavier course loads may complete the program in a shorter period of time. Courses are ten weeks in length and require eight to twelve hours of student effort per week. Most courses are offered four times annually, starting in early January, April, July, and October. Most students will complete four courses per year, one course at a time. First-year courses are designed to help students develop the information literacy and technical competencies they need to become knowledgeable and skillful users of desktop geographic information technologies. Second-year courses prepare students for leadership in their organizations with regard to the design, specification, and management of complex geographic information infrastructures. During the third year, students complete electives and an independent study project by which they demonstrate a substantive contribution to their organization as well as the ability to communicate their contribution to a professional audience. Students who successfully complete the Penn State MGIS satisfy the minimum educational achievement required for professional certification by the Geographic Information Systems Certification Institute (www.gisci.org).

Student Aid

Graduate assistantships are not available. Financial aid opportunities for part-time students who participate through the World Campus are discussed at http://worldcampus.psu.edu/StudentServices_FinancialAidOffice.shtml.

PRESCRIBED COURSES

MASTER OF GEOGRAPHIC INFORMATION SYSTEMS

GEOGRAPHY (GEOG)

- 482. The Nature of Geographic Information (2)
- 864. Professionalism in GIS&T (2)
- 483. Problem-Solving with GIS (3)
- 484. GIS Database Development (3)
- 583. Geospatial System Analysis and Design (3)
- 584. Geospatial Technology Project Management (3)
- 586. Geographical Information Analysis (3)
- 596. Individual Studies (3)

In lieu of the 8 credits of prescribed introductory courses (GEOG 482 or 864 + 483 + 484) plus 6 additional elective credits, MGIS students may substitute 14 credits associated with courses that comprise the Geospatial Intelligence Option. This option is designed for current or aspiring practitioners in government agencies, businesses, and non-governmental organizations that rely on insights produced through skillful, knowledgeable, and conscientious analysis of diverse geo-referenced data to plan for emergencies, to coordinate responses to natural and human induced disasters, to enforce the law, and to plan and conduct military operations.

GEOSPATIAL INTELLIGENCE OPTION

GEOGRAPHY (GEOG)

- 882. Geographic Foundations of Geospatial Intelligence (3)
- 883. Remote Sensing for the Geospatial Intelligence Professional (3)
- 884. Geographic Information Systems for the Geospatial Intelligence Professional (3)
- 885. Advanced Analytic Methods in Geospatial Intelligence (3)
- 889. Seminar in Geospatial Intelligence (2)

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

GEOGRAPHY (GEOG) courses

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-092

Review Date: 01/12/2010

DATE LAST REVIEWED BY PUBLICATIONS: 7/9/07 (link check)

Geography (GEOG)

Program Home Page (Opens New Window)

KARL S. ZIMMERER, *Head of the Department*
302 Walker Building
814-865-3433

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Cynthia A. Brewer, Ph.D. (Michigan State) Professor of Geography
- Robert P. Brooks, Ph.D. (UMass, Amherst) Professor of Geography
- Andrew M. Carleton, Ph.D. (Colorado) Professor of Geography
- Robert G. Crane, Ph.D. (Colorado) Professor of Geography
- Lorraine Dowler, Ph.D. (Syracuse) Associate Professor of Geography and Women's Studies
- Roger M. Downs, Ph.D. (Bristol) Professor of Geography
- William Easterling, Ph.D. (North Carolina) Dean; Professor of Geography
- Rodney A. Erickson, Ph.D. (Washington) Executive Vice President and Provost
- Amy K. Glasmeier, Ph.D. (California, Berkeley) Professor of Geography
- Deryck W. Holdsworth, Ph.D. (British Columbia) Professor of Geography
- Brian King, Ph.D. (Colorado) Assistant Professor of Geography
- Alexander Klippel, Ph.D. (Bremen, Germany) Assistant Professor of Geography
- C. Gregory Knight, Ph.D. (Minnesota) Professor of Geography
- Derrick J. Lampkin, Ph.D. (Arizona) Assistant Professor of Geography
- B. Ikubolajeh Logan, Ph.D. (California, Los Angeles) Professor of Geography
- Alan M. MacEachren, Ph.D. (Kansas) Professor of Geography
- James McCarthy, Ph.D. (California, Berkeley) Associate Professor of Geography
- Donna J. Peuquet, Ph.D. (SUNY, Buffalo) Professor of Geography
- Erica Smithwick, Ph.D. (Oregon State) Assistant Professor of Geography
- Alan H. Taylor, Ph.D. (Colorado) Professor of Geography
- Petra Tschakert, Ph.D. (Arizona) Assistant Professor of Geography
- Melissa Wright, Ph.D. (Johns Hopkins) Associate Professor of Geography
- Lakshman S. Yapa, Ph.D. (Syracuse) Professor of Geography
- Brenton M. Yarnal, Ph.D. (Simon Fraser) Associate Head; Professor of Geography
- Karl S. Zimmerer, Ph.D. (California, Berkeley) Head of the Department; Professor of Geography

Affiliated Faculty

- Guoray Cai, Ph.D. (Pittsburgh) Associate Professor of Information Sciences and Technology, and Geography
- Susan W. Friedman, Ph.D. (Toronto) Adjunct Assistant Professor of Geography
- Stephen Matthews, Ph.D. (U of Wales) Associate Professor of Demography
- Douglas Miller, Ph.D. (Penn State) Associate Professor of Geography; Director for Outreach, Earth and Mineral Sciences Environment Institute
- Adam Rome, Ph.D. (Kansas) Associate Professor of History

Faculty Emeriti

- Ronald F. Abler, Ph.D. (Minnesota) Professor Emeritus of Geography
- Peirce F. Lewis, Ph.D. (Michigan) Professor Emeritus of Geography
- Allan L. Rodgers, Ph.D. (Wisconsin) Professor Emeritus of Geography
- Paul D. Simkins, Ph.D. (Wisconsin) Professor Emeritus of Geography
- Frederick L. Wernstedt, Ph.D. (California, Los Angeles) Professor Emeritus of Geography
- Anthony V. Williams, Ph.D. (Michigan State) Professor Emeritus of Geography
- Wilbur Zelinsky, Ph.D. (California, Berkeley) Professor Emeritus of Geography

The faculty encourages graduate students to arrange courses of study appropriate to their individual needs and aspirations. Programs in Geography may be directed toward a career in public service, teaching and research, private industry, or one of the many other vocational opportunities open to geographers.

Students typically concentrate their study on topics that fall within the special skills and interests of the faculty. Current specialties include behavioral geography; biogeography; cartography; climatology; cultural geography; feminist geography; geo-computation; geographic education; geographic information science; geography of the developing world; geographic theory; geographic visualization; historical geography; human dimensions of global change; nature and society; political geography; population geography; regional economic development and industrial location; remote sensing; and urban geography.

The M.S. program is broadly based. It is designed to provide beginning graduate students with basic training in systematic fields, geographical theory, and research techniques. Study at the Ph.D. level is also broad in the first year, then becomes more specialized.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission, as well as a personal statement. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course work in geography or a related discipline will be considered for admission to the M.S. program. Applicants with master's degrees from high-quality graduate programs in geography will be considered for admission to the doctoral program. The best-qualified applicants will be admitted up to the number of

places that are available for new students. All students must have or must acquire a broad competence in physical geography, human geography, representation methods, and analysis methods (qualitative or quantitative).

Baccalaureate students must earn a master's degree before they will be considered for admission to the doctoral program.

Master's Degree Requirements

The M.S. degree may be earned by completing a thesis or two papers. The thesis option requires completion of at least 30 graduate credits. If the two-paper option is elected, the candidate must earn 35 credits of graduate-level work. The master's papers are usually expanded versions of course or semester papers that are of sufficiently high quality that they can be submitted to scholarly journals. At least one of the papers offered to fulfill the M.S. papers requirement must have been written in connection with a departmental course or seminar.

All M.S. students are required to enroll in GEOG 500 Introduction to Geographic Research (3 credits), GEOG 502 Research Scholarship in Geography (3 credits), and at least 3 credits of GEOG 501A, B, C, or D Research Perspectives (1 credit each) during their first year of residence. All M.S. students are required to complete at least one seminar at the 500 level. Supporting courses are chosen in consultation with an entrance committee (in year one) or the adviser (in subsequent years).

Doctoral Degree Requirements

There is no fixed number of credits; courses are prescribed according to the student's prior experience. The Graduate School's communication and foreign language requirement for the Ph.D. degree shall be satisfied in a manner approved by the candidate's doctoral committee.

All doctoral students are required to enroll in GEOG 500 Introduction to Geographic Research (3 credits) and GEOG 502 Research Scholarship in Geography (3 credits) during their first year of residence.

Other Relevant Information

Penn State's graduate program in Geography works with incoming students to design programs tailored to their specific interests and needs. Thus there are few formal requirements and a maximum of opportunities for students to pursue their own interests under the guidance of the faculty. Each student's work is supervised by his or her academic adviser and by a committee consisting of two additional members of the graduate faculty for M.S. students and three or four additional members for doctoral students.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

GEOGRAPHY (GEOG) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/14/04

Last updated by Publications: 10/28/09

Geosciences (GEOSC)

Program Home Page (Opens New Window)

TIMOTHY J. BRALOWER, *Head of the Department of Geosciences*
KATHERINE H. FREEMAN, *Associate Head for Graduate Programs and Research*
DAVID BICE, *Associate Head for Undergraduate Programs*

Degrees Conferred:

- Ph.D., M.S.
- Integrated B.S/M.S. Program in Geosciences

The Graduate Faculty

- Shelton S. Alexander, Ph.D. (Cal Tech) Professor Emeritus of Geophysics
- Richard B. Alley, Ph.D. (Wisconsin, Madison) Evan Pugh Professor of Geosciences
- Charles J. Ammon, Ph.D. (Penn State) Associate Professor of Geosciences
- Sridhar Anandakrishnan (Wisconsin, Madison) Associate Professor of Geosciences
- Michael A. Arthur, Ph.D. (Princeton) Professor of Geosciences
- Hubert L. Barnes, Ph.D. (Columbia) Distinguished Professor Emeritus of Geochemistry
- Eric J. Barron, Ph.D. (Miami) Professor of Geosciences; Dean, College of Earth and Mineral Sciences
- Timothy J. Bralower, Ph.D. (California, San Diego) Professor of Geosciences
- Susan L. Brantley, Ph.D. (Princeton) Professor of Geosciences
- Roger J. Cuffey, Ph.D. (Indiana) Professor of Paleontology
- David H. Eggler, Ph.D. (Colorado) Professor Emeritus of Petrology
- Terry Engelder, Ph.D. (Texas A&M) Professor of Geosciences
- Donald M. Fisher, Ph.D. (Brown) Professor of Geosciences
- Peter B. Flemings, Ph.D. (Cornell) Professor of Geosciences
- Katherine H. Freeman, Ph.D. (Indiana) Professor of Geosciences
- Kevin P. Furlong, Ph.D. (Utah) Professor of Geosciences
- Tanya Furman, Ph.D. (MIT) Associate Professor of Geosciences
- Earl K. Graham, Ph.D. (Penn State) Professor Emeritus of Geophysics
- Peter Heaney, Ph. D. (Johns Hopkins) Associate Professor of Geosciences
- Christopher H. House, Ph.D. (California) Assistant Professor of Geosciences
- James F. Kasting, Ph.D. (Michigan) Professor of Geosciences and Meteorology
- Klaus Keller, Ph.D. (Princeton) Assistant Professor of Geosciences
- Derrill M. Kerrick, Ph.D. (California, Berkeley) Professor Emeritus of Geochemistry
- Eric Kirby, Ph.D. (MIT) Assistant Professor of Geosciences
- James Kubicki, Ph.D. (Yale) Associate Professor of Geosciences
- Lee R. Kump, Ph.D. (South Florida) Professor of Geosciences
- Christopher J. Marone, Ph.D. (Columbia) Professor of Geosciences
- Raymond G. Najjar, Ph.D. (Princeton) Associate Professor of Meteorology
- Andrew A. Nyblade, Ph.D. (Michigan) Associate Professor of Geosciences
- Hiroshi Ohmoto, Ph.D. (Princeton) Professor of Geochemistry
- Richard R. Parizek, Ph.D. (Illinois) Professor of Geology
- Mark E. Patzkowsky, Ph.D. (Chicago) Associate Professor of Geosciences
- Arthur W. Rose, Ph.D. (Cal. Tech.) Professor Emeritus of Geochemistry
- Rudy L. Slingerland, Ph.D. (Penn State) Professor of Geology
- Barry Voight, Ph.D. (Columbia) Professor of Geology
- William B. White, Ph.D. (Penn State) Professor Emeritus of Geochemistry
- Peter Wilf, Ph.D. (Pennsylvania) Assistant Professor of Geosciences

M.S. and Ph.D. Degrees

The Department of Geosciences offers M.S. and Ph.D. degree programs that provide students with a broad background in any of the major areas of geological sciences and intensive research experiences culminating in the preparation of a formal thesis. The goal of the programs is to prepare students for scientific careers in academia, government, or industry. A wide range of faculty interests and exceptional laboratory and other support facilities provide an extensive variety of areas of specialization in which students may choose their course work and research topics, which include: aqueous geochemistry, chemistry and physics of rocks and mineral, geodynamics, global change and earth history, sedimentary geology and paleobiology, solid earth and applied geophysics, surficial processes. A complete listing can be found at: www.geosc.psu.edu.

The research of faculty and students is facilitated through: the Biogeochemical Research Initiative for Education (BRIE, an NSF-sponsored graduate program in microbial biogeochemistry), the Petroleum Geosystems Initiative (an industry-sponsored, team-based M.S. program) linking the Department of Geosciences and the Department of Energy and Geo-Environmental Engineering and the Penn State Astrobiology Research Center (PSARC, an NSF-sponsored interdisciplinary program in the origin and evolution of life in the universe, aimed at understanding the connections between the environment and the biota on Earth, especially during the stages of its evolution) as well as the Environment Institute of the College of Earth and Mineral Sciences, including the Earth System Science Center, and the Center for Environmental Chemistry and Geochemistry.

In addition to extensive computing and supercomputing facilities developed in association with the Earth System Science Center, students have access to a wealth of analytical, experimental, and field equipment. State-of-the-art analytical equipment is maintained by the department and the Material Characterization Laboratory. The Department of Geography and the Office for Remote Sensing of Environmental Resources have remote sensing facilities.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are normally required for admission. Exceptions must be approved by the

department.

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

For admission, applicants generally are expected to have a bachelor's degree in some branch of the natural or physical sciences, engineering, or mathematics. An applicant also is expected to have completed standard introductory courses in geosciences, chemistry, physics, and mathematics through integral calculus, plus 15 credits of intermediate-level work in one or a combination of these subjects. Greater than minimal preparation in chemistry, geology, biology, mathematics, or physics may be required for particular subdisciplines. Applicants who have taken somewhat less than the indicated minimum in these subjects may be admitted but must make up their deficiencies concurrently with their graduate studies.

Students with special backgrounds, abilities, and interests whose undergraduate grade-point average in courses pertinent to geosciences is below a 3.00 (on a 4.00 scale) will be considered for admission only when there are strong indications that a 3.00 average can be maintained at the graduate level.

Students are admitted both to the M.S. and Ph.D. degree programs. A student may work toward a Ph.D. degree without first earning a master's degree. If this option is desired, the student must arrange the scheduling of a candidacy evaluation no later than the end of the third semester of residence at Penn State.

Faculty Advisers

Upon arrival, students will be advised initially by a committee appointed by the associate head for Graduate program and Research. The committee in turn will designate an interim adviser. Before the end of the first academic year of residence, the student is expected to develop specific academic and research interests so that an appropriate permanent academic adviser and research supervisor may be chosen. The academic adviser and research supervisor are usually the same person, except when the research supervisor is not a member of the geosciences graduate faculty. In such a case, a geosciences program family member serves as the academic adviser.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the Graduate Bulletin. In addition, several graduate fellowships are available for students within the Department of Geosciences.

Programs of study are planned to require no more than two years for the M.S. degree and three additional years, or five years total, for the Ph.D. degree. A student transferring to the department with the M.S. degree should plan on four additional years. Financial support from teaching or research assistantships or from fellowships is available to students in good standing, but not awarded beyond these limits except in unusual cases.

Common Degree Requirements

All graduate students in geosciences, including both M.S. and Ph.D. students, are expected to acquire breadth of knowledge in the geosciences, a fundamental and advanced knowledge of their subdiscipline, and skills in the areas of data collection and quantitative analysis. Toward that end, all graduate students must select one of the approved courses in each of the following areas: (1) Geosciences Breadth -- 3-4 credits; (2) Disciplinary Fundamentals -- 3--4 credits; (3) Data Gathering -- 3--4 credits; and (4) Quantitative Analysis -- 3--4 credits.

Prescribed courses (3 credits): GEOSC 500 (3)

Additional Courses
Disciplinary Fundamentals: Select 3 credits from GEOSC 488(4), GEOSC 489(4), GEOSC 502(4), GEOSC 507(3), GEOSC 518(3), GEOSC 519(3), GEOSC 533(3), GEOSC 542(1-4), GEOSC 548(3), GEOSC 585(3)

Data Gathering and Interpretation: Select 3 credits from GEOSC 410(3), GEOSC 413W(3), GEOSC 483(3), GEOSC 508(3), GEOSC 558(4), GEOSC 565(3), GEOSC 572(1-2)

Quantitative Analysis: Select 3 credits from E MCH 524A(3), GEOSC 514(3), GEOSC 560(3), GEOSC 561(4), MNG 557(3-6), P N G 425(3); GEOSC 597(3) (either Multivariate Analyses in Geosciences OR Data Analysis in the Earth Sciences)

A current list of approved courses is maintained by the Department's Graduate Program Office in room 507 Deike Building. The list of approved courses may be modified by approval of the Department's Graduate Program Committee.

Additional Master's Degree Requirements

Master's degree students are required to take 30 graduate credits, which include at least 18 credits at the 500 to 600 level. The 12 to 16 common degree credits described above satisfy the Graduate School minimum of at least 12 credits in course work in the major program.

As part of the M.S. program, each student is required to complete a thesis. The thesis must be defended in an oral examination administered by an M.S. committee.

Additional Doctoral Degree Requirements

Admission to Ph.D. candidacy is determined by an oral examination before a candidacy committee. Preparation and defense of two research proposals will serve as one means of assessing the student's ability. At least one of these proposals should represent original work by the student, but the other may be an actual thesis proposal and involve limited initial input from the adviser or others.

Course work in addition to the common degree requirements described above will be selected by the student in consultation with his/her committee.

The comprehensive examination is both oral and written. It is administered by the doctoral committee after the student has essentially completed course work and after a foreign language requirement (if required by the committee) is fulfilled. A final oral defense of the thesis is required.

Biogeochemistry Dual-Title Degree Program

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree Program. Students in the Biogeochemistry Dual Title program are required to have two advisers from separate disciplines: one individual

serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. Additional coursework from an approved list of courses is required. All students must pass a candidacy examination that includes an assessment of their potential in the field of biogeochemistry. A single candidacy examination that includes biogeochemistry will be administered for admission into the student's Ph.D. program, as well as the biogeochemistry dual-title. The structure and timing of this exam will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise in biogeochemistry. The field of biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of biogeochemistry is required.

Integrated B.S/M.S. Program in Geosciences

The Department of Geosciences offers an integrated B.S./MS. Program that is designed to allow academically superior students to obtain both the B.S. and the M.S. degree in Geosciences within 5 years of study. Students who wish to complete the Integrated B.S./M.S. Program in Geosciences must apply for admission to the Graduate School and the Integrated B.S/M.S program by the end of their junior year

During the first three years, the student follows the course scheduling of one of the options in Geosciences (see *Undergraduate Degree Program Bulletin*); however, if a student intends to enter the Integrated B.S./M.S. program, he/she would be encouraged to take, wherever appropriate, upper level classes. By the end of the junior year, the student normally would apply for admission to the program. A decision of acceptance would be made prior to the beginning of the senior year and a M.S. Advising Committee would be appointed. During the senior year, the student would follow the scheduling of the B.S. Geosciences option he/she has selected, with an emphasis on completing 500-level coursework wherever appropriate. During the senior year, the student will start work on a thesis designed to meet the departmental requirements of a M.S. Thesis. During the fifth year, the student will take courses fulfilling the departmental M.S. degree requirements and complete the M.S. Thesis. Undergraduate tuition rates will apply as long as the student is an undergraduate, unless the student receives financial support, for example, an assistantship requiring the payment of graduate tuition.

Admission Requirements

Students who wish to complete the Integrated B.S/M.S. Program in Geosciences must apply for admission to the Graduate School and the Integrated B.S/M.S program at the by the end of their junior year. Typical test scores of students admitted to the Geosciences Graduate Program are: GPA 3.5, and GRE's Verbal 570, and Quantitative 700. Three letters of recommendation by faculty members for admission to graduate studies are required. The applications are reviewed by the Admissions Committee of the Geosciences Graduate Program and acted upon by the Associate Head for Graduate Programs.

Requirements

B.S. Degree Portion: Total B.S. Requirements - 121 Credits
(For details on courses see the *Undergraduate Degree Programs Bulletin*.)

General Education: 45 Credits
18 of these are included in the REQUIREMENTS FOR THE MAJOR

Requirements for the Major - 94 Credits

Common Requirements for all options - 61 Credits

Prescribed Courses - 61 credits

Additional Courses - 3 Credits

Additional Geosciences Courses - 15 Credits

Supporting Courses and Related Areas - 15 Credits

M.S. Portion: Total M.S. Requirements - 30 Credits

Prescribed Courses: GEOSC 501(1), GEOSC 600(1-15)

Additional Courses - 9 credits

Disciplinary Fundamentals: Select 3 credits from GEOSC 479, GEOSC 481, GEOSC 489, GEOSC 519, GEOSC 533, GEOSC 548, GEOSC 585

Data Gathering: Select 3 credits from GEOSC 413W, GEOSC 483, GEOSC 558, GEOSC 565, GEOSC 572

Quantitative Analysis: Select 3 credits from E MCH 524A, GEOSC 560, GEOSC 561, GEOSC 514, MNG 557, P N G 425, P N G 430, P N G 511, STAT 500

Additional Geosciences Courses at the 400 and 500 level - 6 Credits

Supporting Areas: 6 Credits of Graduate course work.
These courses should be related to the thesis work of the student.

If a student has accumulated more than 121 Credits as an undergraduate student, 9 credits of 400- or 500-level class credits can be transferred to the MS program, provided these courses were not used to fulfill BS requirements.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

GEOSCIENCES (GEOSC) course list

NOTE: GEOSC 439, GEOSC 470W, GEOSC 472A, GEOSC 472B includes from one to several field trips for which an additional charge will be made.

Unit A.
(MATSC) POWDER X-RAY DIFFRACTION (1) Compound identification, lattice parameter measurement, and other applications of the powder diffraction method.

Unit B.
(MATSC) TRANSMISSION ELECTRON MICROSCOPY (1) Principles and practice of transmission electron microscope operation. Students undertake individual projects.

Unit C.
(MATSC) SPECTROSCOPY (1) Emission spectrographic analysis of powders and atomic absorption analysis of solutions.

Unit D.
(MATSC) ELECTRON MICROPROBE ANALYSIS (1) Qualitative and quantitative elemental analysis of microvolumes within solids. Emphasis on individual student projects.

Unit E.
(MATSC) SCANNING ELECTRON MICROSCOPY (1) Principles and practice of scanning electron microscope operation. Students undertake individual projects.

Unit G.
(MATSC) ANALYTICAL ELECTRON MICROSCOPY (1) Modern analytical electron microscope techniques: scanning transmission electron microscopy; electron energy loss spectroscopy; energy dispersive analysis of X-rays. Prerequisite: MATSC (GEOSC) 511B.

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-06-185D

Review Date: 4/15/08

Last revised by Publications: 6/25/10

German (GER)

Program Home Page

B. RICHARD PAGE, *Head of the Department*
427 Burrowes Building
814-865-5481

Degree Conferred:

Ph.D., M.A.
Dual-Title PH.D. Degree in German and Language Science

The Graduate Faculty

- Thomas O. Beebee, Ph.D. (Michigan) Distinguished Professor of Comparative Literature and German
- Hartmut Heep, Ph.D. (Illinois) Associate Professor of German and Comparative Literature
- Carrie N. Jackson, Ph.D. (Wisconsin, Madison) Assistant Professor of German and Linguistics
- Martina Kolb, Ph.D. (Yale) Assistant Professor of German and Comparative Literature
- Bettina E. Mathes, M.A., Ph.D. (Humboldt) Associate Professor of German; Science, Technology, and Society; and Women's Studies
- B. Richard Page, Ph.D. (Wisconsin, Madison) Associate Professor of German and Linguistics
- Daniel Purdy, Ph.D. (Cornell) Associate Professor of German
- Dennis Schmidt, Ph.D. (Boston College) Professor of Philosophy, German, and Comparative Literature
- Adrian Wanner, Ph.D. (Columbia) Professor of Russian and Comparative Literature

Programs of study with major emphasis upon literature, culture, linguistics, or applied linguistics lead to advanced degrees.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are desirable. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin.*

Minimum qualifications for admission include 30 undergraduate credits in German beyond the intermediate level. Provision is made, however, for admission with limited deficiencies. Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. Requirements for admission to the M.Ed. degree program include 18 credits in education and related psychology. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Master's Degree Requirements

The M.A. in German is designed to offer students a general foundation in German culture, language, linguistics, and literature. After completing a small set of core requirements, students may pursue their individual interests from among the courses offered by faculty who specialize in German Applied Linguistics, Culture, Linguistics, and Literature. The M.A. degree requires a minimum of 36 credits and is designed as a terminal degree.

The following courses are required for the M.A. degree:

- German 510: Introduction to Literary Criticism and Its Application
- German 511: The Teaching of College German
- German 512 or 515: Introduction to German Linguistics or Introduction to German Applied Linguistics

Practical experience in supervised teaching is required for all graduate degrees. Students who wish to earn a Master's Degree must write a research paper of between thirty and fifty pages on a topic defined in conjunction with a faculty adviser. The research paper should demonstrate mastery of primary and secondary literature, interpretative skills, and academic prose in both German and English. A one-hour oral defense of the paper shall be scheduled two weeks after its formal submission to the adviser. A committee consisting of faculty adviser and two other members of the German program selected by the M.A. candidate shall evaluate the student's knowledge of the subject matter.

Doctoral Degree Requirements

For the Ph.D., a student must complete at least 66 credits (including M.A. credits) of graduate-level work. GER 510, 511, and 512 or 515 are required of all students. Other requirements include: (1) demonstrated reading knowledge of one foreign language in addition to German and English, (2) successful passing of the comprehensive examination with written and oral components, and (3) completed doctoral dissertation. Students specialize in one of two options: German Literature and Culture, or German Applied Linguistics. The Literature and Culture option allows students to combine courses in various fields to create an interdisciplinary program of study. In addition to the 9 credits of required work, students will complete 57 credits chosen in consultation with an adviser from courses that allow students to create an interdisciplinary program of study. The Applied Linguistics option requires 15 credits in the core areas of German, 21 credits of German electives (6 of which must be in German linguistics), a minimum of 21 credits in six core areas of Linguistics and Applied Language Studies (LALS), and 9 credits of LALS electives.

Dual-Title Graduate Degree in German and Language Science

Graduate students with research and educational interests in German and Language Science may apply to German and Language Science Ph.D. Graduate Program. The goal of the dual-title degree German and Language Science graduate program is to enable graduate students from German to acquire the knowledge and skills of their major area of specialization in German, while at the same time gaining the perspective and methods of the Language Sciences.

Admission Requirements

To pursue a dual-title degree under this program, the student must first apply to the Graduate School and be admitted through the

Department of Germanic and Slavic Languages and Literatures (see below for admission requirements for the Graduate Program in German). Upon admission to the German Program and with a recommendation from a Language Science program faculty member in the Department of Germanic and Slavic Languages and Literatures, the student's application will be forwarded to a committee that will include the Director of the Linguistics Program, one of the Co-Directors of the Center for Language Science, and a third elected faculty member within the Center for Language Science. All three committee members will be affiliated with the Program in Linguistics. Upon the recommendation of this committee, the student will be admitted to the dual-title degree program in Language Science.

Requirements for the Dual-Title Ph.D. Degree in German and Language Science

The doctoral degree in German and Language Science is awarded only to students who are admitted to the German doctoral program and admitted to the dual-title degree in Language Science. The minimum course requirements for the dual-title Ph.D. degree in German and Language Science, in addition to the German Program requirements, are as follows:

- Language Science proseminar courses (LING 521 and LING 522; 6 credits).
- Research Methods/Statistics (LING 525 or equivalent; 3 credits).
- Theoretical Linguistics (LING 500 or LING 504; 3 credits)
- Cognitive Neuroscience or Psycholinguistics (LING/PSY 520, PSY 511 or equivalent; 3 credits)
- Research internships with two different Language Science faculty mentors (CSD 596, GER 596, LING 596, PSY 596, SPAN 596; 6 credits).

Particular courses may satisfy both the German requirements and those in the Language Science program. Final course selection is determined by the student in consultation with the dual-title program advisors and the major program advisors. Students who already hold a master's degree from another institution may petition to have equivalent course credits accepted.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

EXCHANGE FELLOWSHIPS AT CHRISTIAN ALBRECHTS UNIVERSITÄT, KIEL, AND THE PHILLIPS UNIVERSITÄT, MARBURG--Available to graduate students in German and other fields for a full academic year. Students must have a good command of German.

WALTER EDWIN THOMPSON AND DR. REGINA BLOCK THOMPSON SCHOLARSHIP FUND--Thompson Fellowships are available each year for graduate students in the Department of Germanic and Slavic Literatures and Languages. These fellowships can be awarded in addition to other grants or stipends.

Courses

*GER 001G. ELEMENTARY GERMAN FOR GRADUATE STUDENTS (3) Designed for students preparing to satisfy language requirements for advanced degrees.
*GER 002G. ELEMENTARY GERMAN FOR GRADUATE STUDENTS (3) Continuation of GER 001G, with opportunity for reading in special fields.

*No graduate credit is given for this course.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

GERMAN (GER) course list

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-093

Review Date: 01/12/2010

Last updated by Publications: 8/20/09

Health Administration (H ADM)

Program Home Page (Opens New Window)

JAMES T. ZIEGENFUSS, Jr., *Graduate Program Coordinator*
School of Public Affairs, Penn State Harrisburg
W-160 Olmsted Building; 717-948-6226

Degree Conferred:

M.H.A.

Graduate Faculty

- Cynthia Mara, Ph.D. (Virginia Tech) *Associate Professor of Health Care Administration and Policy*
- Goktug Morcol, Ph.D. (Virginia Tech) *Associate Professor of Public Administration*
- Bing Ran, Ph.D. (Waterloo) *Assistant Professor of Public Administration*
- Jill S. Rumberger, Ph.D. (Penn State) *Assistant Professor of Health Administration*
- Triparna Vasavada, Ph.D. (SUNY-Albany) *Assistant Professor of Public Administration*
- James T. Ziegenfuss, Jr., Ph.D. (Penn/Wharton School) *Professor of Management and Health Care Systems*

Recognizing that the national health care system is in a period of reform and redesign, the program emphasis involves design/redesign in a 36-credit curriculum. Based on eight core courses defined as the foundation of administration in health care, the degree is designed for part-time professional students already engaged in health administration careers. The mission of the program is to further student knowledge and skills in a continuous learning cycle. Students are expected not only to know the existing health system, but are to develop a capability for design consistent with demands of access to care, management, and control of costs and quality of care delivery.

Part-time students may start the program at the beginning of any semester. They usually take one or two 3-credit courses each semester. Students may also take one or two courses during the summer session to maintain steady progress toward the degree. All Health Administration courses are available during the evening for the convenience of part-time students. A student may complete the M.H.A. on a part-time basis in about two to four years.

Admission Requirements

Applicants must have received their baccalaureate degree from an accredited college or university prior to starting the graduate program. Applicants who are still completing their baccalaureate requirements at the time of the application may be admitted to the Graduate School conditional on the awarding of the baccalaureate degree.

Admission to the MHA program is based on clear suitability for the MHA program as demonstrated by the application as a whole, to include: a completed application, evidence of a bachelor's degree from an accredited college; a statement of career and educational goals; a successful undergraduate record with a grade-point average of 3.00 (with particular attention given to the last two years of undergraduate work); satisfactory scores on the Graduate Record Examination (GRE) or Graduate Management Admission Test (GMAT) are required if the GPA is less than 3.00; three years of work experience; and names of three references willing to provide recommendations.

The GPA requirement may be relaxed if the student has professional experience or other strong evidence suggesting likely success in the MHA program. Some applicants may be accepted on a non-matriculated probationary basis, pending performance at the B (3.00) level over 15 hours of approved credit.

Program Requirements

All undergraduate degrees are acceptable for admission. All students are expected to have had at least an introductory course in statistics and statistical software.

If these introductory knowledge and skill areas have not been completed prior to admission they must be satisfied prior to completion of 12 graduate credits. Reading and introductory courses--for which not graduate credit is given--are available at Penn State Harrisburg. The computer area may be satisfied by completing a 1-credit computer course: P ADM 486 Applied Statistical Package.

The degree requires a minimum of 36 graduate credits, including a 3-credit, faculty-supervised paper. Three credits of 400-level work may be included in the electives. An overall 3.00 (B) grade-point average must be earned in all 400- and 500-level work.

REQUIRED COURSES: 24 credits
H ADM 539, H ADM 540, H ADM 541, H ADM 542, H ADM 545, P ADM 503, P ADM 506, P ADM 510

ELECTIVE CONCENTRATION: 9 credits
H ADM 543, H ADM 546, H ADM 548, H ADM 551, H ADM 552, H ADM 597, P ADM 505, P ADM 511, P ADM 512, P ADM 514, P ADM 515, P ADM 516, P ADM 520

CAPSTONE COURSE: 3 credits
H ADM 594

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HEALTH ADMINISTRATION (H ADM) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/26/04

Graduate Bulletin Archive - July 2010

Last updated by Publications: 10/06/09

The Pennsylvania State University

Health Education (HLHED)

Program Home Page (Opens New Window)

SAMUEL W. MONISMITH, *Program Coordinator*
Penn State Harrisburg
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777 W. Harrisburg Pike
Middletown, PA 17057-4898
717-948-6515
E-mail: swm3@psu.edu

Degrees Conferred:

M.Ed.

The Graduate Faculty

- Raffy R. Luquis, Ph.D. (Arkansas) *Associate Professor of Health Education*
- Samuel W. Monismith, D.Ed. (Penn State) *Associate Professor of Health Education*

The Health Education program emphasizes behavioral and organizational strategies to plan, implement, and evaluate interventions that enable individuals, groups and communities to achieve personal, environmental, and social health. It complements other professional fields such as education, nutrition, physical therapy, occupational therapy, dental hygiene, nursing, health care administration, and preventive psychology.

The program follows a professional development focus, as many of the students are employed in the broad areas of disease prevention andhealth promotion and are pursuing graduate study on a part-time basis. The M.Ed. is a professional degree emphasizing applied research.

The program requires a research-based culminating experience. The faculty has a broad range of interests, including health promotion, family systems, teaching and training methods, violence and substance abuse prevention and control, and multicultural health issues.

A minimum of 30 graduate credits is required for the completion of the degree. A 3 credit research-based culminating writing experience is required. The program requires students to complete 21 credits in Prescribed Core courses and 9 credits in Elective courses.

Admission Requirements

Students must have a baccalaureate degree from an accredited college or university, an overall minimum undergraduate grade-point average of 2.50 and a junior/senior GPA of 3.00 (on a 4.00 scale) for admission into the program. Students are also required to submit:

- A completed application form with application fee;
- Two copies of an official transcript from an accredited, college-level university;
- Supplementary application.

An application is available on the Web at www.hbg.psu.edu (Opens New Window) or by calling 717-948-6250.

Degree Requirements

A minimum of 30 graduate credits is required for the completion of the degree. A 3-credit research-based culminating experience is required. The program has a required core of courses totalling 18 credits as follows:

Prescribed Core Courses: 21 credits

- HLHED 415 Planning and Development of Health Education Programs (3)
- HLHED 456 Advanced Techniques in School and Community Health Education (3)
- EDUC 440 Education Statistics and Measurement (3) or EDPSY 400 Introduction to Statistics in Educational Research (3)
- HLHED 552 Current Health Education Issues (3)
- HLHED 553 Multicultural Health Issues (3)
- EDUC 586 Educational Research Design (3) or HLHED 530 Research Techniques in Health Education (3)
- *Culminating Experience:* HLHED 591 Culminating Health Education Seminar (3) or HLHED 587 Master's Project (3)

Elective Courses: 9 credits

A minimum of 12 credits is to be selected from the following HLHED courses: HLHED 420, 421, 443, 497, 501, 516, 590, 596, or 597.

Students also may select electives from suitable courses in Psychology, Community Psychology and Social Change, Education, Training and Development, or Health Administration programs. Note that 6 credits must be at the 500 level. Please contact the program office for further information about electives.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HEALTH EDUCATION (HLHED) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/26/04

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-435

Review Date: 6/12/07

Last updated by Publications: 7/7/05

Health Policy and Administration (H P A)

Program Home Page

DENNIS G. SHEA, *Head*
604 Ford Building
814-863-5421

Degrees Conferred:

- M.S., Ph.D., M.H.A., M.B.A./M.H.A.(concurrent)
- Integrated B.S. in Health Policy and Administration/Master of Health Administration (MHA) Admission and Degree Requirements

The Graduate Faculty

- Rhonda BeLue, Ph.D. (Cornell) *Assistant Professor of Health Policy and Administration*
- S. Diane Brannon, Ph.D. (Cornell) *Professor of Health Policy and Administration*
- Kathryn H. Dansky, Ph.D. (Ohio State) *Associate Professor of Health Policy and Administration*
- Jami DelliFraine, Ph.D. (Virginia Commonwealth) *Adjunct Assistant Professor of Health Policy and Administration*
- Elizabeth Farmer, Ph.D. (Duke) *Associate Professor of Health Policy and Administration*
- Marianne Hillemeier, Ph.D. (Michigan) *Associate Professor of Health Policy and Administration, Demography, Health Evaluation Sciences, Obstetrics and Gynecology, and Nursing*
- Kyoungrae Jung, Ph.D. (Yale) *Assistant Professor of Health Policy and Administration*
- Peter Kemper, Ph.D. (Yale) *Professor of Health Policy and Administration, and Demography*
- Deirdre McCaughey, Ph.D. (Manitoba) *Assistant Professor of Health Policy and Administration*
- Michael R. Meacham, J.D. (Kansas) *Associate Professor of Health Policy and Administration; Director of Professional Development and External Relations*
- Jessica Mittler, Ph.D. (Harvard) *Assistant Professor of Health Policy and Administration*
- John Moran, Ph.D. (Penn State) *Assistant Professor of Health Policy and Administration*
- Dennis Scanlon, Ph.D. (Michigan) *Associate Professor of Health Policy and Administration; Professor-in-Charge of M.S./Ph.D. Program*
- Mark Sciegaj, Ph.D. (Brandeis) *Associate Professor of Health Policy and Administration*
- Dennis G. Shea, Ph.D. (Rutgers) *Professor of Health Policy and Administration and Economics; Department Head*
- Pamela Farley Short, Ph.D. (Yale) *Professor of Health Policy Administration, Demography, and Health Evaluation Sciences*
- Joseph Vasey, Ph.D. (Penn State) *Assistant Professor of Health Policy and Administration*
- Karen Volmar, J.D. (Boston College) *Associate Professor of Health Policy and Administration; Executive Director, Master of Health Administration*

The graduate degrees in the Department of Health Policy and Administration focus on management, policy, and research in health services, with particular attention to the recurrent problems of cost, quality, and access to health services.

The doctoral program (Ph.D.) is designed to provide advanced knowledge and skills in health services research, with an emphasis track in health policy and economics, health care organizations or population health and demography. The doctorate in H P A prepares students to become independent health services researchers in academic and nonacademic settings.

The Master of Science (M.S.) degree in Health Policy and Administration provides a solid foundation of knowledge and skills in health services research. The M.S. in H P A prepares students for further graduate study toward a doctorate in health services research or related fields or for research and analytic work in academic and nonacademic health services research settings.

The professional Master of Health Administration (M.H.A.) program prepares students for the complexities they will face in managing organizations that plan, finance and deliver health care. The curriculum emphasizes strategic decision-making, financial management, communication and detailed aspects of the U.S. health care system. These include health law, epidemiology, health insurance, government health-financing programs, ethics, managed care, long-term care, health care technology, marketing, and strategic planning for health services.

The integrated B.S. in Health Policy and Administration/Master of Health Administration (M.H.A.) program allows qualified undergraduate students to earn both degrees in five calendar years of full time academic study. Students completing an integrated B.S./M.H.A. are prepared to advance quickly to positions of leadership in health care organizations.

The M.B.A. program of the Smeal College of Business and the Department of Health Policy and Administration of the College of Health and Human Development offer a concurrent degree program. The M.B.A./M.H.A. graduate will be well-grounded in both business and health management and prepared for positions in hospitals, nursing homes, managed care and health insurance organizations, health care consulting, and pharmaceutical companies,as well as for helping businesses in all sectors understand the unique features of the health care system.

Doctoral Admission and Degree Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Satisfactory scores from either the Graduate Management Admission Test (GMAT) or the Graduate Record Examination (GRE) are required for admission; the GRE is preferred. A junior/senior grade-point average of 3.00 or better (on a 4.00 scale) and a well-considered statement of experience and career goals are major criteria for admission. Some work experience in health services is preferred, but not required.

The H P A doctoral curriculum includes study in three substantive areas: (1) core courses in health services organization, delivery, finance and policy; (2) core courses in health services research methods and statistics, and (3) courses and a doctoral thesis in an emphasis track approved by the doctoral committee.

M.S. Admission and Degree Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad*

Graduate Bulletin.

Satisfactory scores from either the Graduate Management Admission Test (GMAT) or the Graduate Record Examination (GRE) are required for admission; the GRE is preferred. A junior/senior grade-point average of 3.00 or better (on a 4.00 scale) and a well-considered statement of experience and career goals are major criteria for admission. Some work experience in health services is preferred, but not required.

The M.S. curriculum in H P A includes study in three substantive areas: (1) a core set of courses in health services organization, delivery, finance, and policy; (2) courses in health services research methods and statistics, and (3) courses and a master's thesis approved by the thesis advisor. At least 15 credits of the program must be completed in H P A departmental course offerings at the 400-and 500-level. At least 18 credits of the degree must be in 500-and 600-level courses. A 6-credits master's thesis must be completed as part of the degree requirement.

M.H.A. Admission and Degree Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Satisfactory scores from either the Graduate Management Admission Test (GMAT) or the Graduate Record Examination (GRE) are required for admission; the GRE is preferred. This requirement may be waived for applicants with extensive work experience. A junior/senior grade-point average of 3.00 or better (on a 4.00 scale), a relevant personal statement and three letters of recommendation are necessary. Some work experience in health care is preferred, but not required.

The program can be completed on a full-time basis in 21 months or on a part-time basis. Requirements for the completion of the M.H.A., include 49 credits with at least 18 credits at the 500-or 800-level with a minimum of 6 credits specifically in 500-level courses. Included in the 49 credits are both a ten-week summer residency in a health care setting and a capstone course to demonstrate evidence of analytical ability and synthesis of material.

Integrated B.S. in Health Policy and Administration/Master of Health Administration (M.H.A.) Admission and Degree Requirements

The following credentials will be considered for admission:

- A demonstrated ability to communicate effectively, an advanced level of maturity, and high motivation to pursue a career in the health care field
- Academic references
- Successful completion of 60 undergraduate credits having maintained a cumulative GPA of 3.4 or better

Students admitted to the B.S. in Health Policy and Administration/M.H.A. are able to earn both the B.S. and M.H.A. in five calendar years of full-time academic study.

M.B.A./M.H.A. Concurrent Degree Program Admission and Degree Requirements

Students may apply to be admitted to either the M.H.A. or the M.B.A. program initially. During the initial year in either graduate program, students may apply to complete the concurrent degree program and must meet admission requirements for the other program. See the M.H.A. and M.B.A. degree program descriptions for further admission requirements of each program.

Students complete 88 credits associated with both the M.H.A. and M.B.A. degrees. Included within the required credits is a 10-week integrated residency during a summer. The time required to complete the M.B.A./M.H.A. can be as much as 34 months.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HEALTH POLICY AND ADMINISTRATION (H P A) course list

Last Revised by the Department: Spring Semester 2010

Blue Sheet Item #: 38-06-137

Review Date: 04/13/2010

Last updated by Publications: 7/02/10

Higher Education (HI ED)

Program Home Page (Opens New Window)

DOROTHY EVENSEN, *Professor-in-Charge of Graduate Programs in Higher Education*
400 Rackley Building
814-863-2690
Highered@psu.edu

Degrees Conferred:

Ph.D., D.Ed., M.Ed.

The Graduate Faculty

- Michael Dooris, Ph.D. (Penn State) Affiliate Assistant Professor of Education
- Dorothy H. Evensen, Ph.D. (New York U) Associate Professor of Education
- Roger L. Geiger, Ph.D. (Michigan) Distinguished Professor of Education
- Kimberly A. Griffin, Ph.D. (UCLA) Associate Professor of Education
- Donald E. Heller, Ed.D. (Harvard) Associate Professor of Education
- Robert M. Hendrickson, Ed.D. (Indiana) Professor of Education
- Lisa R. Lattuca, Ph.D. (Michigan) Assistant Professor of Education
- Beverly Lindsay, Ph.D. (American) Professor of Education
- David M. Post, Ph.D. (Chicago) Professor of Education
- Robert D. Reason, Ph.D. (Iowa State) Assistant Professor of Education
- Patrick T. Terenzini, Ph.D. (Syracuse) Professor of Education
- M. Lee Upcraft, Ph.D. (Michigan State) Adjunct Professor of Education
- Roger L. Williams, D.Ed. (Penn State) Affiliate Assistant Professor of Education

The graduate program in Higher Education has as its goal the preparation of individuals who will pursue careers and exert leadership in postsecondary education as administrators, faculty, or researchers in the nation's colleges and universities and in a variety of public and private agencies and associations in the United States and other nations. With emphasis on the systematic study of higher education, the program builds on the scholarly and scientific disciplines offered throughout the University and applies these studies to the professional functions and responsibilities that its graduates will assume, and to the knowledge of the field of higher education. The program is concerned with four broad areas of higher education study and with three areas of special emphasis: academic programs and evaluation, organization and administration, and perspectives on higher education policy and practice.

With mounting awareness of the changes occurring in various academic and professional fields, of the need for higher education reform, and of the need for improved articulation among the various levels of education, higher education faculty cooperates with other departments of the University to offer a number of courses and seminars for graduate students interested in pursuing a minor in higher education.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by the graduate program and authorized by the dean of the Graduate School, such as the Miller Analogies Test (MAT), are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

APPLICATION DEADLINE: Candidates may enter the program at the beginning of the fall or spring semester, or the summer session. To allow sufficient time for processing applications, required information must be received by January 1 for international applicants and those wishing to be considered for Graduate Fellowships, or February 1 for all other applicants. Those wishing consideration for the spring semester should submit materials by September 15. Applicants should contact the program office for additional application materials.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Joint Degree Program between The Pennsylvania State University Dickinson School of Law (J.D.) and the Higher Education Program (M.Ed., D.Ed., Ph.D.)

Joint Degree Program. The Pennsylvania State University Dickinson School of Law (DSL) and the Higher Education (HI ED) Program are offering a joint degree program leading to a Juris Doctor (J.D.); and a Master of Education (M.Ed), a Doctor of Education (D.Ed), or a Doctor of Philosophy (Ph.D). in Higher Education.

Admission Requirements

The number of openings in the joint degree J.D./M.Ed., D.Ed., or Ph.D. program will be limited to students with an outstanding academic record who have successfully completed two semesters at the Dickinson School of Law.

Applicants to the joint degree program:

1. must have been admitted to the Dickinson School of Law
2. should have successfully completed two semesters of course work at the Dickinson School of Law with a grade-point average of 3.0
3. must submit two letters of recommendation from the Dickinson School of Law faculty
4. must submit a career statement

Note: Students are eligible to start taking courses in the HI ED program after successfully completing two semesters of law school work.

College-Specific Admission Requirements

DSL: A bachelor's or equivalent degree from an accredited college is a prerequisite for admission; however, there is no standard prescribed undergraduate curriculum. An applicant should have acquired significant oral and written communication skills before entering law school. The following are required of applicants: a completed application form for DSL; submission of the results of the law school admission test (LSAT); completion of an LSDAS report; a one-page personal statement; employment records since high school; and two letters of recommendation.

HI ED: The following are required of all applicants: a completed application form to HI ED; submission of the results of the Graduate Record Examination (GRE), Miller Analogy Test (MAT), or LSAT; an official undergraduate transcript or transcripts; a personal statement; employment records since high school; and four letters of recommendation.

All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the Test of English as a Second Language (TOEFL) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test or a score of 213 on the computer-based test, or 80 points on the new Internet-based test with a minimum of 23 points on the new speaking portion; or the International English Language Testing System (IELTS) with a minimum composite score of 6.5 is required for admission.

Residency

Students will normally spend four semesters in residence at DSL and as many additional semesters in residence as needed to complete the additional requirements for the pertinent HI ED degree. Ph.D. candidates must arrange the sequence of semesters to ensure that they are in residence as full-time students in the HI ED program for at least two consecutive semesters (Fall-Spring or Spring-Fall) excluding summer in a single twelve-month period. D.Ed. candidates must take at least 90 credits, of which at least 30 credits must be earned at the University Park campus.

Liaisons

The department and faculty liaisons for DSL shall be the Associate Dean for Academic Affairs and the student advisor will be the Associate Dean for Academic Affairs or such other faculty member(s) as may be designated by the Dean. The liaison for HI ED shall be the Professor-in-Charge (PIC) or such faculty member(s) as may be designated by the PIC.

PRESCRIBED COURSES

DSL: All students in the J.D. program are required to take the first-year curriculum in DSL. In the second or third year, students must take CORE 934 (Professional Responsibility).

The fall curriculum for the first year consists of the following courses:

CORE COURSES (CORE)
900. Civil Procedure (4)
910. Criminal Law (3)
912. Legal Analysis, Research & Writing I (3)
925. Torts (4)

The spring curriculum of the first year consists of the following courses:

One 3-credit Elective

CORE COURSES (CORE)
903. Constitutional Law (3)
905. Contracts (4)
914. Legal Analysis, Research & Writing II (3)
920. Property (4)

HI ED: *All students pursing a Ph.D. must satisfy the following minimum requirements:*

Core Courses: 18 credits

HIGHER EDUCATION (HI ED)
548. Curriculums in Higher Education (2-3)
552. Administration in Higher Education (3)
556. Higher Education Students and Clientele (3)
562. Organizational Theory and Higher Education (3)

Research Requirements: 12 credits

Statistics through Multivariate Analysis:

AG 400(4) and R SOC 573(3) or STAT 500(3) and STAT 501(3)

HIGHER EDUCATION (HI ED)
585. Research Design
586. Qualitative Research Methods

Advanced Skills: 9 credits

Specialization in Higher Education: 12 credits

Cognate Minor: 15 credits (minimum)

PROPOSAL WRITING

HI ED 594 (Research Topics) (minimum of 3 credits; maximum of 9)

Ph.D. DISSERTATION (non-credit; for continuous registration after completion of coursework and Oral Comprehensive Exam)

HI ED 601 (full time) or HI ED 611 (part time)

All students pursuing a D.Ed. must satisfy the following minimum requirements:

Core Courses: 18 credits

HIGHER EDUCATION (HI ED)
548. Curriculums in Higher Education (2-3)
552. Administration in Higher Education (3)
556. Higher Education Students and Clientele (3)
562. Organizational Theory and Higher Education (3)

Research Requirements: 12 credits

Statistics through Multivariate Analysis:

AG 400(4) and R SOC 573(3) or STAT 500(3) and STAT 501(3)

HIGHER EDUCATION (HI ED)
585. Research Design (3)
586. Qualitative Research Methods (3)

Specialization in Higher Education: 12 credits

Minor or General Studies Grouping: 15 credits (minimum)

INTERNSHIP

HI ED 595 (9 credits optional based on previous experience in higher education administration)

VI. D.Ed. THESIS RESEARCH

HI ED 594 (Research Topics) (minimum of 3 credits; maximum of 9)

DISSERTATION (minimum of 15 credits)

HI ED 600 (thesis research) or HI ED 610 (Thesis Research Off-Campus)

Students pursuing the M.Ed. must satisfy the following requirements: (30 credits for degree)

- Higher Education Courses (15 credits minimum; HI ED 545 (Higher Education in the U.S.) is required).
- Research methods (3 credits)
- Minor field or General Studies Grouping (6 credits)
- Master's Paper (3 credits)
- HI ED 596 (Independent Study)

INTERPROGRAM TRANSFER OF CREDITS

DSL: A maximum of twelve credits for HI ED course work may be transferred for credit toward the J.D. degree at DSL. Students must obtain a grade satisfactory to DSL for the course work to be credited towards the J.D. degree. The following HI ED program may qualify for credit in DSL: (1) HI ED 545 (Higher Education in the United States); (2) HI ED 552 (Administration in Higher Education); (3) HI ED 560 (Legal Issues in Higher Education); (4)HI ED 546 (College Teaching) and (5) HI ED 587 (Education Policy and Politics).

HI ED: What courses may be credited will be determined by the student's degree program. Normally a maximum of twelve credits of DSL course work will be counted for credit for the minimum requirements for a master's degree, subject to approval by the student's advisory committee. Normally, a maximum of 30 credits from a master's degree program will be counted for credit for the minimum requirements for a Ph.D. or D.Ed. degree.

Sequence

The sequence of courses will be determined by the students and their advisors.

Recommended Program of Study and Advising

All students in the program will have two advisors, one from DSL and one from HI ED. Periodic interaction between the two advisors will be encouraged. A program of study will be developed for each student, taking into account the fact that some courses at both locations are offered on a rotating or intermittent basis. Many courses are offered every year but some are offered every two or three years. Advisors will have available a list of projected relevant courses or educational experiences in order to work with the student on an individualized program of study. The standard committee structure will apply to the HI ED programs.

Tuition

Students will be charged the applicable DSL tuition to cover the J.D. program and the applicable graduate tuition to cover the HI ED degree program. DSL tuition will be paid for the semesters in which the student is registered for DSL courses, and graduate tuition will be paid for the semesters in which the student is registered for graduate courses. A student may take up to one course (3 credit hours) per semester in the program where the student is not primarily registered without any change in tuition, but must pay additional tuition to the program that the student is not primarily registered if he or she wishes to take additional course work pursuant to that program during the semester.

Financial Aid and Assistantships

Decisions on financial aid and assistantships will be made by each school according to that school's procedures. Generally, assistantships and financial aid granted by HI ED will not apply to time spent at DSL.

Fulfillment of Degree Requirements and Graduation

All courses in one program that will count towards meeting the requirements of the other must be completed before the awarding of

either degree. Students will be required to fulfill all requirements for each degree in order to be awarded that degree, subject to the interprogram transfer of credits. With respect to HI ED program requirements for a thesis or paper, work done while at DSL under the supervision of a DSL faculty member may be appropriate for incorporation into the thesis or paper with the approval of the HI ED degree program committee (in such cases, the committee should consider whether the credits afforded such work will be subject to the twelve credit maximum for interprogram transfers). A DSL faculty member must be a member of the committee).

If for some reason the student cannot complete the requirements of the J.D., the student will still be allowed to count DSL courses already taken toward the pertinent HI ED degree, even if he or she is no longer in the joint degree program.

Course Descriptions

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HIGHER EDUCATION (HI ED) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/12/04

Last Revised by the Department: Fall Semester 2007

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Last updated by Publications: 3/27/09

History (HIST)

Program Home Page

Sally A. McMurry, Head of the Department
Matthew Restall, Director of Graduate Studies
108 Weaver Building
814-865-1367

Degrees Conferred:

Ph.D., M.A.
Dual-Title Graduate Degree in History and Asian Studies

The Graduate Faculty

Charlse D. Ameringer, Ph.D. (Fletcher Sch. Law & Dipl) Professor Emeritus of Latin American History
David G. Atwell, Ph.D. (U of Hawaii) Assistant Professor of History and Religious Studies
William A. Blair, Ph.D. (Penn State) Associate Professor of History; Director, Civil War Era Center
Daniel C, Beaver, Ph.D. (Chicago) Associate Professor of History
Eugene N. Borza, Ph.D. (Chicago) Professor Emeritus of Ancient History
Jonathan E. Brockopp, Ph.D. (Yale) Associate Professor of Religious Studies and History
Kumkum Chatterjee, Ph.D. (Calcutta, India) Associate Professor of History
Priscilla F. Clement, Ph.D. (Pennsylvania) Associate Professor of History
Gary S. Cross, Ph.D. (Wisconsin, Madison) Distinguished Professor of Modern History
Ronnie Po-chia Hsia, Ph.D. (Yale) Edwin Erle Sparks Professor of History
Alan Derickson, Ph.D. (California) Professor of History
Sophie C. M. deSchaepdrijver, Ph.D. (U Amsterdam) Associate Professor of History
William J. Duiker III, Ph.D., (Georgetown) Professor Emeritus of History and Liberal Arts, and East Asian Studies
Gerald G. Eggert, Ph.D. (Michigan) Professor Emeritus of American History
Greg Eghigian, Ph.D. (Chicago) Associate Professor of History
George M. Enteen Ph.D. (George Washington) Professor Emeritus of Russian History
Garett G. Fagen, Ph.D. (McMaster) Associate Professor of Classics and Ancient Mediterranean Studies and History
John B. Frantz, Ph.D. (Pennsylvania) Associate Professor Emeritus of American History
Cary Fraser, Ph.D. (U of Geneva) Associate Professor of African and African American Studies and History
Lori D. Ginzberg, Ph.D. (Yale) Associate Professor of History and Women's Studies
Arthur E. Goldschmidt, Jr., Ph.D. (Harvard) Professor Emeritus of Middle East History
Amy Greenberg, Ph.D. (Harvard) Associate Professor of History and Women's Studies
Baruch Halpern, Ph.D. (Harvard) Professor of Ancient History, Jewish Studies, and Classics and Ancient Mediterranean Studies
Paul B. Harvey, Ph.D. (Pennsylvania) Associate Professor of Classics and Ancient Mediterranean Studies, History, and Religious Studies
Claire Hirshfield, Ph.D. (Pennsylvania) Professor Emerita of European History
Benjamin T. Hudson, Ph.D. (Oxford) Associate Professor of History and Medieval Studies
Natalie K. Isser, Ph.D. (Pennsylvania) Professor Emerita of European Studies
Philip Jenkins, Ph.D. (Cambridge) Distinguished Professor of Religious Studies and History
Leah R. Johnson, Ph.D. (California, Berkeley) Assistant Professor of Classics and Ancient Mediterranean Studies, and History
Anthony E. Kaye, Ph.D. (Columbia) Assistant Professor of History
Isabel F. Knight, Ph.D. (Yale) Associate Professor Emerita of History
Joan B. Landes, Ph.D. (NYU) Professor of Women's Studies and History
Daniel L. Letwin, Ph.D. (Yale) Associate Professor of History
Kathleen L. Lodwick, Ph.D. (Arizona) Professor of Modern Chinese History
Robert J. Maddox, Ph.D. (Rutgers) Professor Emeritus of American History
David McBride, Ph.D. (Columbia) Professor of African/African American Studies and African American History
Sally A. McMurry, Ph.D. (Cornell) Professor of American History
Jennifer L. Mittlestadt, Ph.D. (Michigan) Assistant Professor of History and Women's Studies
Wilson J. Moses, Ph.D. (Brown) Professor of American History
Mark Munn, Ph.D. (Bryn Mawr) Associate Professor of History, and Classics and Ancient Mediterranean Studies
Mark E. Neely, Jr., Ph.D. (Yale) McCabe Greer Professor of the Era of the American Civil War
Sylvia Neely, Ph.D. (Notre Dame) Associate Professor of History
On-Cho Ng, Ph.D. (Hawaii, Manoa) Associate Professor of History
Susan M. O'Brien, Ph.D. (Wisconsin, Madison) Assistant Professor of History
William A. Pencak, Ph.D. (Columbia) Professor of American History
Carol Reardon, Ph.D. (Kentucky) Associate Professor of History
P. Peter Rebane, Ph.D. (Michigan State) Associate Professor of History
Matthew Restall, Ph.D. (California, Los Angeles) Professor of History
A.G. Roeber, Ph.D. (Brown) Professor of Early Modern History and Religious Studies
Adam Rome, Ph.D. (Kansas) Associate Professor of History
Anne Carver Rose, Ph.D. (Yale) Professor of History, Religious Studies, and Jewish Studies
Paul Lawrence Rose, Ph.D. (Sorbonne) Professor of European History and Mitrani Professor of Jewish Studies
Gonzalo Rubio, Ph.D. (Johns Hopkins) Assistant Professor of Classics and Ancient Mediterranean Studies, and History and Religious Studies
Janina Safran, Ph.D. (Harvard) Associate Professor of History
Dan P.Silverman, Ph.D. (Yale) Professor Emeritus of European History
Mrinalini Sinha, Ph.D. (SUNY, Stony Brook) Associate Professor of History and Women's Studies
Gregory Smits, Ph.D. (Southern California) Associate Professor of History
Robin Spencer, Ph.D. (Columbia) Assistant Professor of African and African American Studies, and History
Jackson J. Spielvogel, Ph.D. (Ohio State) Associate Professor Emeritus of History
James Ross Sweeney, Ph.D. (Cornell) Professor of Medieval History
Ben Vnson III, PH. D. (Columbia) Associate Professor of History
Catherine Wanner, Ph.D. (Columbia) Assistant Professor of History and Religious Studies
Christine A. White, Ph.D. (Cambridge) Associate Professor of History
Michael Wolfe, Ph.D. (Johns Hopkins) Associate Professor of History
Nan E. Woodruff, Ph.D. (Tennessee) Professor of History

Paul Tiyambe Zeleza, Ph.D. (Dalhousie U) Professor of African Studies and History

Graduate instruction at the master's degree level is offered in the following areas of history: the Ancient Mediterranean; Medieval, Early Modern, and Modern European, including Great Britain and Russia; the United States, including colonial American and African American history; the Middle East; East and South Asian; and Latin America. In addition, graduate instruction is offered in such comparative or topical areas as Military History, Women's History, History of Religion, Jewish History, and the History of Science.

Doctoral programs ordinarily are limited to American, Ancient, Medieval, Early Modern British and European, Modern European, and East Asian History; as well as comparative studies in the History of War and Society; Women's History; the History of Industry, Agriculture, and Society; the History of Science and Technology; and the History of Religion. Prospective doctoral candidates are invited to contact the graduate officer about the current availability of any of these or other areas before applying.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Applicants to the doctoral program must hold or be near completion of the master's degree (or its equivalent); all others will be considered for admission to the master's program, even if it is their ultimate intention to pursue a doctoral degree at Penn State.

To be considered for admission, applicants must submit transcripts that show (1) substantial course work in history with a minimum grade-point average of 3.50 (on a 4.0 scale) in all undergraduate history courses, (2) a minimum junior/senior GPA in all courses of 3.30, (3) at least three semesters of college-level work in a foreign language (additional language training appropriate to the fields in which the applicant proposes to work may also be required for admission) and (4) where applicable, a minimum GPA of 3.50 for all graduate work previously undertaken. Each applicant must submit the scores of the Graduate Record Examination (GRE) taken within five years previous to the date of application; the general examination scores are mandatory, the history examination is optional. Students with scores of 650 or better in each of the verbal, quantitative, and analytic sections of the general examination will be given preference in admission. Applicants from abroad whose native language is not English must submit the scores of TOEFL to the Graduate School; admission to the history program normally requires a score of 600 or better.

The Department of History further requires all applicants to submit directly to the department a statement of intent outlining their proposed fields of study and career goals, as well as a sample of their written work (undergraduate history thesis, master's thesis, seminar paper or equivalent research paper) as evidence of their historical research and writing skills. Three letters of recommendation are required; it is strongly preferred that at least two of them be from historians.

Master's Degree Requirements

(1) Candidates for the M.A. degree must earn a minimum of 33 credits of graduate-level work, of which 18 credits will be in the student's major area and 6 credits each in two other areas, one of which may be in another discipline. Three credits in History 592 (Proseminar) in the student's major area of historical study, or in a related field if no Proseminar exists in the major area. (2) Reading proficiency in at least one foreign language must be demonstrated no later than the beginning of the second year of residence. (3) Students electing to write a master's thesis will take 6 credits of thesis research as part of the 18 credits in their major area, and will be given an oral examination on the thesis and topics related to the thesis. Students offering a master's paper in lieu of a thesis will be given an oral examination based on the master's paper and any of the student's course and seminar work in history related to the paper.

Doctoral Degree Requirements

History 592 (Proseminar in the major field or related field) is the only course required of all Ph.D. candidates. The remainder of a student's doctoral program, including foreign language requirements, will be determined by the doctoral committee. In order to be admitted to doctoral candidacy, students must submit a historiographical essay in the proposed research field and pass an oral examination (the candidacy examination) on the essay and on possible dissertation topics suggested by the essay. After completing all course work, doctoral candidates must pass written and oral examinations in the research field, a primary area of specialization, and two additional areas (one of which may be outside the discipline of history). Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the degree.

Other Relevant Information

The department's graduate officer, who supervises the overall graduate program in history and maintains student records, will assign newly admitted graduated students to advisers on the basis of each student's expressed area of interest. Advisers provide assistance in planning courses of study, guidance in choosing thesis and dissertation topics, direction in conducting research, and career counseling. Students who serve as graduate assistants will be given a variety of experiences as they assist different professors, ranging from paper-grading and administering exams, to preparing and delivering occasional lectures, to conducting review or discussion sections for large lecture courses. Advanced doctoral students may hold lectureships while working on their dissertations; lecturers have complete instructional responsibility for one or two sections of an undergraduate course in their area of specialization.

Student Aid

In addition to the fellowships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the Graduate Bulletin, the following awards typically have been available to graduate students in this program:

JAMES HAMILTON HARTZELL AND LUCRETIA IRVINE BOYD HARTZELL HISTORY AWARD
A $200 to $300 award made annually to a graduate student in the Department of History whose field of interest is Pennsylvania history.

JAMES LANDING FELLOWSHIP ADN THE WARREN HASSLER FELLOWSHIP FOR STUDY IN THE CIVIL WAR
Each fellowship is available each year to doctoral candidates who are working on their dissertations. The award consists of a stipend that earns the successful candidate one semester of release time for research and writing. No tuition waiver if offered.

HILL FELLOWSHIPS FOR STUDY IN HISTORY
Awarded annually by the Department of History to doctoral candidates who are working on their dissertations. The amount of the award varies, but it generally supports one semester free of duties.

EDWIN ERLE SPARKS FELLOWSHIP IN THE HUMANITIES
One fellowship is available each year to doctoral candidates in the Department of History who are working on their dissertations.

MARK AND LUCY MACMILLAN STITZER AWARD
Awarded by the Department of History each year to support graduate student travel for the purpose of research. The number and value of

these awards depends on the quality of proposals received, the level of funding required by each meritorious project, and the funds available in the endowment. Preference is given to request for doctoral dissertation research.

THE E-TU ZEN SUN AWARD FOR OUTSTANDING TEACHING BY A GRADUATE ASSISTANT
One award is made each year to recognize excellence in teaching by a History graduate assistant in the conduct of discussion sections, review sessions, or lecture presentations. The value of the award varies depending on funds available, but it is normally about $500.

Dual-Title Graduate Degree in History and Asian Studies

Graduate students with research and educational interests in international education may apply to the History/Asian Studies Degree Program. The goal of the dual-title degree History and Asian Studies is to enable graduate students from History to acquire the knowledge and skills of their major area of specialization in History while at the same time gaining the perspective of Asian Studies.

In order to prepare graduate students for the competitive job market, this program provides them with a solid disciplinary foundation that will allow them to compete for the best jobs in their field. For such students the dual-title Ph.D. in Asian Studies will add value to their degree and their status as candidates. It will produce excellent historians who are experts in Asian Studies as well. The dual-title degree in History and Asian Studies will build curricular bridges beyond the student's major field so as to provide a unique training regime for the global scholar.

Additional details of the dual degree program are available in separate documentation and from the Asian Studies Program (see http://asian.la.psu.edu/graduate.shtml).

Admission Requirements

For admission to the dual-title Ph.D. degree under this program, a student must first apply and be admitted to the History graduate program. Once accepted into the History program, the student can apply to the Admissions Committee of the Asian Studies. The Asian Studies admissions committee reviews applications and recommends students for admission to the Asian Studies program to the Graduate School. There are no specific requirements for admissions into the dual-title program beyond the requirements of the Graduate School and History, though applicants interested in the program should make that known clearly on their applications and include remarks in their essays that explain their training, interests, and career goals in an area of Asian Studies.

Each applicant must submit the scores of the Graduate Record Examinations (GRE) taken within five years previous to the date of application; the general examination scores are mandatory, the history examination is optional. Students with scores of 650 or better in each of the verbal, quantitative, and analytic sections of the general examination will be given preference in admission.

General Graduate School requirements are stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Degree Requirements

To qualify for an Asian Studies degree, students must satisfy the requirements of the History program in which they are primarily enrolled. In addition, they must satisfy the requirements described below, as established by the Asian Studies committee. Within this framework, final course selection is determined by the student, their Asian Studies advisor, and their History program advisor.

Upon a student's acceptance by the Asian Studies Admissions Committee, the student will be assigned an Asian Studies academic advisor in consultation with the Asian Studies chair. As students develop specific scholarly interests, they may request that a different Asian Studies faculty member serve as their advisor. The student and advisor will discuss a program of study that is appropriate for the student's professional objectives and that is in accord with the policies of The Graduate School, the History department and the Asian Studies program.

Requirements for the History/Asian Studies Ph.D.

The doctoral degree in History and Asian Studies is awarded only to students who are admitted to the History doctoral program and admitted to the dual-title degree in Asian Studies. The minimum course requirements for the dual-title Ph.D. degree in History and Asian Studies are as follows:

- History 592 and History 593 (proseminars in historical methods and research)
  - For students entering with a B.A. degree, a two-year sequence of these courses is required, for a total of four courses
  - For students entering with an M.A. degree, a one-year sequence of these courses is required, for a total of two courses
- 15 credits of Asia-related coursework at the 400 or 500 level. At least 6 of these 15 credits will be from ASIA 501 and 502 (the required proseminar sequence in Asian Studies). As many as 6 may come from History, as approved by the student's doctoral advisor and the ASP Director of Graduate Studies. The remaining credits can be taken in ASIA or in any department other than History.

Particular courses may satisfy both the History requirements and those of the Asian Studies program. Final course selection is determined by the student in consultation with their dual-title program advisors and their major program advisors. Students who already hold a master's degree from another institution may petition to have equivalent course credits accepted.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-094

Review Date: 01/12/2010

Intercollege Master of Professional Studies in Homeland Security (iMPS-HLS)

Robert A. Cherry, MD, MS, CPE, FACS
Chair, iMPS-Homeland Security Graduate Education
Associate Professor of Surgery and Public Health Sciences
Penn State College of Medicine, MC H070
500 University Drive
Hershey, Pennsylvania
717-531-6066 (tel.); 717-531-0321 (fax)
PHP_Programs@psu.edu

Degree Conferred:

Master of Professional Studies in Homeland Security

Graduate Faculty:

Agricultural Biosecurity
Walter R. McVey, Jr., M.S. (West Virginia University) Sr. Project Manager in VBSC
Catherine Cutter, Ph.D. (Clemson) Assoc. Professor of Food Science
Bhushan Jayarao, MPH, Ph.D. (Univ. of Vet Sci Budapest) Professor of Veterinary and Biomedical Sciences
Fred Gildow, Ph.D. (Cornell), Professor of Plant Pathology
Gretchen Kuldau, Ph.D. (California), Associate Professor of Plant Pathology

Computer and Network Security
Raj Acharya, Ph.D. (Minnesota/Mayo Grad School of Med), Professor
Piotr Berman, Ph.D. (M.I.T), Associate Professor
Guohong Cao Ph.D. (OSU) Professor
Trent Jaeger, Ph.D. (Michigan), Associate Professor
George Kesidis, Ph.D. (Berkeley), Professor of CSE & EE
Thomas La Porta, Ph.D. (Columbia), Distinguished Professor
Yanxi Liu, Ph.D. (Umass), Associate Professor
John Metzner. (NYU), Professor of CSE & EE
David Miller, Ph.D. (UCSB), Associate Professor of EE
Patrick McDaniel, Ph.D. (Michigan), Associate Professor
Sofya Raskhodnikova, Ph.D. (M.I.T.), Assistant Professor
Anand Sivasubramaniyam Ph.D. (Gatech), Professor
Adam Smith, Ph.D. (M.I.T.), Assistant Professor
Aylin Yener, Ph.D. (Rutgers), Associate Professor of EE
Sencun Zhu, Ph.D. (GMU), Assistant Professor of CSE & IST

Geospatial Intelligence
Todd Bacastow, Ph.D. (PSU), Professor of Practice for Geospatial Intelligence
Mark Corson, Ph.D. (PSU), Associate Professor of Geography
Peter Guth, Ph.D. (PSU), Visiting Professor of Geography
David Hall, Ph.D. (PSU), Associate Dean for Research and Graduate Programs, College of Information Sciences and Technology

Homeland Security (Base Program)
Thomas Arminio (United States Naval War College), Instructor
Jeremy Plant (Virginia), Professor of Public Administration and Public Policy
Peter Forster (Penn State), Instructor

Information Security and Forensics
Guoray Cai, Ph.D. (Pittsburgh) Associate Professor of IST, Geography and CSE
Chao-Hsien Chu, Ph.D. (Penn State) Professor of IST and Management Science
Dongwon Lee, Ph.D. (UCLA) Associate Professor of IST and CSE
Peng Liu, Ph.D. (George Mason) Associate Professor of IST and CSE
Prasenjit Mitra, Ph.D. (Stanford) Assistant Professor of IST and CSE
Irene Petrick, Ph.D. (Penn State) Professor of Practice in IST
Gerald M. Santoro, Ph.D. (Penn State) Assistant Professor of IST and CAS
Robin G. Qiu, Ph.D. (Penn State) Associate Professor of Information Science
Anna Squicciarini, Ph.D. (U. Milan, Italy) Assistant Professor of IST
Heng Xu, Ph.D. (National Singapore) Assistant Professor of IST
Sencun Zhu, Ph.D. (George Mason) Assistant Professor of CSE and IST

Public Health Preparedness
Robert A. Cherry, MD (Columbia), Associate Professor of Surgery
Kevin P. Furlong, PhD (Utah), Professor of Geosciences
Jim Holliman, MD (Washington), Professor of Emergency Medicine
Gretchen A. Kuldau, PhD (California), Assistant Professor of Plant Pathology
Eugene J. Lengerich VMD, MS (U of Penn), Associate Professor, Health Evaluation Sciences
Craig Meyers, PhD, (UCLA), Professor of Microbiology and Immunology
Roxanne Parrott PhD, Professor of Communication Arts and Sciences & Health Policy Admin
Zhengmin Qian MD, PhD (Rutgers), Assistant Professor of Health Evaluation Sciences

Program Description
The *i*MPS-HLS degree program is designed to prepare professionals and develop leaders for the field of homeland security by providing exceptional graduate education. The curriculum is delivered in a distance education format through the Penn State World Campus in order to accommodate the needs and careers of professionals who are already active in homeland security and public health, or those interested in transitioning into the field. The program provides enrollees with an integrated, cross-functional curriculum that is focused

on a set of unified educational goals in order to help them understand and manage the complexities of homeland security in a global environment. Students select from one of six disciplines of study: homeland security (base program); public health preparedness; geospatial intelligence; computer and network security; information security and forensics; and agricultural biosecurity. The participating academic units for this collaborative program are: Penn State Harrisburg, the College of Medicine, the College of the Liberal Arts, the College of Earth and Mineral Sciences, the College of Information Sciences and Technology, Penn State Great Valley School of Graduate Professional Studies, the College of Engineering, and the College of Agricultural Sciences.

General Admission Requirements

Educational Background:

An applicant must hold either (1) a bachelor's degree from a U.S. regionally accredited institution or (2) a postsecondary degree that is equivalent to a U.S. baccalaureate degree earned from an officially recognized degree-granting international institution.

Core Application Packet

- Statement of Purpose
- Vita or Résumé
- Three letters of recommendation
- Two official transcripts from each institution attended
- Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) score, if applicable
- Application fee

Statement of Purpose and Curriculum Vitae

A statement of professional experience and goals (up to 500 words) and the candidate's Vita or Resume must accompany the application.

Letters of Recommendation

- The individuals writing letters should be familiar with you and comfortable discussing your professional and/or academic strengths and accomplishments.
- The Admissions Committee prefers that all letters be written within the last 6 months and reference the applicant's current career goals and/or ability to perform graduate level study.
- A person choosing to submit a letter of reference will do this through the online application process and either select our pre-formatted template or upload his/her own letter.

GPA Requirements

Your GPA is interpreted by the admissions committee in the context of a completed application. Some Options may require a minimum GPA.

GRE Requirements

The GRE may be required by some options.

TOEFL

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. Specific graduate programs may have more stringent requirements.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

Other Considerations

Special backgrounds, abilities, and interests related to homeland security are desirable.

Course Enrollment before Formal Acceptance

- If a student wishes to enroll in a course (s) while he/she completes the application process, the student can do so by contacting Adult Learner Enrollment Services at 800-252-3592.
- Students who have completed an application and have already been accepted to the program will be given preference for course enrollment.
- All other students will be enrolled in courses on a first-come, first-served basis depending on availability.

Financial Aid

World Campus students who are enrolled in a degree program and meet all other federal student aid eligibility requirements may be eligible for federal aid programs. Students must complete the Free Application for Federal Student Aid (FAFSA) to be considered for student aid.

Degree Requirements:

The Master of Professional Studies in Homeland Security program requires a minimum of 33 credits, 24 of which must be earned at Penn State. Up to 10 graduate credits may be transferred in from an accredited institution (as is permissible by the Graduate School). At least 18 credits must be courses at the 500 level and above, of which 6 credits must be in 500-level courses. Students are expected to maintain a B (3.0) or better average in academic courses to be retained in the program. Each student will take a 9 credit *core curriculum* consisting of HLS/PDM 801, HLS 803/PHIL, and HLS/CRIM 805. Students will also take 12 credits of prescribed courses for the specialized option. There are 9 elective credits of elective that are chosen in consultation with the student's advisor. Students choose two courses from Elective Group A and one course from Elective Group B. Finally, each degree candidate must complete a capstone project on a topic related to homeland security and defense (IST 594 - Research Topics). Lists below are the courses required/suggested for the option:

Prescribed Courses

Homeland security refers to the unifying core for the vast global network of organizations and institutions that are involved in the efforts to secure society. Regardless of field of specialization, or chosen discipline for graduate study, all professionals in the program will participate in a Unifying Core Curriculum with the following educational goals and objectives:

1. Understand major policies and legislation that shapes homeland security in a globalized society.

- Become familiar with organizations that play a key role in the implementation of homeland security policies and administration, and recognize the interactions among them.
- Understand the way in which a person or group responds to a set of conditions so as to prevent and respond to incidents and catastrophic events when needed.
- Recognize the impact that catastrophic events, both natural and man-made, have on society and the domestic and global economy.
- Identify and assess potential threats, vulnerabilities, and consequences.
- Apply leadership skills and principles that are necessary for producing and acting on information of value within a collaborative setting.
- Communicate effectively in the context of particular institutional cultures.
- Use, conduct, and interpret research and data effectively in decision-making.
- Practice ethics and integrity as a foundation for analytical debate and conclusion.
- Develop an appreciation of the cultural, social, psychological, political, and legal aspects of terrorism and counterterrorism.

The Core Curriculum consists of the following three courses:

HLS/P ADM 801: Homeland Security Administration: Policies and Programs (3). Foundation for understanding homeland security history, the development of homeland security policies and organizations, and current management approaches.

HLS/PHIL 803: Ethics and Leadership (3). This course will examine the social, political, legal, and ethical issues that arise in the context of homeland security.

HLS/CRIM 805: Violence, Threats, Terror, and Insurgency (3) Provides an overview of the domestic and global issues related to homeland security.

Agricultural Biosecurity Option

Director: Gretchen Kuldau, Ph.D. (California), Associate Professor of Plant Pathology 0205 Buckout Laboratory, University Park; 814 863 7232; kuldau@psu.edu

Core Curriculum
HLS 801/P ADM: Homeland Security Administration: Policies and Programs (3)
HLS 803/PHIL: Ethics and Leadership (3)
HLS/CRIM 805: Violence, Threats, Terror, and Insurgency (3)

Prescribed Courses
AGBIO 520*: Agricultural Biosecurity: Protecting a Key Infrastructure (3)
AGBIO 801: Veterinary Infectious Disease Diagnostic and Surveillance Systems (3)
AGBIO 802: Plant Protection: Responding to Introductions of Threatening Pest and Pathogens (3)
AGBIO 521: Food Defense: Prevention Planning For Food Processors (3)

Elective Group A (Choose 2)
GEOSC 402Y: Natural Disasters (3)
MANGT 510: Project Management (3)
PHP/PSY 558: Disaster Psychology (3)
VB SC 444: Epidemiology of Infectious Disease (3)

Courses with an asterisk (*) found in other Options

Elective Group B (Choose 1)
IST 564: Crisis, Disaster, Risk Management (3)
PHP/CAS 553: Disaster Communication (3)
PL SC 439: Politics of Terrorism (3)

Capstone Experience
AGBIO 594: Research Topics

Computer and Network Security Option:

Director: Patrick McDaniel, Ph.D. (Michigan), Associate Professor of Computer Science & Engineering; 360A Information Sciences and Technology Building; 814-863-3599; pdm12@psu.edu

Core Curriculum
HLS/P ADM 801: Homeland Security Administration: Policies and Programs (3)
HLS/PHIL 803: Ethics and Leadership (3)
HLS/CRIM 805: Violence, Threats, Terror, and Insurgency (3)

Prescribed Courses
CSE 514: Computer Networks (3)
CSE 543*: Introduction to Computer and Network Security (3)
CSE 546: Cryptography (3)
E E 561: Information Theory (3)

Elective Group A (Choose 2)
CSE 511: Operating Systems (3)
CSE 544: Advanced Systems Security (3)
CSE 545: Advanced Network Security (3)
E E/CSE 588: Pattern Recognition & Data Mining (3)

Courses with an asterisk (*) found in other Options

Elective Group B (Choose 1)
IST 564: Crisis, Disaster, Risk Management (3)
PHP 553 / CAS 553: Disaster Communications (3)
PL SC 439: Politics of Terrorism (3)

Capstone Experience
CSE 594: Research Topics (3)

Geospatial Intelligence Option:

Director: Todd Bacastow, Ph.D. (PSU), Professor of Practice for Geospatial Intelligence; 2217 Earth & Engineering Sciences, University Park; 814-863-0049; bacastow@psu.edu

Core Curriculum
HLS/P ADM 801: Homeland Security Administration: Policies and Programs (3)
HLS/PHIL 803: Ethics and Leadership (3)
HLS/CRIM 805: Violence, Threats, Terror, and Insurgency (3)

Prescribed Courses
GEOG 882: Geographic Foundations of Geospatial Intelligence (3)
GEOG 883*: Remote Sensing for the Geospatial Intelligence Professional (3)
GEOG 884: Geographic Information Systems for the Geospatial Intelligence Professional (3)
GEOG 885: Advanced Analytic Methods for Geospatial Intelligence (3)

Elective Group A (Choose 2)
GEOSC 402Y: Natural Disasters (3)
IST 552: Data, Information, and Knowledge Management
IST 885: Introduction to Multi-sensor Data Infusion (3)

Courses with an asterisk (*) found in other Options

Elective Group B: (Choose 1)
IST 564: Crisis, Disaster, Risk Management (3)
PHP 553 / CAS 553: Disaster Communications (3)
PL SC 439: Politics of Terrorism (3)

Capstone Experience
GEOG 594: Research Topics

Homeland Security (Base Program):
Director: Dr. Jeremy F. Plant, Professor of Public Administration and Public Policy, School of Public Affairs, W160 Olmsted Building, Penn State Harrisburg; 717-948-6045; jfp2@psu.edu

Core Curriculum
HLS/P ADM 801: Homeland Security Administration: Policies and Programs (3)
HLS/PHIL 803: Ethics and Leadership (3)
HLS/CRIM 805: Violence, Threats, Terror, and Insurgency (3)

Prescribed Courses
P ADM 401: Foundations of Homeland Security (3)
P ADM 404: Homeland Security and Defense in Practice (3)
P ADM 802: Collaboration and Integration: Multifaceted Approaches to Homeland Security (3)
P ADM 803*: Strategic Planning and Organizational Imperatives in Homeland Security and Defense (3)

Elective Group A (Choose 2)
GEOSC 402: Natural Disasters (3)
PHP/CAS 553: Disaster Communication (3)
PHP/PSY 558: Disaster Psychology (3)
PL SC 439: Politics of Terror (3)

Courses with an asterisk (*) found in other Option

Elective Group B (Choose 1)
IST 564: Crisis, Disaster, Risk Management (3)
PHP/CAS 553: Disaster Communication (3)
PL SC 439: Politics of Terror (3)

Capstone Experience
P ADM 594: Research Topics (3)

Information Security and Forensics

Director: Chao-Hsien Chu, Ph.D. (Penn State) Professor of IST and Management Science; 301K Information Sciences and Technology Building, University Park; 814-865-4446; chc4@psu.edu

Core Curriculum
HLS 801/P ADM: Homeland Security Administration: Policies and Programs (3)
HLS 803/PHIL: Ethics and Leadership (3)
HLS/CRIM 805: Violence, Threats, Terror, and Insurgency (3)

Prescribed Courses
IN SC 561: Web Security and Privacy (3)
IST 454: Computer and Cyber Forensics (3)
IST 515: Information Security and Assurance (3)
IST 554*: Network Management and Security

Elective Group A (Choose 2)
IST 451: Network Security (3)
IST 456: Security and Risk Management (3)
IST 564: Crisis, Disaster, and Risk Management (3)
SRA 468: Visual Analytics for Intelligence and Security (3)

Courses with an asterisk (*) found in other Options

Elective Group B (Choose 1)

IST 564: Crisis, Disaster, Risk Management (3)
PHP 553/CAS 553: Disaster Communication (3)
PL SC 439: Politics of Terrorism (3)

Capstone Experience
IST 594: Research Topics

Public Health Preparedness Option
Director: Robert A. Cherry, MD, MS, CPE, FACS; Associate Professor of Surgery and Public Health Sciences; Penn State College of Medicine, MC H070; 500 University Drive; Hershey, Pennsylvania; 717-531-6066; PHP_Programs@psu.edu

Core Curriculum
HLS/P ADM 801: Homeland Security Administration: Policies and Programs (3)
HLS/PHIL 803: Ethics and Leadership (3)
HLS/CRIM 805: Violence, Threats, Terror, and Insurgency (3)

Prescribed Courses
PHP 410: Public Health Preparedness for Disaster and Bioterrorism Emergencies I (3)
PHP 510: Public Health Preparedness for Disaster and Bioterrorism Emergencies II (3)
PHP 527*: Public Health Evaluation of Disasters and Bioterrorism (3)
PHP 530: Critical Infrastructure Protection of Health Care Delivery Systems (3)

Elective Group A (Choose 2)
GEOSC 402: Natural Disasters (3)
IST 564: Crisis, Disaster, and Risk Management (3)
PHP/CAS 553: Disaster Communication (3)
PHP/PSY 558: Disaster Psychology (3)

Courses with an asterisk (*) found in other Options

Elective Group B (Choose 1)
IST 564: Crisis, Disaster, Risk Management (3)
PHP/CAS 553: Disaster Communication (3)
PL SC 439: Politics of Terror (3)

Capstone Experience
PHP 594: Research Topics (3)

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-095

Review Date: 01/12/2010

Horticulture (HORT)

Program Home Page (Opens New Window)

RICHARD P. MARINI, *Head of the Department*
102 Tyson Building
814-865-2571

Degrees Conferred:

Ph.D., M.S., M.Agr.

The Graduate Faculty

- Richard N. Arteca, Ph.D. (Washington State) Professor of Horticultural Physiology
- Rick Bates, Ph.D. (Virginia Tech) Assistant Professor of Ornamental Horticulture
- David J. Beattie, Ph.D. (Michigan State) Associate Professor of Ornamental Horticulture
- Robert D. Berghage, Ph.D. (Michigan State) Associate Professor of Horticulture
- Kathleen B. Brown (formerly Evensen), Ph.D. (Florida) Professor of Postharvest Physiology
- Richard Craig, Ph.D. (Penn State) Professor of Plant Breeding and J. Franklin Styer Professor of Horticultural Botany
- Robert M. Crassweller, Ph.D. (Ohio State) Professor of Tree Fruit
- David Decoteau, Ph.D. (UMass) Professor of Horticulture
- David M. Eissenstat, Ph.D. (Utah) Professor of Woody Plant Physiology
- Peter A. Ferretti, Ph.D. (Penn State) Professor of Vegetable Crops
- Majid R. Foolad, Ph.D. (California, Davis) Professor of Plant Genetics
- Mark J. Guiltinan, Ph.D. (California, Irvine) Professor of Plant Molecular Biology
- Charles W. Heuser, Ph.D. (Rutgers) Professor of Horticultural Physiology
- E. Jay Holcomb, Ph.D. (Penn State) Professor of Floriculture
- Kathleen Kelley, Ph.D. (Michigan State) Assistant Professor of Consumer Horticulture
- Roger T. Koide, Ph.D. (California, Berkeley) Professor of Horticultural Ecology
- Larry J. Kuhns, Ph.D. (Ohio State) Professor of Ornamental Horticulture
- William J. Lamont, Jr. Ph.D. (Cornell) Associate Professor of Vegetable Crops
- Jonathan P. Lynch, Ph.D. (California, Davis) Professor of Plant Nutrition
- Michael D. Orzolek, Ph.D. (Maryland) Professor of Vegetable Crops
- Elsa Sanchez, Ph.D. (Washington State) Assistant Professor of Horticultural Systems Management
- James C. Sellmer, Ph.D. (Wisconsin, Madison) Assistant Professor of Ornamental Horticulture
- Dan T. Stearns, M.S. (North Carolina State) Professor of Landscape Contracting
- Dennis J. Wolnick, Ph.D. (Penn State) Associate Professor of Floriculture

Students may specialize in crop production and marketing, integrated crop management, plant genetics and breeding, horticultural plant physiology, postharvest physiology, plant molecular biology and biotechnology, and horticultural ecology.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of the graduate program officer, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Prerequisites for admission vary according to the area of specialization, but basic courses in physical sciences, mathematics, biological sciences, communication skills, and social sciences and humanities are required. Students who lack prerequisite courses may be admitted but are required to make up deficiencies without degree credit.

Students with a 2.75 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students.

See hortweb.cas.psu.edu/academic/gradprog.html for the most current Admission requirements.

Master's Degree Requirements

All M.Agr. candidates must present one seminar (HORT 590) and an acceptable paper on a selected professional problem, or a report of internship training. Up to 3 graduate credits will be given for an acceptable paper. The candidate may be required to provide one or more copies of the paper for the University. All M.S. degree candidates must complete at least one graduate course in biometry, at least 2 credits of resident or extension education (HORT 596 or HORT 602), and two seminars (HORT 590). A thesis is required for the M.S. degree.

Doctoral Degree Requirements

The communication requirement for the Ph.D. degree may be satisfied by completing at least 6 graduate credits in an area of communications skills approved by the student's advisory committee.

All Ph.D. candidates must present at least three seminars (HORT 590) for credit and complete at least two graduate courses in statistics or statistical applications. Ph.D. students must take 2 credits of resident or extension education (HORT 596 or HORT 602).

The candidacy examination must be taken within six months after beginning residency.

Within one semester after passing the candidacy examination, the student's doctoral committee, with the thesis adviser in charge, will have the program planning meeting. The purposes of this meeting are to (1) determine the student's strengths and weaknesses in pertinent subject matter areas; (2) guide the student in developing a plan of study; and (3) review and discuss the proposed thesis research.

The comprehensive examination, composed of both written and oral parts, will be given when, in the student's and adviser's opinion, the

student is ready for the examination, and when the communication requirements and essentially all courses have been completed.

After the thesis is completed and all other requirements for the Ph.D. have been met, the dean of the Graduate School will schedule the final examination. Normally, three months must elapse between the comprehensive and the final examinations. A major part of the examination will be an oral defense of the thesis.

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin*. Students who wish to compete for fellowships should be sure that their application materials are complete by January 15 for entry the following fall semester.
The following award typically has been available to graduate students in this program:

WALTER THOMAS MEMORIAL SCHOLARSHIP

Available to students studying the nutrition of horticultural crops; stipend equivalent to a half-time assistantship. Apply through the Department of Horticulture.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HORTICULTURE (HORT) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/3/04

Last reviewed by Publications: 7/7/05

Hotel, Restaurant, and Institutional Management (HRIM)

Program Home Page (Opens New Window)

ANNA MATTILA, *Professor in Charge*
224 Mateer Building
814-863-5757
klh3@psu.edu

Degree Conferred:

Ph.D., M.S.

The Graduate Faculty

- William P. Andrew, Ph.D. (Penn State) Associate Professor of Hotel, Restaurant, and Institutional Finance
- Albert Bartlett, Ph.D. (Penn State) Associate Professor of Hospitality Management
- Peter Bordi, Ph.D. (Penn State) Associate Professor of Hospitality Management
- Martha Conklin, Ph.D. (New York) Associate Professor of Hospitality Management
- David Cranage, Ph.D. (Penn State) Assistant Professor of Hospitality Management
- Robert D. Lee, Ph.D. (Syracuse) Professor Emeritus of Hospitality Management
- Anna Mattila, Ph.D. (Cornell) Associate Professor of Hospitality Management
- Daniel Mount, Ph.D. (U.S. International U) Associate Professor of Hospitality Management
- Karthik Namasivayan, Ph.D. (Cornell) Assistant Professor of Hospitality Management
- John O'Neill, Ph.D. (Rhode Island) Assistant Professor of Hospitality Management
- Sara J. Parks, R.D., M.B.A. (Michigan State) Professor Emerita of Hospitality Management
- Elwood L. Shafer, Ph.D. (SUNY, Syracuse) Professor Emeritus of Environmental Management and Tourism
- Arun Upneja, Ph.D. (U of Houston) Associate Professor of Hospitality Management
- Hubert B. Van Hoof, Ph.D. (Arizona State) Professor of Hospitality Management

The Hotel, Restaurant, and Institutional Management M.S. and Ph.D. degree programs are designed to prepare individuals for research and educational roles in the hospitality industry. The programs offer advanced graduate research training for students who desire to become educators, researchers, and knowledge-based professionals in the hospitality field. Student's individualized programs are designed to ensure they will have a mastery of the scope of knowledge covering the entire spectrum of hospitality management as well as the ability the complete significant research in a specific hospitality area.

Students in the program may elect the dual-title degree program in Operations Research for the Ph.D. and M.S. degrees. (See also Operations Research.)

Admission Requirements

Entry into the program requires a baccalaureate degree from a regionally accredited institution as well as a minimum of one to two years of work experience in the hospitality industry.

Scores for the Graduate Record Examinations (GRE), Graduate Management Aptitude Test (GMAT), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Grad Graduate Bulletin*

Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) will be considered for admission. Exceptions to this minimum average are sometimes made for students with special backgrounds, abilities, interests, and circumstances. Students are expected to have managerial competency in accounting, marketing, economics, human resource management, management information systems, and computer technology prior to entry into the program. Deficiencies in any of these areas must be made up in the first year that the student is enrolled (and will not be counted toward the program's 36-credit requirement).

Master's Degree (M.S.) Requirements

The master's degree program is designed to help students develop solid graduate-level research skills within a focused hospitality research area. Each student must complete a core of 12 credits of Methods Courses to include HRIM 503, STAT 500, and 6 credits of Methods Courses. In addition, students must take a minimum of 3 credits of HRIM 590 Colloquium. Students also complete a minimum of 15 credits of concentration area course work that is custom tailored to the student's hospitality research interests and academic and professional background.

A master's thesis is required of all students. The thesis is based on original empirical research. A master's committee of three persons who oversee the master's thesis is appointed for each candidate. This committee gives the final master's exam, which is an oral defense of the master's thesis.

Doctoral Degree Requirements

The doctoral program is an advanced graduate research program designed for students who want to become educators, researchers, and knowledge-based professionals in the hospitality field. Students' programs are individualized to ensure in addition to a mastery of the scope of knowledge in hospitality management they will also have the ability to complete significant research in a focused hospitality management area. In addition to satisfying the requirements of the Graduate School, a student must complete the following courses prior to scheduling the Ph.D. comprehensive examination: HRIM 585, HRIM 586, HRIM 590 (total of 3 credits), 12 credits of quantitative and statistical analysis, 18 credits in an HRIM concentration area, and 12 credits from an outside supporting area.

The language or communication requirement for the Ph.D. can be fulfilled by (1) demonstrating proficiency in an approved foreign language, or (2) demonstrating proficiency in computer programming, or (3) completing a minor. The demonstration of proficiency is determined by an HRIM faculty committee.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT (HRIM) course list

Last Revised by the Department: Fall Semester 2005

Blue Sheet Item #: 33-07-109

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Review Date: 06/14/05

Last updated by Publications: 8/11/09

Human Development and Family Studies (HD FS)

Program Home Page (Opens New Window)

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CRAIG EDELBROCK, *In Charge of Graduate Programs in Human Development and Family Studies*
S-211 Henderson Building
814-863-8000

Degrees Conferred:

Ph.D., M.S. (A master's degree is offered only to persons interested in studying for a doctorate.)

The Graduate Faculty

- David M. Almeida, Ph.D. (Victoria) Associate Professor of Human Development and Family Studies
- Leann Birch, Ph.D. (Michigan) Distinguished Professor of Human Development and Family Studies
- Clancy Blair, Ph.D. (Alabama, Birmingham) Associate Professor of Human Development and Family Studies
- Alan Booth, Ph.D. (Nebraska, Lincoln) Distinguished Professor of Human Development, Sociology, and Demography
- Chalandra M. Bryant, Ph.D. (Texas, Austin) Associate Professor of Human Development and Family Studies
- Robert L. Burgess, Ph.D. (Washington, St. Louis) Professor of Human Development
- Linda M. Burton, Ph.D. (Southern California) Professor of Human Development and Sociology
- J. Douglas Coatsworth, Ph.D. (Minnesota) Assistant Professor of Human Development and Family Studies
- Linda Collins, Ph.D. (Southern California) Professor of Human Development and Family Studies
- Sherry Corneal, Ph.D. (Penn State) Associate Professor of Human Development and Family Studies
- Ann C. Crouter, Ph.D. (Cornell) Professor of Human Development and Family Studies
- Anthony R. D'Augelli, Ph.D. (Connecticut) Professor of Human Development
- Judith F. Dunn, Ph.D. (Cambridge) Adjunct Professor of Human Development and Family Studies
- Craig Edelbrock, Ph.D. (Oregon State) Professor of Human Development and Family Studies
- David J. Eggebeen, Ph.D. (North Carolina) Associate Professor of Human Development and Family Studies, and Sociology
- Donald H. Ford, Ph.D. (Penn State) Professor Emeritus of Human Development
- Paul A. Games. Ph.D. (Iowa) Professor Emeritus of Human Development
- Scott Gest, Ph.D. (Minnesota) Assistant Professor of Human Development and Family Studies
- Mark T. Greenberg, Ph.D. (Virginia) Professor of Human Development and Family Studies and Bennett Chair of Prevention Research
- Bernard G. Guerney, Jr., Ph.D. (Penn State) Professor Emeritus of Human Development and Counseling Psychology
- Louise F. Guerney, Ph.D. (Penn State) Professor Emerita of Human Development and Family Studies and Counseling Psychology
- Melissa A. Hardy, Ph.D. (Indiana) Distinguished Professor of Human Development and Family Studies, and Sociology; Director, Gerontology Center
- Scott M. Hofer, Ph.D. (Southern California, Los Angeles) Assistant Professor of Human Development and Family Studies
- Kathryn Hood, Ph.D. (Temple) Associate Professor of Human Development
- Rukmalie Jayakody, Ph.D. (Michigan) Associate Professor of Human Development and Family Studies, and Demography
- Eva S. Lefkowitz, Ph.D. (California, Los Angeles) Associate Professor of Human Development and Family Studies
- Eric Loken, Ph.D. (Harvard) Assistant Professor of Human Development and Family Studies
- Jennifer L. Maggs, Ph.D. (Victoria) Associate Professor of Human Development and Family Studies
- Susan M. McHale, Ph.D. (North Carolina) Professor of Human Development and Family Studies
- Gordon K. Nelson, Ph.D. (Wisconsin) Associate Professor of Human Development (Capital College)
- Judith L. Newman, Ph.D. (Temple) Associate Professor of Human Development (Abington College)
- Robert Plomin, Ph.D. (Texas) Adjunct Professor of Human Development and Family Studies
- Michael Rovine, Ph.D. (Penn State) Associate Professor of Human Development and Family Studies
- K. Warner Schaie, Ph.D. (Washington) Evan Pugh Professor of Human Development and Psychology
- Rainer Silbereisen, Ph.D. (Jena) Adjunct Professor of Human Development and Family Studies
- Edward Smith, Ph.D. (North Carolina) Senior Research Associate in the College of Health and Human Development
- Emilie Phillips Smith, Ph.D. (Michigan State) Associate Professor of Human Development and Family Studies
- Graham B. Spanier, Ph.D. (Northwestern) Professor of Human Development and Family Studies, Sociology, Demography, and Family and Community Medicine
- Cynthia A. Stifter, Ph.D. (Maryland) Professor of Human Development and Family Studies
- Dena Swanson, Ph.D. (Emory) Assistant Professor of Human Development and Family Studies
- Douglas M. Teti, Ph.D. (Vermont) Professor of Human Development
- Fred W. Vondracek, Ph.D. (Penn State) Professor of Human Development
- Sherry L. Willis, Ph.D. (Texas) Professor of Human Development
- Steven H. Zarit, Ph.D. (Chicago) Professor of Human Development

This interdisciplinary program is one of the graduate programs of the College of Health and Human Development. It is administered through the Department of Human Development and Family Studies. The Human Development and Family Studies graduate program is designed to educate students about research, theory, and methodology related to the study of individuals and families across diverse populations and diverse settings. There is a strong interest in the ways in which social institutions and settings such as day care facilities, schools, neighborhoods, and social policy institutions facilitate (or inhibit) opportunities for development and change for individuals and families. Understanding the characteristics and conditions that place individuals or families at risk for developing problems, designing effective prevention program to address those risks, and mounting rigorous evaluations of such programs is a growing emphasis in the program. All students, regardless of substantive area, are encouraged to develop strong skills in research methods, a hallmark of our graduate training. Through course work and apprenticeship experiences, students develop an understanding of the program's multidisciplinary life span/life course, and applied orientation. As student's progress through the program, they are expected to develop specialized expertise in two or more of the department's areas of concentration: individual development, family studies, intervention research, and research methods. Further specialization is possible in adult development and aging, biological bases of behavior, child and adolescent development, cognitive development and functioning, family relationships, integrative theories of human development, interpersonal relationships, and social-emotional development and change.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Entering students should have at least 6 credits in the biological and physical sciences; 12 in the social sciences and, depending upon proposed area of emphasis, basic courses in sociology, psychology, and economics; and 6 in developmental and family studies. Students not meeting these requirements may be admitted with limited deficiencies to be made up concurrently with their graduate work.

Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission for fall semester only. Early application is required, and a special application to HD FS must be completed; additional information can be obtained from the professor in charge of Graduate Recruitment and Interdisciplinary Training. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Degree Requirements

Entering students take three required 3-credit courses (Life Span Development, Family Studies, and Intervention Research), four required 3-credit methods courses in Research Methods and Statistics, and 2 credits of a professional development seminar during the first two years. Over time, course work becomes increasingly specialized and tailored to the student's individual interests. Yearly Plans of Study developed in consultation with the student's adviser specify course work and apprenticeship experience directed at the student's emerging scholarly and career interests. For the master's degree, in addition to the required courses, students take 9 credits in their substantive field and 6 credits of thesis research. For the doctorate, in addition to the required courses, students must take a total of 12 credits in their substantive field, 6 methodology elective credits, and 6 credits of thesis research.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HUMAN DEVELOPMENT AND FAMILY STUDIES (HD FS) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/21/04

Last reviewed by Publications: 7/5/05

Human Dimensions of Natural Resources and the Environment (HDNRE)

Co-Chairs, Department of Agricultural Economics and Rural Sociology and Department of Geography

Degrees Conferred:

Students electing the dual-title intercollege program in HDNRE through participating majors may earn a degree with dual-title at both the Ph.D. and M.S./M.A. levels, i.e., Ph.D. in (graduate program name) and Human Dimensions of Natural Resources and the Environment, or M.S./M.A. in (graduate program name) and Human Dimensions of Natural Resources and the Environment.

The following graduate programs offer dual-title degrees in HDNRE: M.A. and Ph.D. in Anthropology and HDNRE; M.S. and Ph.D. in Energy and Mineral Engineering and HDNRE; M.S. and Ph.D. in Forest Resources and HDNRE; M.S. and Ph.D. in Geography and HDNRE; M.S. and Ph.D. in Recreation, Park and Tourism Management and HDNRE; and M.S. and Ph.D. in Rural Sociology and HDNRE.

The Graduate Faculty

- Richard B. Alley, Ph.D. (Wisconsin, Madison) Evan Pugh Professor of Geosciences
- Theodore R. Alter, Ph.D. (Michigan State) Professor of Agricultural, Environmental, and Regional Economics
- John C. Becker, J.D. (Dickinson) Professor of Agricultural Economics and Law
- Stephen J. Beckerman, Ph.D. (New Mexico) Associate Professor of Anthropology
- André L. Boehman, Ph.D. (Stanford) Professor of Fuel Science
- Mallika Bose, Ph.D. (Wisconsin) Assistant Professor of Landscape Architecture
- Caru Bowns, Ph.D. (California, Davis) Assistant Professor of Landscape Architecture
- Kathy Brasier, Ph.D. (Wisconsin) Assistant Professor of Rural Sociology
- C. Andrew Cole, Ph.D. (Southern Illinois) Assistant Professor of Landscape Architecture and Ecology
- Robert G. Crane, Ph.D. (Colorado) Professor of Geography; Director, Alliance for Earth Sciences, Engineering, and Development in Africa
- Duane R. Diefenbach, Ph.D. (Georgia, Athens) Adjunct Assistant Professor; Leader—Wildlife, PaCFWRU
- Stuart Echols, Ph.D. (Virginia Tech) Assistant Professor of Landscape Architecture
- Semih Eser, Ph.D. (Penn State) Professor of Energy and Geo-Environmental Engineering
- Jill L. Findeis, Ph.D. (Washington State) Distinguished Professor of Agricultural Economics
- James C. Finley, Ph.D. (Penn State) Professor of Forest Resources
- Leland Glenna, Ph.D. (Missouri) Assistant Professor of Rural Sociology and Science Technology and Society
- Larry Gorenflo, Ph.D. (California, Santa Barbara) Associate Professor of Landscape Architecture
- Alan R. Graefe, Ph.D. (Texas A&M) Associate Professor of Leisure Studies
- Murali Haran, Ph.D. (Minnesota) Assistant Professor of Statistics
- Clare Hinrichs, Ph.D. (Cornell) Associate Professor of Rural Sociology
- Nina G. Jablonski, Ph.D. (Washington) Head and Professor of Anthropology
- Jason Kaye, Ph.D. (Colorado State) Assistant Professor of Soils and Biogeochemistry
- Klaus Keller, Ph.D. (Princeton) Associate Professor of Geosciences
- C. Gregory Knight, Ph.D. (Minnesota) Professor of Geography
- Neil P. Korostoff, M.L.A. (Pennsylvania) Associate Professor of Landscape Architecture
- A.E. Luloff, Ph.D. (Penn State) Professor of Rural Sociology
- James McCarthy, Ph.D. (California , Berkeley) Assistant Professor of Geography
- Robert McKinstry, J.D., M.F.S. (Yale) Adjunct Professor of Forest Resources
- Douglas Miller, Ph.D. (Penn State) Assistant Professor of Geography; Director for Outreach, Earth and Mineral Sciences Environment Institute
- Timothy Murtha, Ph.D. (Penn State) Assistant Professor of Landscape Architecture
- Wayne L. Myers, Ph.D. (Michigan) Professor of Forest Biometrics
- Lee A. Newsom, Ph.D. (Florida) Associate Professor of Anthropology
- Daniel F. Perkins, Ph.D. (Michigan State) Professor of Agricultural and Extension Education
- Charles Ray, Ph.D. (Texas A&M) Assistant Professor of Wood Products Operations
- Gary J. San Julian, Ph.D. (Colorado State) Professor of Wildlife Resources
- Michael C. Saunders, Ph.D. (Georgia) Professor of Entomology
- Kamini Singha, (Stanford) Assistant Professor of Geosciences
- Arthur Small, (California, Berkeley) Associate Professor of Meteorology
- Sanford Smith, Ph.D. (Penn State) Lecturer in Forest Resources
- Ken Tamminga, M.P.L. (Queen's) Associate Professor of Landscape Architecture
- Petra Tschakert, Ph.D. (Arizona) Assistant Professor of Geography
- Nancy Tuana, Ph.D. (California, Santa Barbara) DuPont/Class of '49 Professor of Philosophy, Humanities, and Women's Studies; Director, Rock Ethics Institute
- George Vahoviak, Ph.D. (Penn State) Affiliate Associate Professor of Recreation, Park, and Tourism Management; Program Director, Shaver's Creek Center
- Thorsten Wagener, Ph.D. (Imperial College) Assistant Professor of Civil Engineering
- James W. Wood, Ph.D. (Michigan) Professor of Anthropology and Demography
- Melissa Wright, Ph.D. (Johns Hopkins) Associate Professor of Geography and Women's Studies
- Brenton M. Yarnal, Ph.D. (Simon Fraser) Professor of Geography; Director, Center for Integrated Regional Assessment
- Karl S. Zimmerer, Ph.D., (California, Berkeley) Head and Professor of Geography
- Harry C. Zinn, Ph.D. (Colorado) Associate Professor of Recreation, Park, and Tourism Management

The HDNRE dual-title intercollege degree program is administered by the HDNRE Program Committee. The committee maintains program definition, identifies appropriate faculty and courses, and recommends policies and procedures for its operation. This dual-title intercollege degree program is offered through graduate major programs in four colleges: Agricultural Sciences, Earth and Mineral Sciences, Health and Human Development, and the Liberal Arts. HDNRE enables students to attain and be identified with the content, techniques, applications, methods, and policy implications of an interdisciplinary focus on Human Dimensions of Natural Resources and the Environment, while maintaining a close association with areas of application.

Through participation in HDNRE, student programs of study will emphasize integrated, multidisciplinary approaches designed for improving their understanding about and management of natural resources. Areas of study will reflect the faculty advisor's home department and disciplinary thrust. To pursue a dual-title intercollege degree under this program, the student must first apply and be admitted through one of the existing graduate programs that offers the dual-title degree in HDNRE (Anthropology; Energy and Mineral

Engineering; Forest Resources; Geography; Recreation, Park, and Tourism Management; or Rural Sociology).

Admission Requirements

HDNRE requirements include: (1) a minimum baccalaureate Jr/Sr grade point average of 3.0 out of a 4.0 scale; (2) a statement of professional goals, natural resource management philosophy, and reasons for applying to the program; and (3) three letters of reference from individuals capable of evaluating the applicant's potential for graduate work in interdisciplinary natural resource management. TOEFL scores are required of all students for whom English is a second language.

The language of instruction at Penn State is English. All international applicants whose first language is not English or who have not received a baccalaureate or master's degree from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test, a score of 213 on the computer-based test, or 80 points on the new Internet-based Test with a minimum of 20 points on the speaking portion; or the IELTS module with a minimum composite score of 6.5 is required for admission.

Degree Requirements

To qualify for a dual-title intercollege degree, students must satisfy the requirements of the major program in which they are enrolled, including the communication/foreign language requirements, if any. In addition, they must satisfy the minimum requirements in the HDNRE dual-title intercollege program described here. Final course selection is determined by the student and her/his respective graduate committee. All dual-title intercollege degree candidates must enroll in HDNRE 590 in each of their first two semesters.

M.S./M.A. Degree: A candidate for the dual-title intercollege M.S./M.A. in HDNRE must complete 17 credit hours of HDNRE coursework beyond the bachelor's degree in addition to curricular requirements for the masters degree in the student's primary program. The HDNRE requirement includes four common courses in the HDNRE curriculum – i.e., HDNRE 590 Colloquium (two credits), HDNRE 574 Integrated Perspectives in Human Dimensions of Natural Resources and the Environment, HDNRE 575 Ethical Issues in Human Dimensions of Natural Resources and the Environment, and RSOC 555 Human Dimensions of Natural Resources. In addition, each HDNRE student will take either ANTH 559 Behavioral Ecology (to be changed to Human Ecology – name change proposal at Department) or FOR 565 GIS-Based Socio-Ecological Landscape Analysis, and one additional course selected in consultation with the student's graduate committee. The HDNRE Colloquium must be taken in each of the first two semesters of enrollment in the dual-title intercollege degree program. In addition, 6 semester credit hours of Thesis Research (in the student's home graduate degree program) are required if the candidate is writing a thesis. Particular courses may satisfy both the graduate major program requirements and those of the HDNRE dual-title intercollege program. All courses must be approved by the student's M.S./M.A. committee.

The thesis supervisor and chair of the student's graduate committee shall be a member of the student's major program, and a member of the dual-title program. All members of the committee must hold Graduate Faculty status or secure the same before serving on the committee.

The culminating experience (e.g., thesis, scholarly paper, project) must incorporate an HDNRE interest together with the primary field of study. All students are also required to successfully complete an oral defense of the M.S./M.A. project completed as part of the master's requirements if required by the participating program.

Ph.D. Degree: A candidate for the dual-title intercollege HDNRE Ph.D. must complete, in addition to curricular requirements for the doctoral degree in the student's primary program, a minimum of 18 credit hours of HDNRE coursework. This includes the required courses for the HDNRE M.S./M.A. program. The HDNRE Colloquium must be taken each of the first two semesters of enrollment in the dual-title intercollege degree program, and once more prior to graduation. In addition, 9 semester credit hours of Thesis Research (either in the home department or in HDNRE) are required. Particular courses may satisfy both the graduate major program requirements and those of the HDNRE program. If an HDNRE M.S./M.A. student continues into the HDNRE Ph.D. program, 15 credits of interdisciplinary course work must be selected, with the approval of the student's doctoral committee. As well, a continuing doctoral candidate must take 3 credits of HDNRE 590 (each student must enroll the first two semesters and then once more prior to graduation).

All Ph.D. students will be required to complete, present, and defend a dissertation that incorporates a topic related to HDNRE, in addition to the participating program.

All participating primary programs (Anthropology; Energy and Mineral Engineering; Forest Resources; Geography; Recreation, Park, and Tourism Management; and Rural Sociology) have agreed to incorporate the dual-title program within the student's dissertation work.

Student Aid

Forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Primary Programs of Study

All students (M.S./M.A. and Ph.D.) in the dual-title intercollege graduate degree program in HDNRE are expected to complete the common series of courses (HNDRE 590 – 2 credit minimum for masters students and 3 credit minimum for doctoral students, HDNRE 574, HDNRE 575, and RSOC 555). As well, each student is required to take either ANTH 559 or FORS 565 and one additional course selected in consultation with the student's graduate committee. All students must complete the required course of study in their primary program. Further, all HDNRE Ph.D. students will be encouraged to assist in teaching at least one course as part of their training and education in the dual-title intercollege graduate degree program.

Rural Sociology

M.S.

- M.S. – minimum of 30 credits (400, 500, 600 level) plus thesis
- Research Methods (AGEC 525 or its equivalent)
- Statistics – two semester sequence (AG 400 or RSOC 573 or their equivalent)
- Two or more of the following courses for Rural Sociology (RSOC 444, 452, 501, 502, 508, or 516)
- 6 semester credit hours of Thesis Research
- A final oral defense of thesis

- M.S. – 17 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course).
- 6 semester credit hours of Thesis Research if a thesis is required.

Ph.D.

- Ph.D. – no specified minimum credit requirements plus dissertation
- RSOC 502
- Either RSOC 516 or 517
- Two of the following (includes untaken course from above; RSOC 501, 508, 525, 530, 552, 555, 597A-E)
- Research Methods (AGEC 525 or its equivalent)
- Statistics – two semester sequence (AG 400 or RSOC 573 or their equivalent)
- 9 semester credit hours of Thesis Research
- Comprehensive examinations in four areas (Rural Sociology; Methods/Statistics; two additional areas. These areas of concentration are developed in consultation with major professor and others. One of these areas must be HDNR.)
- A final oral defense of dissertation

- Ph.D. – 18 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course). If a HDNRE M.S./M.A. student continues into the HDNRE Ph.D. program, 15 credits of interdisciplinary courses must be selected with the approval of the student's doctoral committee.
- 9 semester credit hours of Thesis Research

Forest Resources

M.S.

- M.S. – minimum of 30 credits (400, 500, 600 level) plus thesis
- 12 credits in 400 and 500 level courses appropriate to field of interest
- 6 credits of graduate level statistics
- 2 graduate seminar colloquium credits
- At least 6 and no more than 15 credits of Thesis Research
- At least 18 credits total must consist of 500- or 600-level course series, and only 6 thesis research credits (600) are applicable
- A final oral examination

- M.S. – 17 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course).
- 6 semester credit hours of Thesis Research if a thesis is required.

Ph.D.

- Ph.D. – no specified minimum credit requirements plus dissertation
- Candidacy Examination
- 2 credits of 590
- 1 credit FOR 602 credit (Supervised Experience in College Teaching)
- Satisfy Language or Culture requirement
- Comprehensive Examination
- A final oral defense of dissertation

- Ph.D. – 18 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course). If a HDNRE M.S./M.A. student continues into the HDNRE Ph.D. program, 15 credits of interdisciplinary courses must be selected with the approval of the student's doctoral committee.
- 9 semester credit hours of Thesis Research

Energy and Mineral Engineering

M.S.

- M.S. – minimum of 30 credits (24 course credits + 6 credits of Thesis Research)
- 15 credits representing physical (EGEE 500 – 3 credits) and chemical (EGEE 510 -3 credits) interactions, quantitative skills (EGEE 520 -3 credits), integrative design experience (EGEE 580 – 5 credits), or equivalent substitution in these main programmatic areas, and Colloquium (EGEE 590- 1 credit)
- A final oral defense of thesis

- M.S. – 17 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course).
- 6 semester credit hours of Thesis Research if a thesis is required.

- Ph.D. – minimum of 15 credits of 500-level courses plus dissertation
- Candidacy examination
- Comprehensive examination
- A final oral defense of dissertation

- Ph.D. – 18 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course). If a HDNRE M.S./M.A. student continues into the HDNRE Ph.D. program, 15 credits of interdisciplinary courses must be selected with the approval of the student's doctoral committee.
- 9 semester credit hours of Thesis Research

Recreation, Park, and Tourism Management

M.S.

- M.S. – minimum of 36 credits including thesis
- 9 credits RPTM core courses (RPTM 501, 527, 545)
- Research Methods (RPTM 530)
- Statistics – one statistics course at 400 or 500 level
- 5 credits of RPTM electives
- 6 semester credit hours of thesis research
- A final oral defense of thesis

- M.S. – 17 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course).

- 6 semester credit hours of Thesis Research if a thesis is required.

- Ph.D. – no specified minimum number of credits plus dissertation
- 12 credits RPTM core courses (RPTM 501, 527, 545, 597)
- Research Methods (RPTM 533 plus a qualitative methods course)
- Candidacy and comprehensive examination
- Statistics – three statistics courses beyond master's coursework
- 6 credits of RPTM electives
- Dissertation research (no specified minimum of credit hours)
- A final oral defense of dissertation

- Ph.D. – 18 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course). If a HDNRE M.S./M.A. student continues into the HDNRE Ph.D. program, 15 credits of interdisciplinary courses must be selected with the approval of the student's doctoral committee.
- 9 semester credit hours of Thesis Research

Anthropology

M.A.

- M.A. – minimum of 30 credits (24 course credits + 6 credits of Thesis Research)
- 12 credits in Anthropology (including ANTH 408 and ANTH 456)
- 6 credits of graduate level statistics
- At least 6, but no more than 15 credits of Thesis Research
- At least 18 credits total must consist of 500- or 600- level course series, and only 6 thesis research credits (600) are applicable
- A final oral examination

- M.A. – 17 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course).
- 6 semester credit hours of Thesis Research if a thesis is required.

Ph.D.

- Ph.D. – The M.A. requirements as noted above (or equivalent)
- 18 additional graduate level credits
- Satisfy foreign language requirement
- Comprehensive Examination
- A final oral defense of dissertation

- Ph.D. – 18 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course). If a HDNRE M.S./M.A. student continues into the HDNRE Ph.D. program, 15 credits of interdisciplinary courses must be selected with the approval of the student's doctoral committee.
- 9 semester credit hours of Thesis Research

Geography

M.S.

- M.S. –Thesis option or two-paper option: thesis option minimum of 30 credits, plus thesis; paper option minimum of 35 credits, plus two papers, one of which must be associated with a seminar. Geography 500 and 502, 3 credits of 501, 2 credits of 590, and a minimum of 3 other 500-level seminar credits from the Department required. Proposal defense required of both options;
- Illustrated Paper presentation required at end of 2 nd year.

- M.S. – 17 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course).
- 6 semester credit hours of Thesis Research if a thesis is required.

Ph.D.

- Ph.D. – Geography 500 and 502, 2 credits of 590; no other course or credit requirements, plus dissertation
- Proposal defense a minimum of two weeks before comprehensive exam; final oral defense of dissertation.

- Ph.D. – 18 credits in HDNRE program (HDNRE 590, HDNRE 574, HDNRE 575, RSOC 555; either ANTH 559 or FORS 565; plus one course). If a HDNRE M.S./M.A. student continues into the HDNRE Ph.D. program, 15 credits of interdisciplinary courses must be selected with the approval of the student's doctoral committee.
- 9 semester credit hours of Thesis Research

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HUMAN DIMENSIONS OF NATURAL RESOURCES AND THE ENVIRONMENT (HDNRE) course list

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-07-009

Review Date: 6/17/08

Human Resources and Employment Relations (HRER)

Program Home Page (Opens New Window)

PAUL F. CLARK, *Head*
133 Willard Building
814-865-5425

Degree Conferred:

- M.S. in Human Resources and Employment Relations
- Master of Professional Studies in Human Resources and Employment Relations (MPS HRER)
- Integrated B.S. in Labor and Employment Relations and M.S. in Human Resources and Employment Relations (LRHRER)
- Integrated B.S. in Spanish and M.S. in Human Resources and Employment Relations (SPHRER)

The Graduate Faculty

- Mark S. Anner, Ph.D. (Cornell) Assistant Professor of Labor Studies and Employment Relations, and Political Science
- Forrest S. Briscoe, Ph.D. (MIT) Assistant Professor of Labor Studies and Employment Relations, and Sociology
- Paul F. Clark, Ph.D. (Pittsburgh) Professor of Labor Studies and Employment Relations
- Alex Colvin, Ph.D. (Cornell) Assistant Professor of Labor Studies and Employment Relations
- Alan Derickson, Ph.D. (California, San Francisco) Professor of Labor Studies and Employment Relations, and History
- Robert Drago, Ph.D. (Massachusetts, Amherst) Professor of Labor Studies and Employment Relations, and Women's Studies
- Ronald L. Filippelli, Ph.D. (Penn State) Professor of Labor Studies and Employment Relations
- Dennis Gouran, Ph.D. (Iowa) Professor of Speech Communication and Labor Studies and Employment Relations
- Sumita Raghuram, Ph.D. (Minnesota) Associate Professor of Labor Studies and Employment Relations
- Jackie Krasas Rogers, Ph.D. (USC) Associate Professor of Labor Studies and Employment Relations, Sociology, and Women's Studies
- James B. Stewart, Ph.D. (Notre Dame) Professor of Labor Studies and Employment Relations
- Mark Wardell, Ph.D. (Missouri) Associate Professor of Labor Studies and Employment Relations

The master of science degree in Human Resources and Employment Relations (HRER) is a two-year program designed for students anticipating careers in some aspect of labor and human resources or labor-management relations. The program has the following objectives:

- provide students with an understanding of the roles employers, employees, employee organizations, and public policy makers play in the employment relationship;
- familiarize students with the complex personal and organizational issues inherent in the employment relationship;
- prepare students to systematically analyze complex issues and evaluate research results in the process of administering labor and human resource systems;
- prepare students for advanced graduate or professional training beyond the master's degree;
- prepare students for employment as practitioners in the field.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) or the Graduate Management Admission Test (GMAT) are required. Applicants with a 3.00 junior/senior grade-point average (on a 4.00 scale) will be considered for admission. Applicants must have three letters of recommendation sent from people who can assess adequately their likelihood of completing the graduate program.

Students are expected to have completed successfully an undergraduate statistics course plus a minimum of 12 undergraduate credits in the social sciences as part of their baccalaureate degree.

Degree Requirements

THESIS OPTION:

The HRER thesis option is intended for students anticipating additional graduate education beyond the master's degree. It requires 36 credits, including a minimum of 30 at the 400 and 500 level, and a minimum of 6 600-level thesis credits. For the degree, an overall 3.00 (B) grade-point average must be earned in the 400- and 500-level work and a grade of B or above must be earned in all 500-level courses. At least 6 credits must emphasize a particular aspect of employment relations. A student's thesis should reflect the chose emphasis.

RESEARCH PAPER OPTION:

The HRER research paper option is intended for students expecting to enter the labor market upon completion of the master's degree. It requires a minimum of 37 credits at the 400 and 500 level. For the degree, and overall 3.00 (B) grade-point average must be earned in the 400- and 500-level work and a grade of B or above must be earned in all 500-level courses. At least 6 credits must emphasize a particular aspect of employment relations. A student's research paper should reflect the chosen emphasis.

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Course Requirements

Core Courses (22 credits)

HRER 501, HRER 502, HRER 504, HRER 505, HRER 512, HRER 513, HRER 516
Required course are offered once per academic year and elective courses at least once every two academic years.

Emphasis Courses (6 credits)

An emphasis is an area of study related to a particular aspect or domain of industrial relations and human resources. Students select an emphasis in consultation with their master's advisory committee.

Elective Courses (3-9 credits)

With the faculty adviser's approval, a student selects at least 3 or more elective credits, depending on the chosen option. Examples of suitable elective courses are: HRER 500, HRER 535, HRER 536, HRER 594, HRER 595, HRER 596, HRER 597, HRER 599; LER 411, LER 401, LER 444, LER 458Y; ECON 412, ECON 436W, ECON 571; EDLDR 565, EDLDR 574; HIST (LER) 555; MGMT 321, MGMT 523, MGMT 548; PSYCH 484, PSYCH 485, PSY 522; SOC 455, SOC 456, SOC 555.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HUMAN RESOURCES AND EMPLOYMENT RELATIONS (HRER) course list

Master of Professional Studies in Human Resources and Employment Relations (MPS HRER)

PAUL F. CLARK, *Professor in charge*

The MPS in Human Resources and Employment Relations (HRER) is a 33 credit program of study for professionals working in human resources/employment relations or considering a career in some aspect of human resources and employment relations. The program will prepare students to:

- understand the roles that employers, employees, employee organizations and unions, and public policy makers play in the employment relationship;
- analyze the complex personal, legal, and organizational issues inherent in the employment relationship;
- understand the ethical dimensions of human resource and employment relations;
- analyze complex issues and evaluate research results in the process of administering labor and human resource systems;

Courses include the study of employment law, labor and employment relations, human resources, workplace organization, labor markets, ethics, and the employment relationship, recruiting/selection, compensation and benefits, workforce development, and diversity in the workplace.

The program will highlight the changing nature of the HRER field, including the impact of the globalization of private and public organizations and the growing importance of diversity in the workforce. It will culminate in a capstone class in which students will demonstrate their understanding of the curriculum and apply it to their professional areas of interest. Upon completion of the MPS HRER, students will be equipped to work as professionals in human resource management, employment relations, and general management with private employers, unions, government agencies, and non-profit organizations.

Students pursuing the MPS in HRER would be required to complete a concentration designed to provide the student an opportunity to develop expertise in a specific area of human resources and employment relations. The focused coursework should make the degree more relevant to potential students and add value to the degree from the student's perspective.

Students will choose and complete one concentration which will include six credits beyond the 27 required credits. Double counting six required credits, including the Research Project, the concentration would be 12 credits of coursework in a particular area of HRER. Students will be required to complete the capstone project in their area of concentration. (For example, students choosing the Benefits and Compensation concentration would be required to complete a capstone project that focused on some aspect of benefits and compensation).

Degree Requirements

PRESCRIBED COURSES: 27 credits

HUMAN RESOURCES AND EMPLOYMENT RELATIONS (HRER)
501. Labor and Employment Law (3)

504. Seminar in Industrial Relations (3)
505. Seminar in Human Resources (3)
800. International Context of HRER (3)
802. Organizations in the Workplace (3)
816. Labor Market Analysis (3)
836. Diversity in the Workplace (3)
894. Research Project (3)

PHILOSOPHY (PHIL)
503. Ethics Seminar (3)

ELECTIVE COURSES: 6 credits
Select 6 credits in area of concentration.

LABOR AND EMPLOYMENT RELATIONS (LER)
401. Law of Labor-Management Relations (3)
424. Employment Compensation (3)
425. Employment Benefits (3)
426. Staffing and Training
435. Labor Relations in the Public Sector (3)
445Y. Politics of Affirmative Action (3)

WORKFORCE EDUCATION AND DEVELOPMENT (WF ED)
471. Training in Industry and Business (3)
573. Needs Assessment for Industrial Trainers (3)

AREAS OF CONCENTRATION (student must complete one)

--Benefits and Compensation

HRER 505 Seminar in Human Resources (3)
HRER 894 Research Project (3)
LER 424 Employment Compensation (3)
LER 425 Employment Benefits (3)

--Employment and Labor Law

HRER 501 Labor and Employment Law (3)
HRER 894 Research Project (3)
LER 401 Law of Labor-Management Relations (3)
LER 445 Y The Politics of Affirmative Action (3)

--Labor and Collective Bargaining

HRER 504 Seminar in Industrial Relations (3)
HRER 894 Research Project (3)
LER 401 Law of Labor-Management Relations (3)
LER 435 Labor Relations in the Public Sector (3)

--Staffing, Training, and Development

HRER 505 Seminar in Human Resources (3)
HRER 894 Research Project (3)
LER 426 Staffing and Training (3) or WF ED 471 Training in Industry and Business (3)
WF ED 573 Needs Assessment for Industrial Trainers (3)

3. Admission Requirements

In order to enter the MPS in HRER, applicants must have a baccalaureate degree from an accredited college or university with a GPA of 3.0. or above. Students who do not have a GPA of 3.0 will be considered on a case-by-case basis depending on the quality of their overall application. Applicants who are still completing their baccalaureate requirements at the time of application may be admitted to the Graduate School conditional on the awarding of the baccalaureate degree. Students are also expected to have a minimum of two years of full-time work experience prior to admission.

Admissions decisions for the program are based on the quality of the applicant's credentials. The decisions are based on a review of the complete application portfolio. During the admission process, students who are better suited for another graduate level program will be encouraged to apply to the appropriate program. Applicants to the MPS HRER should submit the following materials:

- Penn State graduate degree application form and application fee;
- World Campus program application;
- A 2-3 page essay articulating career and educational goals that demonstrates the applicant's written communication skills. Documentation of a minimum of two years of full-time work and a resume should be attached as a supplement;
- Three letters of recommendation that attest to the applicant's readiness for graduate study and document the requisite minimum of two years of work experience;
- Official transcript(s) of all institutions attended;

TOEFL score, if applicable. A TOEFL score of 580 on the paper test, a score of 237 on the computer-based test, or **80** points on the new Internet-based test with a minimum of 23 points on the new speaking portion is required for admission.

A minimum composite score of 6.5 on the IELTS test is required for admission.

Graduate Record Examination (GRE) scores are not required.

4. Recommended Sequence of Courses

Most adult students will participate in the online program on a part-time basis because of full-time professional responsibilities. The typical student course load is expected to be one course or two courses each semester (fall, spring, and possibly summer). Below, we illustrate one course per semester program. The sequence of courses may change and additional courses may be scheduled per semester depending on enrollment and demand. Course development will focus on one area of concentration creating one path through the degree. Additional courses for other areas of concentration will be added as enrollments increase to support a broader curriculum.

Year one: 9 Credits

HRER 501(3): Labor and Employment Law (fall)
HRER 504(3): Seminar in Industrial Relations (spring)
HRER 505(3): Seminar in Human Resources (summer)

Year two: 9 Credits

HRER 800(3): International Context of HRER (fall)
HRER 802(3): Organizations in the Workplace (spring)
HRER 836(3): Diversity in the Workplace (summer)

Year three: 9 credits

HRER 816(3): Labor Market Analysis (fall)
PHIL 503(3): Ethics Seminar (spring)
Electives (3): (summer)

Electives for concentration

Year four: 6 credits

Electives (3): Fall/Spring)

HRER 894 Research Project (Can be offered fall, spring, and summer depending on demand.)

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-437

Review Date: 6/12/07

Integrated B.S. in Labor and Employment Relations and M.S. in Human Resources and Employment Relations (LRHRER)

PROFESSOR PAUL F. CLARK, *Head*

The integrated LER B.S. and HRER M.S. is a five-year program designed for academically talented baccalaureate students to obtain both the B.S. and the M.S. degrees in LER and HRER with five years of study. Students will develop expertise in the human resources and labor relations fields beyond the B.S. degree. The undergraduate curriculum educates students about (1) the roles of employers, employees, employee organizations and public policy makers play in the employment relationship, (2) the complex personal and organizational issues inherent in the employment relationship (3) and how to systematically analyze those complex issues and evaluate research relevant to those analyses. The graduate curriculum provides for more individualized, focused learning in a concentrated sub-area of the HRER field. The program culminates with an M.S. research paper. Upon completion of the integrated degree, students will enter the workforce with advanced knowledge and expertise gained from conducting and analyzing empirical work and participating in seminar-style classes.

Bachelor of Science

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

REQUIREMENTS FOR THE MAJOR: 98-99 credits
[12 credits may be double counted, 6 must be at the 500 level]

B.S. REQUIREMENTS: 62-63 credits
(This includes 10 credits of General Education courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 36-37 credits

PRESCRIBED COURSES: (16 credits)
(Some courses in this category have prerequisites that are not included in the major)
LER 100 GS(3), LER 312(4) (Sem: 3-8)
ECON 002 GS(3), ECON 315 GS(3), PSYCH 281 GS(3) (Sem: 1-8)

ADDITIONAL COURSES: (13 credits)
(Some courses in this category have prerequisites that are not included in the major)
LER 201 GS(3) or LER 401(3) (Sem: 3-8)
SCM 200(4) or STAT 200 GQ(4) (Sem: 3-8)
LER 136 US(3) or WMNST 136 US(3) or LER 400 IL(3) (Sem: 5-8)
LER 458Y US(3) or HIST 458Y US(3) or LER 414W(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS: (33-34 credits)

(LER courses that are used in the Additional Courses category may not be double counted to satisfy this requirement. Some courses in this category have prerequisites that are not included in the major.)

Select 15-21 credits from appropriate LER courses, at least 9 must be at the 400 level (only 3 credits of LER 495 or 3 credits of LER 496 may be used to satisfy this requirement) (Sem: 5-8)

Select 12-19 credits from the department list in consultation with an adviser, at least 6 credits must be at the 400 level, 3 each from 3 categories:

1. ECON 342 GS(3), ECON 370 GS(3), ECON 412(3), ECON 436W(3), ECON 445(3) (Sem: 5-8)
2. MGMT 100(3), MGMT 321(3), MGMT 331(3), MGMT 341(3), MGMT 424(3) (Sem: 3-8)
3. PL SC 451(3), PL SC 471(3), PL SC 473(3), PL SC 474(3) (Sem: 5-8)
4. PSYCH 482(3), PSYCH 484(3), PSYCH 485(3) (Sem: 5-8)
5. SOC 119 GS;US(4), SOC 409 US(3), SOC 444(3), SOC 455(3), SOC 456(3) (Sem: 3-8)
6. ACCTG 211(4), CAS 352(3), H P A 460(3), HD FS 425 US(3), HIST 155 GH;US(3), S T S 407(3) (Sem: 5-8)

M.S. REQUIREMENTS: 36 credits

[12 credits may be double counted, 6 must be at the 500 level]

PRESCRIBED COURSES: (21 credits)
HRER 501(3), HRER 502(3), HRER 504(3), HRER 505(3), HRER 512(3)*, HRER 513(3)**, HRER 516(3)
*or other statistics course approved in advance by graduate director
**or other methods course approved in advance by graduate director

ADDITIONAL COURSES: (15 credits)
Select 15 credits from the following list in consultation with adviser (only 6 credits may be at the 400 level).
LER 400 IL(3), LER 401(3), LER 414W(3), LER 424(3), LER 434(3), LER 435(3), LER 437(3), LER 444(3), LER 458Y US(3), LER 460(3), LER 465(3), LER 470(3), HRER 500(3), HRER 535(3), HRER 536(3), HRER 594(1-6), HRER 595(1-6), HRER 596(1-6), HRER 597(1-3), HRER 600(3-6)

Emphasis Courses (6 credits)
An emphasis is an area of study related to a particular aspect or domain of industrial relations and human resources. Select 6 credits from the M.S. prescribed or additional courses in consultation with their adviser.

Masters Research Paper or a Masters Thesis (6 credits)
Students must complete either a Masters Research Paper or a Masters Thesis. Students choosing the Thesis option must complete 6 thesis credits (HRER 600). These credits can be counted towards the 15 credits required from the M.S. Additional Courses section above.

HUMAN RESOURCES AND EMPLOYMENT RELATIONS (HRER) course list
LABOR AND EMPLOYMENT RELATIONS (LER) course list

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Integrated B.S. in Spanish and M.S. in Human Resources and Employment Relations (SPHRER)

The integrated Spanish B.S. and HRER M.S. is a five-year program designed for highly qualified and motivated students seeking employment within a culturally diverse workplace. Students will develop basic skills in speaking, understanding, reading, and writing Spanish. Students will gain familiarity with Hispanic cultures through literature and the University's international education program, if they choose to have that experience. Students also will learn about (1) the roles that employers, employees, employee organizations, and public policy makers play in the employment relationship, (2) the complex personal and organizational issues inherent in the employment relationship, and (3) how to systematically analyze those complex issues and evaluate research relevant to those analyses.

For the B. S./M. S. degree in Integrated Spanish B.S. and Human Resources and Employment Relations M.S., a minimum of 154 credits is required. Twelve graduate level credits can apply to both undergraduate and graduate degrees; six of these must be at the 500 level. Students can complete the B.S. in Spanish and not advance to the M.S. HRER degree if they desire.

Bachelor of Science

Scheduling Recommendation by Semester Standing given like (Sem: 1–2)

GENERAL EDUCATION: 45 credits
(10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

REQUIREMENTS FOR THE MAJOR: 101 credits
(This includes 10 credits of General Education courses: 6 credits of GS courses; 4 credits of GQ courses.)

PRESCRIBED COURSES: (27 credits)
[Some courses in this category have prerequisites that are not included in the major]
SPAN 100(3), SPAN 120(3), SPAN 200(3), SPAN 253(3), SPAN 305(3) (Sem: 1–6)
SPAN 300W(3), SPAN 410(3), SPAN 412(3), SPAN 414(3) (Sem: 5–8)

ADDITIONAL COURSES: (12 credits)
SPAN 210(3) or SPAN 220(3), SPAN 353(3) or SPAN 354(3) (Sem: 3–6)
SPAN 472(3) or SPAN 476(3) (Sem: 5–8)
Select 3 credits of SPAN 415(3), SPAN 418(3), SPAN 420(3), SPAN 439(3), SPAN 490(3), SPAN 491(3), or SPAN 497(1–9) (Sem: 5–8)

LABOR AND EMPLOYMENT RELATIONS: (32 credits)
[Prescribed undergraduate credits in Labor and Employment Relations option]
ECON 002 GS(3), LER 100 GS(3), LER 201(3), LER 312(4), LER 400 IL(3), LER 414W(3), LER 458Y US(3), STAT 200 GQ(4) (Sem: 1–6)
HRER 501(3), HRER 512(3) (Sem: 7–8)

Master of Science

EMPLOYMENT RELATIONS/HUMAN RESOURCES M.S.: (30 credits)
[HRER credits to be selected from the following in consultation with an HRER adviser]
HRER 500, HRER 502, HRER 504, HRER 505, HRER 513, HRER 516, HRER 535, HRER 536, HRER 595*, HRER 596*, HRER 597, HRER 599

[* Heritage speakers (students with Spanish language in family background but not necessarily a native speaker) should take SPAN 100A and SPAN 301 instead of SPAN 100 and SPAN 300W]

HUMAN RESOURCES AND EMPLOYMENT RELATIONS (HRER) course list
LABOR AND EMPLOYMENT RELATIONS (LER) course list

SPANISH (SPAN) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

DATE LAST REVIEWED BY PUBLICATIONS: 9/27/06

Last Revised by the Department: Summer Session 2007

Blue Sheet Item #: 35-06-466 (HRER); 35-07-437 (M.P.S.)

Review Date: 4/10/07

UCA Revision #1: 8/8/06

Humanities (HUMAN)

Program Home Page (Opens New Window)

PATRICIA E. JOHNSON, *Graduate Program Coordinator*
School of Humanities
W-356 Olmsted Building
Penn State Harrisburg
777 W. Harrisburg Pike
Middletown, PA 17057
pej1@psu.edu; 717-948-6329

Degree Conferred:

M.A.

The Graduate Faculty

- George W. Boudreau, Ph.D. (Indiana) Associate Professor of Humanities and History
- Carl P. Burrowes, Ph.D. (Temple) Associate Professor of Communications and Humanities
- Sandra G. Carter, Ph.D. (Texas) Assistant Professor of Communications and Humanities
- Gloria B. Clark, Ph.D. (SUNY, Binghamton) Associate Professor of Humanities and Spanish
- Louise E. Hoffman, Ph.D. (Bryn Mawr) Associate Professor of Humanities and History
- Margaret Rose Jaster, Ph.D. (Maryland) Associate Professor of Humanities and Literature
- Patricia E. Johnson, Ph.D. (Minnesota) Professor of Humanities and Literature
- Peter J. Kareithi, Ph.D. (Massachusetts) Associate Professor of Humanities and Communications
- Julie Kearney, Ph.D. (Bowling Green) Assistant Professor of English Composition and Humanities
- Glen A. Mazis, Ph.D. (Yale) Professor of Humanities and Philosophy
- Catherine A. Rios, M.F.A. (Columbia) Assistant Professor of Humanities and Communications
- Kathryn Robinson, Ph.D. (Texas Tech) Director, School of Humanities; Professor of Humanities
- Cheri L. Ross, Ph.D. (Purdue) Associate Professor of Humanities and English
- Yu Shi, Ph.D. (Iowa) Assistant Professor of Speech Communications and Humanities
- Troy M. Thomas, Ph.D. (California, Berkeley) Associate Professor of Humanities and Art
- Robin Veder, Ph.D. (William and Mary) Assistant Professor of Humanities and Art History/Visual Culture
- Craig Welsh, M.F.A. (Marywood) Assistant Professor of Humanities and Communications
- Matthew T. Wilson, Ph.D. (Rutgers) Professor of Humanities and English
- Samuel Winch, Ph.D. (Indiana) Associate Professor of Humanities and Communications
- David Witwer, Ph.D. (Brown) Associate Professor of History and Humanities

This program is interdisciplinary, emphasizing critical theories and interpretive approaches that transcend disciplinary boundaries as well as providing advanced study within various humanities disciplines. These include art history, communications, history, literature, music history, philosophy, and writing. The program offers small classes, individualized advising, and assistance in developing advanced analytical, synthetic, and interpretive skills. It accommodates both part- and full-time students.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Applicants must hold a baccalaureate degree from an accredited college or university; have earned at least a 2.50 grade-point average in their junior and senior years; and have studied in two humanities disciplines (usually a major in one area and some course work in another). Exceptions may be made for those with special backgrounds or abilities who are committed to advanced interdisciplinary study. All applicants must submit the following items, preferably by March of the year in which they wish to begin study: an application form and fee; two copies of official transcripts from all colleges/universities attended; a letter explaining personal or career goals and reasons for wishing to enroll in the program; two letters of reference (preferably from previous professors or others familiar with the applicant's intellectual/creative work or interests); and a writing sample (an academic paper; if this is not available, consult the graduate coordinator for an alternative).

Students applying for fellowships or assistantships must submit scores from the Graduate Record Examinations (GRE) or similar examination by January 15. An admissions committee often interviews applicants in person or by telephone. Applications must be received by November 1 for spring semester admission; by January 15 for applicants requesting financial aid for the following year; and by April 1 for summer and fall admission.

Degree Requirements

All students must complete 30 credits, 18 of which must be at the 500 level, achieve a 3.00 grade-point average, and successfully complete an interdisciplinary master's production (academic thesis or creative production with academic essay). Students work with their faculty advisers and supervisory committees to select courses in accordance with their individual interests.

Courses required of all students include HUM 500, a foundation course in research methods; HUM 560, a capstone course in interdisciplinary theory and research; and HUM 580, the master's production. (See course titles and descriptions in this section.) Recommended courses include HUM 525 Studies in Aesthetics, and HUM 535 Topics in Cultural and Intellectual History, both multidisciplinary courses, covering the content of various disciplines form the perspective of one discipline. To acquire breadth in the humanities, students must take at least one course in each of three disciplines; single-discipline courses are available as HUM 515 Seminar (repeatable for credit). Other courses in particular disciplines are available at the 400 level. Other available 500-level courses are listed in this section. Students planning to teach in a junior or community college may arrange a teaching internship (HUM 550), subject to appropriate preparation and approval by both the program and the community college.

A full-time student can expect to complete the program in four semesters, a part-time student in six or more semesters. Students are expected to complete all requirements for the degree within six years, although the deadline may be extended at the discretion of the graduate coordinator in accordance with policies approved by the Graduate School.

Required Courses

HUMANITIES (HUM)
500. RESEARCH METHODS AND SCHOLARLY INQUIRY IN THE HUMANITIES (3)
560. INTERRELATIONS IN THE HUMANITIES (3)
580. MASTER'S PRODUCTION (1-6)

Recommended Courses

HUMANITIES (HUM)
525. STUDIES IN AESTHETICS (3)
535. TOPICS IN CULTURAL AND INTELLECTUAL HISTORY (3 per semester, maximum of 9)

Other Courses

HUMANITIES (HUM)
502. ENGLISH COMPOSITION STUDIES (3)
515. SEMINAR (3 per semester, maximum of 9)
Unit A. Art History (3)
Unit B. History. (3)
Unit C. Literature (3)
Unit D. Music History and Analysis (3)
Unit E. Philosophy (3)
Unit F. Communications (3)
Unit G. Writing (3)
530. SEMINAR IN COMPARATIVE ARTS (3 per semester, maximum of 9)
550. JUNIOR COLLEGE TEACHING INTERNSHIP (3)
590. COLLOQUIUM (1-3)
596. INDIVIDUAL STUDIES (1-9)
597. SPECIAL TOPICS (1-9)

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

HUMANITIES (HUM) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/26/04

Last updated by Publications: 3/2/09

Immunology and Infectious Diseases (I&ID)

Program Home Page

Current Co-Chairs

Margherita Cantorna, Department of Veterinary and Biomedical Sciences, University Park
Neil Christensen, Department of Pathology, College of Medicine, Milton S. Hershey Medical Center

Degrees Conferred:

Ph. D., M.S.

The Graduate Faculty

- Avery August, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)
- Ottar Bjonstad, Ph.D., (Entomology, College of AgSci)
- Robert Bonneau, Ph.D., (Microbiology and Immunology, CoM)
- Margherita Cantorna, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)
- Pamela Correll, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)
- Neil D. Christensen, Ph.D., (Pathology, CoM)
- Timothy Craig, D.O., (Medicine, CoM)
- Liwang Cui, Ph.D., (Entomology, College of AgSci)
- Richard Frisque, Ph.D., (Biochemistry and Molecular Biology, ECoS)
- Thomas Gardner, M.D., (Ophthalmology, CoM)
- Bryan Grenfell, Ph.D., (Biology, ECos)
- Eric Harvill, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)
- Biao He, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)
- Andrew Henderson, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)
- Eddie Holmes, Ph.D., (Biology, ECos)
- Peter Hudson, Ph.D., (Biology, ECos)
- Walter Koltun, M.D., (Surgery, CoM)
- Andrea M. Mastro, Ph.D., (Biochemistry and Molecular Biology, ECoS)
- Stanley Naides, M.D., (Medicine, CoM)
- Christopher Norbury, Ph.D., (Microbiology and Immunology, CoM)
- Robert Paulson, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)
- David Phelps, Ph.D., (Pediatrics, CoM)
- Catharine Ross, Ph.D., (Nutrition, HHD)
- Witold Rybka, M.D., (Medicine, CoM)
- Todd Schell, Ph..D., (Microbiology and Immunology, CoM)
- Robert A. Schlegel, Ph.D., (Biochemistry and Molecular Biology, ECoS)
- Anthony Schmitt, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)
- Shao-Cong Sun, Ph.D., (Microbiology and Immunology, CoM)
- Michael Teng, Ph.D., (Biochemistry and Molecular Biology, ECoS)
- Satvir S. Tevethia, Ph.D., (Microbiology and Immunology, CoM)
- Emmy Truckenmiller, Ph.D., (Microbiology and Immunology, CoM)
- Na Xiong, Ph.D., (Veterinary and Biomedical Sciences, College of AgSci)

The Intercollege Graduate Program in Immunology and Infectious Diseases (IGDP in I&ID) prepares graduates for diverse opportunities in academic institutions, pharmaceutical companies, private research foundations, governmental research and regulatory programs. The program includes faculty from 12 departments in the College of Agricultural Sciences, Health and Human Development and Eberly College of Science at the University Park campus and the College of Medicine at the Penn State Milton S. Hershey Medical Center. The IGDP in I&ID is also supported by the Huck Institutes of Life Sciences which provides modern telecommunications facilities and sophisticated equipment for state-of-the-art research applications. Doctoral students not only explore new conceptual connections, but also engage in active group learning experiences and explore a variety of potential career opportunities before graduation. Two unique aspects are (1) optional dual mentors will expose students to complementary viewpoints and encourage students to pursue problems at the interface between traditional disciplines, and (2) an optional internship will provide a mechanism for students to obtain practical experience in future professional settings.

General Admission Requirements

M.S. or Ph.D. degrees

Application deadline is January 10 for priority consideration.

1. Completed official Penn State Graduate School application
2. Paid nonrefundable application fee
3. Two official transcripts from each institution attended
4. Completed Integrative Biosciences Graduate Degree Program application
5. Application for a U.S. visa (International applicants only)
6. Graduate Record Examinations (GRE) general test
7. Three letters of recommendation
8. Statement of goals that pertains to the life sciences
9. All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System) and submit the results of that test with the application for admission. A TOEFL score of 550 on the paper test, a score of 213 on the computer-based test, or 80 points on the new Internet-based test with a minimum of 23 points on the speaking portion; or the International English Language Testing System (IELTS) module with a minimum composite score of 6.5 is required for admission.
10. Students must have completed a bachelor's degree at an accredited college or university and have a minimum of a 3.0/4.0

junior/senior undergraduate grade-point average.

Program Requirements

M.S. or Ph.D. degrees

Students are expected to have a foundation and basic knowledge in immunology, infectious diseases, molecular biology, cell biology, biochemistry, and virology. Required course are designed to fulfill this aspect of the training. The courses offered at the Hershey and University Park Campuses are interchangeable and fulfill requirements on both campuses. All students receive A-F grades except for rotations, internships and research credits for which students will receive R (satisfactory/passing) or F (unsatisfactory/failing).

General coursework required for both M.S. and Ph.D. Students

IBIOS 590 COLLOQUIUM (2 credits) All students are required to enroll for 4 credits of colloquium.

IBIOS 591 ETHICS IN THE LIFE SCIENCES (1 credit)

IBIOS 596 INDEPENDENT STUDIES: LABORATORY ROTATIONS (1-3 credits per semester)

IBIOS 600 THESIS RESEARCH (1-9 credits per semester)

IBIOS 601 THESIS PREPARATION (0 credit per semester) For those students who passed their comprehensive exams (For Ph.D. students only)

IBIOS 511 .MOLECULAR IMMUNOLOGY (2) or **MICRO/CMBIO 554**.PRINCIPLES OF IMMUNOLOGY (2)

BMMB/VB SC 432 MECHANISMS OF MOLECULAR CELL COMMUNICATION(2) or **CMBIO/BCHEM/MICRO 503** CORE MOLECULAR BIOLOGY (3)

BMMB 501 CORE CONCEPTS IN BIOMOLECULAR SCIENCE (5), or **BCHEM 502** CORE BIOCHEMISTRY (3) or **B M B 401H** BIOCHEMISTRY (3) and **B M B 400** MOLECULAR BIOLOGY (2-3)

Supporting Courses

IBIOS 595 INTERNSHIP (1)

VB SC 602/IBIOS 602 SUPERVISED EXPERIENCE IN COLLEGE TEACHING. (1) All students are strongly encouraged to enroll for 1 credit (or the equivalent) although this is an optional requirement.

IBIOS/V SC/BMMB 515 INNATE IMMUNITY (2)

IBIOS/V SC/BMMB 516 VIRAL EVASION OF IMMUNE RESPONSES (2)

IBIOS/V SC/BMMB 518 T CELL RECOGNITION AND DEVELOPMENT (2)

IBIOS/V SC/BMMB 519 DEVELOPMENT OF THE HEMATOPOIETIC AND VASCULAR SYSTEM (2)

MICRO 550 MEDICAL MICROBIOLOGY (2)

MICRO 572 LITERATURE REPORTS (1)

MICRO 553 SCIENCE OF VIROLOGY (4)

The Graduate School requires all graduate students to maintain a 3.0 grade-point average.

M.S. Degree Requirements

Masters students must have a minimum of 30 credits and a 3.0 overall GPA. IBIOS 595 (Internship) and 596 (Rotations) credits all count toward the 30 credits. 18 credits need to be in the major at the 500-600 level. If pursuing a Masters thesis option, up to 6 IBIOS 600 credits may be A-F graded and 12 credits need to be in the major at the 400-500 level. The student selects a thesis committee (upon consultation with faculty advisor), writes a thesis, and defends his/her work. If all course credits and requirements are met, students do not have to be registered for classes while writing and/or defending his/her work. If pursuing a masters non-thesis option, 18 credits must be in 500-level courses; and the student must have a first authored manuscript (based on his/her research) that has been submitted to a peer reviewed journal. The manuscript is given to at least the faculty advisor and the IGDP Chair for evaluation.

Students must present their thesis in accordance with the Penn State guidelines as described in the *THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses.* Current copies may be obtained from the following website: http://www.gradsch.psu.edu/current/thesis/guide.html (Opens New Window).

Ph.D. Degree Requirements

Ph.D. students must have a minimum of 30 credits and a 3.0 overall GPA through out the program. IBIOS 595 (Internship) and 596 (Rotations) credits all count toward the 30 credits. 18 credits need to be in the major at the 500-600 level. Up to 6 IBIOS 600 credits may be A-F graded and 12 credits need to be in the major at the 400-500 level. Additional course work is left to the discretion of the student and advisor.

Grade Point Average/Unsatisfactory Scholarship:

Students are required to have a minimum grade-point average of 3.0 through out the course of their training. Furthermore, the student must have a 3.0 to take the doctoral candidacy, the comprehensive and final oral examinations. One or more failing grades (F) or a cumulative grade-point average below 3.0 may be considered evidence of unsatisfactory scholarship and be grounds for dismissal from the program.

English Competence:

A candidate for the degree of Doctor of Philosophy is required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking, as part of the language and communication requirements for the Ph.D. This will be assessed for both domestic and international students as part of the candidacy exam, which includes a reading and original writing component. Should deficiencies be identified at the candidacy examination, students will be directed into appropriate remedial activities, including additional English and communication courses. Competence must be formally attested by the program before the doctoral comprehensive

examination is scheduled. (International students should note that passage of the minimal TOEFL requirement does not demonstrate the level of competence expected of a Ph.D. from Penn State.)

Besides coursework, research, and teaching, IGDP in I&ID doctoral students participate in the following:

Candidacy Exam:

This exam should be taken by the end or during the student's third semester in the I&ID Program. The student will be assigned two scientific papers from the primary literature to read and analyze for approximately one month. The papers will be selected based upon the students' background and coursework. The analysis should involve exploring the relevant literature as well as the fundamental issues in immunology, infectious diseases, biochemistry, molecular biology and biology. Following this independent research the student will take a written exam to answer several questions related to the two papers followed by an oral exam a week later. The questions and oral exam will be administered by at least three members of the graduate program and include individuals from both UP and CoM. The overall goal of the exam is to assure that the student has an intellectual foundation in immunology and infectious diseases. The exam is designed to evaluate basic knowledge in immunology, infectious diseases, biochemistry, molecular biology and related disciplines as well as the students' ability to integrate this understanding to effectively evaluate experimental design, results, and the conclusions drawn. In the event that the student does not pass this exam, the student's committee will make a recommendation as to whether to offer another opportunity or to terminate the student's enrollment in the program.

Doctoral Committee:

Upon successful completion of the Candidacy Examination, the student in consultation with the mentors will, as soon as possible, select a doctoral committee. The committee will consist of both mentors, one additional member of the IGDP in I&ID and one faculty member who is not a member of the IGDP in I&ID. If the three I&ID members of the committee are also members of the same department, the fourth committee member must be from a different department. This committee is responsible for supervising the academic program and monitoring the progress of the student towards his/her degree. It is the charge of this committee to assure that the student carries out a substantial piece of independent research and presents it as a dissertation. Doctoral Thesis Committee Composition is based on the Graduate Degree Programs Bulletin published by the Graduate School (refer to http://bulletins.psu.edu/bulletins/whitebook/degree_requirements.cfm?section=degreeReq1) regarding Doctoral Committees and requires:

- 4 person minimum of approved PSU Graduate Faculty.
- 2 members must be inside the major and 1 member must be outside the major. Note - the outside member must be member of the approved PSU Graduate Faculty. The outside member for intercollege graduate programs may be inside the major but committee membership must have representation from more than one department.
- A person not affiliated with PSU may be added as a special member (beyond the 4 members of the approved PSU Graduate Faculty) upon recommendation of the head of the program and approval of the graduate dean.
- Have committee chair or one of the co-chairs be a member of the approved PSU Graduate Faculty. Typically it's the faculty advisor.
- The doctoral candidate and three committee members must be physically present for the comprehensive exam and defense. No more than one person may be present via telephone. Telephone or video conference arrangements must be approved by the Dean of the Graduate School.
- Need approval of 2/3 of the committee members for passing comprehensive exam and defense dissertation.

Comprehensive Examination:

Evaluation via the Doctoral Committee to determine the feasibility of proposed research and the preparedness of the student. Students must be registered for classes (typically IBIOS 600) the semester they take this exam.

Ph.D. Defense: Evaluation via the Doctoral Committee of the thesis research.

Students must present their thesis in accordance with the Penn State guidelines as described in the *THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses*. Current copies may be obtained from the following Web site: http://www.gradsch.psu.edu/current/thesis/guide.html (Opens New Window).

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BIOCHEMISTRY, MICROBIOLOGY & MOLECULAR BIOLOGY (BMMB) course list

INTEGRATIVE BIOSCIENCES (IBIOS) course list

MICROBIOLOGY (MICRO) course list

VETERINARY SCIENCE (V SC) course list

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-440

Review Date: 6/12/07

Last updated by Publications: 8/19/09

Industrial Engineering (I E)

Program Home Page (Opens New Window)

PAUL M. GRIFFIN, *Head of the Harold and Inge Marcus Department of Industrial and Manufacturing Engineering*
310 Leonhard Building
814-865-7601

Degrees Conferred:

M.Eng., M.S., Ph.D.

The Graduate Faculty

- David J. Cannon, Ph.D. (Stanford) Associate Professor of Industrial Engineering
- Enrique del Castillo, Ph.D. (Arizona State) Distinguished Professor of Industrial Engineering
- Tom M. Cavalier, Ph.D. (Virginia Tech) Professor of Industrial Engineering
- M. Jeya Chandra, Ph.D. (Syracuse) Professor of Industrial Engineering
- Paul H. Cohen, Ph.D. (Ohio State) Distinguished Professor Emeritus of Industrial Engineering
- Edward C. De Meter, Ph.D. (Virginia Tech) Professor of Industrial Engineering
- Andris Freivalds, Ph.D. (Michigan) Professor of Industrial Engineering
- Terry L. Friesz, Ph.D. (John Hopkins) Harold and Inge Marcus Chaired Professor of Industrial Engineering
- Paul M. Griffin, Ph.D. (Texas A&M) Peter and Angela Dal Pezzo Department Head; Professor of Industrial Engineering
- Catherine M. Harmonosky, Ph.D. (Purdue) Associate Professor of Industrial Engineering
- Sanjay Joshi, Ph.D. (Purdue) Professor of Industrial Engineering
- E. Amine Lehtihet, Ph.D. (Lehigh) Professor of Industrial Engineering
- Deborah J. Medeiros, Ph.D. (Purdue) Associate Professor of Industrial Engineering
- David A. Nembhard, Ph.D. (Michigan) Associate Professor of Industrial Engineering; Harold and Inge Marcus Career Professor
- Harriet Black Nembhard, Ph.D. (Michigan) Associate Professor of Industrial Engineering; Bashore Career Professor
- Vittal Prabhu, Ph.D. (Wisconsin) Professor of Industrial Engineering
- A. Ravi Ravindran, Ph.D. (Berkeley) Professor of Industrial Engineering
- Ling Rothrock, Ph.D. (Georgia Tech) Associate Professor of Industrial Engineering
- Clayton O. Ruud, Ph.D. (Denver) P.E. Professor Emeritus of Industrial Engineering
- Timothy W. Simpson, Ph.D. (Georgia Tech) Professor of Industrial Engineering and Mechanical Engineering
- Soundar R. Tirupatikumara (Kumara), Ph.D. (Purdue) Allen E. Pearce/Allen M. Pearce Chaired Professor; Distinguished Professor of Industrial Engineering
- Jose A. Ventura, Ph.D. (Florida) Professor of Industrial Engineering
- Robert C. Voigt, Ph.D. (Wisconsin) P.E. Professor of Industrial Engineering
- Richard A. Wysk, Ph.D. (Purdue) Leonhard Chair in Engineering; Professor of Industrial Engineering
- Tao Yao, Ph.D. (Stanford) Assistant Professor of Industrial Engineering

Graduate study and research are conducted in manufacturing process, information engineering operations research-management science, production engineering, process design, systems engineering, human factors, ergonomics, quality engineering, and robotics.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission, at the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

To be admitted into the program, an applicant must have received a baccalaureate degree from a regionally accredited institution. Graduates in engineering, physical sciences, and mathematics who present a 3.00 grade-point average will be considered for admission. For all international students whose native language is not English, scores from the Test of English as a Foreign Language (TOEFL) are required with a minimum score of 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the Internet-based test required for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Degree Requirements

Three degrees are offered: Master of Engineering (M.Eng.), Master of Science (M.S.), and the Doctor of Philosophy (Ph.D.).

The M.Eng. is a professional degree program aimed at preparing students with a breadth of technical and managerial skills to make significant immediate contributions in an industrial setting. The degree requirements include 27 credits of course work, one credit of I E 590 (Colloquium), and a scholarly paper for which two credits of I E 596 (Individual Studies) must be taken. Of the 27 credits of required course work, at least 18 must be prefixed I E, and at least 15 must be at the 500 level. Of the 15 credits at the 500 level, at least 12 must be in I E courses. The scholarly paper must demonstrate comprehensive and in-depth knowledge of a topic in industrial engineering, and it should be suitable for submission for publication in a refereed journal as approved by the committee.

The M.S. degree program is intended for students to gain advanced knowledge for research, analysis, and design in industrial engineering. The degree requirements include 24 credits of course work and two I E 590 (Colloquium) credits. Of the 24 credits of required course work, at least 15 must be prefixed I E, and at least 12 must be at the 500 level. Of the 12 credits at the 500 level, at least nine must be I E courses. A thesis is required, for which six credits of I E 600 or I E 610 must be taken.

For the M.Eng. and M.S. degrees, area options are available in Human Factors/Ergonomics Engineering, Manufacturing Engineering and Quality Engineering. M. Eng. and M. S. dual-title degree programs in Industrial Engineering and Operations Research are also offered.

The Ph.D. program emphasizes scholarly research, and prepares students for research and development careers in industry, government, and academe. Students are admitted to candidacy after passing a written examination. The Ph.D. is awarded upon completion of a program of advanced study that includes a minimum period of residence, passing the English proficiency and comprehensive

examinations, completing a satisfactory dissertation, and passing the final oral examination. The degree requirements consist of 45 credits of course work and four I E 590 (Colloquium) credits. Of the 45 credits of required course work, 36 must be prefixed I E, and at least 30 must be at the 500 level. Nine credits must be from outside the Department and must include a six-credit sequence, with at least three credits at the 500 level. A Ph.D. dual-title degree program in Industrial Engineering and Operations Research is also available.

Continuous registration is required for all graduate students until the paper, thesis, or dissertation is approved.

Master of Engineering (M.Eng.) Degree - Human Factors/Ergonomics Engineering Option

To receive the M.Eng. degree in Industrial Engineering with an Option in Human Factors/Ergonomics Engineering, a student must complete at least 30 credits beyond the bachelor's degree: 27 credits of course work, 1 credit of colloquium, and 2 credits of individual studies leading to a scholarly paper, as required for the M.Eng. degree in Industrial Engineering.

The 30 credits for the Option in Human Factors/Ergonomics Engineering must include the following:

I. CORE REQUIREMENT

1. Experimental Design (3 credits)

INDUSTRIAL ENGINEERING (I E)
511. Experimental Design in Engineering

II. ELECTIVES

1. Human Factors - Any three courses from the following list: (9 credits)

INDUSTRIAL ENGINEERING (I E)
552. Mechanics of the Musculoskeletal System
553. Engineering of Human Work
558. Engineering of Cognitive Work
Any of these courses may be substituted by other suitable I E 500-level courses, subject to the approval of the IME Graduate Faculty.

2. Industrial Engineering (6 credits)

Any two I E courses approved for graduate credit.

3. Any three courses from the following list; at least one course must be at the 500 level. (9 credits)

BIOENGINEERING (BIOE)
507. Biomedical Signal Processing

INDUSTRIAL HEALTH AND SAFETY (I H S)
445. Industrial Hygiene & Toxicology
447. Industrial Hygiene Measurements
450. Environmental Health & Safety
470 Analytical Metholds for System Safety

KINESIOLOGY (KINES)
565. Neurophysiological Basis of MOvement
574. Modeling in Biomechanics
578. Physiology & Mechanical Behavior of Skeletal Tissues
579. Advanced Biomechanics of Human Motion

PSYCHOLOGY (PSYCH)
453. Sensation & Perception
456. Advanced Cognitive Psychology
458. Visual Cognition
462. Physiological Psychology

III. Colloquium (1 credit)

I E 590. Colloquium (or 1 credit of O R 590)

IV. Individual Studies (2 credits)

I E 596 Individual Studies

Master of Engineering (M.Eng.) Degree - Manufacturing Engineering Option

To receive the M.Eng. degree in Industrial Engineering with an Option in Manufacturing Engineering, a student must complete at least 30 credits beyond the bachelor's degree: 27 credits of course work, 1 credit of colloquium, and 2 credits of individual studies leading to a scholarly paper, as required for the M.Eng. degree in Industrial Engineering.

The 30 credits required for the Option in Manufacturing Engineering must include the following:

I. CORE REQUIREMENT

INDUSTRIAL ENGINEERING (I E) (9 credits)

511. Experimental Design in Engineering
550. Manufacturing Systems
582. Information Technology for Industrial & Manufacturing Engineering

II. ELECTIVES

1. Students must take at least one course from each of the following four groups; at least two courses must be at the 500 level.

a. Materials and Manufacturing Processes
INDUSTRIAL ENGINEERING (I E)
428. Metal Casting
438. Metal Cutting Principles & Practices
518. Materials, Forming Processes & Quality
528. Metal Cutting Theory
538. Experimental Investigation in Materials Processing
561. Weld Design
580. Analysis of Machining Precision

b. Process, Assembly and Product Engineering
INDUSTRIAL ENGINEERING (I E)
464. Assembly of Printed Circuit Boards
563. Computer-Aided Design for Manufacturing
576. Computer-Aided Tolerancing in Design & Manufacturing
579. Designing Product Families

c. Manufacturing Productivity and Quality
INDUSTRIAL ENGINEERING (I E)
402. Advanced Engineering Economy
456. Industrial Robot Applications
507. Operations Research: Scheduling Models
551 Computer Control of Manufacturing Systems
553. Engineering of Human Work
556. Robotic Concepts
558. Engineering of Cognitive Work
566. Advanced Quality Control

d. Manufacturing Integration Methods for Systems Design
INDUSTRIAL ENGINEERING (I E)
455. Production Panning & Control
505. Linear Programming
509. Operations Research: Waiting Line Models
521. Non-Linear Programming
522. Discrete Event Systems Simulation
532. Reliability Engineering
540. Manufacturing Systems Simulation
554. Production, Planning & Control
562. Expert Systems Design in Industrial Engineering
578. Using Simulation Models for Design

2. Any two I E or non-I E courses approved for graduate credit. See *"IME List of Approved Non-I E Courses--All Options" (attached) (6 credits)

III. Colloquium (1 credit)

I E 590 Colloquium (or 1 credit of O R 590)

IV. Individual Studies (2 credits)

I E 596 Individual Studies

Master of Engineering (M.Eng.) Degree - Quality Engineering Option

To receive the M.Eng. degree in Industrial Engineering with an Option in Quality Engineering, a student must complete at least 30 credits beyond the bachelor's degree: 27 credits of course work, 1 credit of colloquium, and 2 credits of individual studies leading to a scholarly paper, as required for the M.Eng. degree in Industrial Engineering.

I. CORE REQUIREMENT

INDUSTRIAL ENGINEERING (I E)
511. Experimental Design in Engineering

II. ELECTIVES

1. Any three courses from the following list: (9 credits)

INDUSTRIAL ENGINEERING (I E)

532. Reliability Engineering
566. Quality Control
576. Computer-Aided Tolerancing in Design and Manufacturing
583. Response Surface Methodology and Process Optimization
584. Time Series Control and Process Adjustment

2. Any one course from the following list: (3 credits)

STATISTICS (STAT)
500. Applied Statistics
505. Applied Multivariate Statistical Analysis
506. Sampling Theory and Methods
511. Regression Analysis and Modeling
512. Design and Analysis of Experiments

3. Any two I E courses from the following list; of which at lest one course must be at the 500 level. (6 credits)

INDUSTRIAL ENGINEERING (I E)
454. Applied Decision Analysis
468. Optimization Modeling and Methods
505. Linear Programming
516. Applied Stochastic Processes
519. Dynamic Programming
520. Multiple Criteria Optimization
521. Nonlinear Programming

4. Any two I E or non-I E courses approved for graduate credit. See *"IME List Of Approved No-I E Courses-All Options" (attached). (6 credits)

III. Colloquium (1 credit)

I E 590 Colloquium (or 1 credit of O R 590)

IV. Individual Studies (2 credits)

I E 596 Individual Studies

***IME List of Approved Non-I E Courses - All Options**
(The material covered in a course already taken should not be duplicated.)

500 LEVEL: Any courses, subject to approval by the Graduate Program Coordinator

400 LEVEL:
BIOE 419
CMPEN 362, CMPSC 431W, CMPSC 456, CMPSC 468
E MCH 461
ENGR 411, ENGR 407
FD SC 430
I H S 430, I H S 445, I H S 447, I H S 450, I H S 470
MATH 451, MATH 456, MATH 485, MATH 486
MATSE 425, MATSE 450
M I S 431, M I S 479W
MKTG 437
PHIL/S T S 432 (for students interested in health systems)
PSYCH 413, PSYCH 456, PSYCH 458, PSYCH 462
SCM 450, SCM 430, SCM 435
STAT 460, STAT 464
W P 416

Other Relevant Information

Students in this program may elect the dual-title degree program in Operations Research for the Ph.D. and M.S. degrees.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following award typically has been available to graduate students in this program:

HAROLD & INGE MARCUS GRADUATE FELLOWSHIPS--Consideration for these fellowships shall be given to all students exhibiting academic excellence who have been admitted to Penn State as candidates for a graduate degree in the Department of Industrial and Manufacturing Engineering, College of Engineering.

BENJAMIN W. NIEBEL MANUFACTURING FELLOWSHIP
Consideration for this fellowship shall be given to all students exhibiting academic excellence who have been admitted to Penn State as candidates for a graduate degree in the Department of Industrial and Manufacturing Engineering, College of Engineering.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

INDUSTRIAL ENGINEERING (I E) course list

Last Revised by the Department: Fall Semester 2005

Blue Sheet Item #: 33-07-112

Blue Sheet Item #: 33-07-113

Review Date: 06/14/05

UCA Revision #2: 7/30/07

Last updated by Publications: 1/29/10

Industrial Relations and Human Resources (IRHR)

Program Home Page (Opens New Window)

PAUL F. CLARK, *Head*
133 Willard Building
814-865-5425

Degree Conferred:

M.S. in Industrial Relations and Human Resources

The Graduate Faculty

- Mark S. Anner, Ph.D. (Cornell) Assistant Professor of Labor Studies and Industrial Relations, and Political Science
- Forrest S. Briscoe, Ph.D. (MIT) Assistant Professor of Labor Studies and Industrial Relations, and Sociology
- Paul F. Clark, Ph.D. (Pittsburgh) Professor of Labor Studies and Industrial Relations
- Alex Colvin, Ph.D. (Cornell) Assistant Professor of Labor Studies and Industrial Relations
- Alan Derickson, Ph.D. (California, San Francisco) Professor of Labor Studies and Industrial Relations, and History
- Robert Drago, Ph.D. (Massachusetts, Amherst) Professor of Labor Studies and Industrial Relations, and Women's Studies
- Ronald L. Filippelli, Ph.D. (Penn State) Professor of Labor Studies and Industrial Relations
- Dennis Gouran, Ph.D. (Iowa) Professor of Speech Communication and Labor Studies and Industrial Relations
- Sumita Raghuram, Ph.D. (Minnesota) Associate Professor of Labor Studies and Industrial Relations
- Jackie Krasas Rogers, Ph.D. (USC) Associate Professor of Labor Studies and Industrial Relations, Sociology, and Women's Studies
- James B. Stewart, Ph.D. (Notre Dame) Professor of Labor Studies and Industrial Relations
- Mark Wardell, Ph.D. (Missouri) Associate Professor of Labor Studies and Industrial Relations

The master of science degree in Industrial Relations and Human Resources (IRHR) is a two-year program designed for students anticipating careers in some aspect of labor and human resources or labor-management relations. The program has the following objectives:

- provide students with an understanding of the roles employers, employees, employee organizations, and public policy makers play in the employment relationship;
- familiarize students with the complex personal and organizational issues inherent in the employment relationship;
- prepare students to systematically analyze complex issues and evaluate research results in the process of administering labor and human resource systems;
- prepare students for advanced graduate or professional training beyond the master's degree;
- prepare students for employment as practitioners in the field.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) or the Graduate Management Admission Test (GMAT) are required. Applicants with a 3.00 junior/senior grade-point average (on a 4.00 scale) will be considered for admission. Applicants must have three letters of recommendation sent from people who can assess adequately their likelihood of completing the graduate program.

Students are expected to have completed successfully an undergraduate statistics course plus a minimum of 12 undergraduate credits in the social sciences as part of their baccalaureate degree.

Degree Requirements

THESIS OPTION: The IRHR thesis option is intended for students anticipating additional graduate education beyond the master's degree. It requires 36 credits, including a minimum of 30 at the 400 and 500 level, and a minimum of 6 600-level thesis credits. For the degree, an overall 3.00 (B) grade-point average must be earned in the 400- and 500-level work and a grade of B or above must be earned in all 500-level courses. At least 6 credits must emphasize a particular aspect of employment relations. A student's thesis should reflect the chose emphasis.

RESEARCH PAPER OPTION: The IRHR research paper option is intended for students expecting to enter the labor market upon completion of the master's degree. It requires a minimum of 37 credits at the 400 and 500 level. For the degree, and overall 3.00 (B) grade-point average must be earned in the 400- and 500-level work and a grade of B or above must be earned in all 500-level courses. At least 6 credits must emphasize a particular aspect of employment relations. A student's research paper should reflect the chosen emphasis.

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Course Requirements

Core Courses (22 credits)
IRHR 501, IRHR 502, IRHR 504, IRHR 505, IRHR 512, IRHR 513, IRHR 516
Required course are offered once per academic year and elective courses at least once every two academic years.

Emphasis Courses (6 credits)
An emphasis is an area of study related to a particular aspect or domain of industrial relations and human resources. Students select an emphasis in consultation with their master's advisory committee.

Elective Courses (3-9 credits)
With the faculty adviser's approval, a student selects at least 3 or more elective credits, depending on the chosen option. Examples of suitable elective courses are: L I R 411, L I R 401, L I R 444, L I R 458Y; IRHR 500, IRHR 535, IRHR 536, IRHR 594, IRHR 595, IRHR 596, IRHR 597, IRHR 599; ECON 412, ECON 436, ECON 571; EDLDR 565, EDLDR 574; HIST (L I R) 555; MGMT 321, MGMT 523, MGMT 548; PSYCH 484, PSYCH 485, PSY 522; SOC 455, SOC 456, SOC 555.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

INDUSTRIAL RELATIONS AND HUMAN RESOURCES (IRHR) course list

Integrated B.S. in Labor and Industrial Relations and M.S. in Industrial Relations and Human Resources (LRIRHR)

PROFESSOR PAUL F. CLARK, *Head*

The integrated B.S. in Labor and Industrial Relations and M.S. in Industrial Relations and Human Resources is a five-year program designed for academically talented baccalaureate students to obtain both the B.S. and the M.S. degrees in LIR and IRHR with five years of study. Students will develop expertise in the human resources and labor relations fields beyond the B.S. degree. The undergraduate curriculum educates students about (1) the roles of employers, employees, employee organizations and public policy makers play in the employment relationship, (2) the complex personal and organizational issues inherent in the employment relationship (3) and how to systematically analyze those complex issues and evaluate research relevant to those analyses. The graduate curriculum provides for more individualized, focused learning in a concentrated sub-area of the IRHR field. The program culminates with an M.S. research paper. Upon completion of the integrated degree, students will enter the workforce with advanced knowledge and expertise gained from conducting and analyzing empirical work and participating in seminar-style classes.

Bachelor of Science

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

REQUIREMENTS FOR THE MAJOR: 98-99 credits
[12 credits may be double counted, 6 must be at the 500 level]

B.S. REQUIREMENTS: 62-63 credits
(This includes 10 credits of General Education courses)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 36-37 credits

PRESCRIBED COURSES: (16 credits)
(Some courses in this category have prerequisites that are not included in the major)
L I R 100 GS(3), L I R 312(4) (Sem: 3-8)
ECON 002 GS(3), ECON 315 GS(3), PSYCH 281 GS(3) (Sem: 1-8)

ADDITIONAL COURSES: (13 credits)
(Some courses in this category have prerequisites that are not included in the major)
L I R 201 GS(3) or L I R 401(3) (Sem: 3-8)
SCM 200(4) or STAT 200 GQ(4) (Sem: 3-8)
L I R 136 US(3) or WMNST 136 US(3) or L I R 400 IL(3) (Sem: 5-8)
L I R 458Y US(3) or HIST 458Y US(3) or L I R 414W(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS: (33-34 credits)

(L I R courses that are used in the Additional Courses category may not be double counted to satisfy this requirement. Some courses in this category have prerequisites that are not included in the major.)

Select 15-21 credits from appropriate L I R courses, at least 9 must be at the 400 level (only 3 credits of L I R 495 or 3 credits of L I R 496 may be used to satisfy this requirement) (Sem: 5-8)

Select 12-19 credits from the department list in consultation with an adviser, at least 6 credits must be at the 400 level, 3 each from 3 categories:

1. ECON 342 GS(3), ECON 370 GS(3), ECON 412(3), ECON 436(3), ECON 445(3) (Sem: 5-8)
2. MGMT 100(3), MGMT 321(3), MGMT 331(3), MGMT 341(3), MGMT 424(3) (Sem: 3-8)
3. PL SC 451(3), PL SC 471(3), PL SC 473(3), PL SC 474(3) (Sem: 5-8)
4. PSYCH 482(3), PSYCH 484(3), PSYCH 485(3) (Sem: 5-8)
5. SOC 119 GS;US(4), SOC 409 US(3), SOC 444(3), SOC 455(3), SOC 456(3) (Sem: 3-8)
6. ACCTG 211(4), CAS 352(3), H P A 460(3), HD FS 425 US(3), HIST 155 GH(3), S T S 407(3) (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

M.S. REQUIREMENTS: 36 credits
[12 credits may be double counted, 6 must be at the 500 level]

PRESCRIBED COURSES: (21 credits)
IRHR 501(3), IRHR 502(3), IRHR 504(3), IRHR 505(3), IRHR 512(3)*, IRHR 513(3)*, IRHR 516(3)
*or other statistics course approved in advance by graduate director
**or other methods course approved in advance by graduate director

ADDITIONAL COURSES: (15 credits)
Select 15 credits from the following list in consultation with adviser (only 6 credits may be at the 400 level).
L I R 400 IL(3), L I R 401(3), L I R 414W(3), L I R 424(3), L I R 434(3), L I R 435(3), L I R 437(3), L I R 444(3), L I R 458Y US(3), L I R 460(3), L I R 465(3), L I R 470(3), IRHR 500(3), IRHR 535(3), IRHR 536(3), IRHR 594(1-6), IRHR 595(1-6), IRHR 596(1-6), IRHR 597(1-3), IRHR 600(3-6)

Emphasis Courses (6 credits)
An emphasis is an area of study related to a particular aspect or domain of industrial relations and human resources. Select 6 credits from the M.S. prescribed or additional courses in consultation with their adviser.

Masters Research Paper or a Masters Thesis (6 credits)
Students must complete either a Masters Research Paper or a Masters Thesis. Students choosing the Thesis option must complete 6 thesis credits (IRHR 600). These credits can be counted towards the 15 credits required from the M.S. Additional Courses section above.

INDUSTRIAL RELATIONS AND HUMAN RESOURCES (IRHR) course list
LABOR AND INDUSTRIAL RELATIONS (L I R) course list

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Integrated B.S. in Spanish and M.S. in Industrial Relations and Human Resources (SPIRHR)

http://lsir.la.psu.edu/gshms/integratedspanishirhrbsms.htm

The integrated Spanish B.S. and IRHR M.S. is a five-year program designed for highly qualified and motivated students seeking employment within a culturally diverse workplace. Students will develop basic skills in speaking, understanding, reading, and writing Spanish. Students will gain familiarity with Hispanic cultures through literature and the University's international education program, if they choose to have that experience. Students also will learn about (1) the roles that employers, employees, employee organizations, and public policy makers play in the employment relationship, (2) the complex personal and organizational issues inherent in the employment relationship, and (3) how to systematically analyze those complex issues and evaluate research relevant to those analyses.

For the B. S./M. S. degree in Integrated Spanish B.S. and Industrial Relations and Human Resources M.S., a minimum of 154 credits is required. Twelve graduate level credits can apply to both undergraduate and graduate degrees; six of these must be at the 500 level. Students can complete the B.S. in Spanish and not advance to the M.S. IRHR degree if they desire.

Bachelor of Science

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(10 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 18 credits

REQUIREMENTS FOR THE MAJOR: 101 credits
(This includes 10 credits of General Education courses: 6 credits of GS courses; 4 credits of GQ courses.)

PRESCRIBED COURSES: (27 credits)
[Some courses in this category have prerequisites that are not included in the major]
SPAN 100(3), SPAN 120(3), SPAN 200(3), SPAN 253(3), SPAN 305(3) (Sem: 1-6)
SPAN 300W(3), SPAN 410(3), SPAN 412(3), SPAN 414(3) (Sem: 5-8)

ADDITIONAL COURSES: (12 credits)
SPAN 210(3) or SPAN 220(3), SPAN 353(3) or SPAN 354(3) (Sem: 3-6)
SPAN 472(3) or SPAN 476(3) (Sem: 5-8)
Select 3 credits of SPAN 415(3), SPAN 418(3), SPAN 420(3), SPAN 439(3), SPAN 490(3), SPAN 491(3), or SPAN 497(1-9) (Sem: 5-8)

LABOR AND INDUSTRIAL RELATIONS: (32 credits)
[Prescribed undergraduate credits in Labor and Industrial Relations option]
ECON 002 GS(3), L I R 100 GS(3), L I R 201(3), L I R 312(4), L I R 400 IL(3), L I R 414W(3), L I R 458Y US(3), STAT 200 GQ(4) (Sem: 1-6)
IRHR 501(3), IRHR 512(3) (Sem: 7-8)

Master of Science

INDUSTRIAL RELATIONS/HUMAN RESOURCES M.S.: (30 credits)
[IRHR credits to be selected from the following in consultation with an IRHR adviser]
IRHR 500, IRHR 502, IRHR 504, IRHR 505, IRHR 513, IRHR 516, IRHR 535, IRHR 536, IRHR 595*, IRHR 596*, IRHR 597, IRHR 599
[* only 3 credits of IRHR 595 and IRHR 596 may be used to satisfy this requirement]

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

INDUSTRIAL RELATIONS AND HUMAN RESOURCES (IRHR) course list
LABOR AND INDUSTRIAL RELATIONS (L I R) course list
SPANISH (SPAN) course list

Last Revised by the Department: Fall Semester 2006
Blue Sheet Item #: 34-07-474
Review Date: 6/13/06
UCA Revision #1: 8/8/06
DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04
Last updated by Publications: 9/27/06

Information Science (IN SC)

Program Home Page (Opens New Window)

JAMES A. NEMES, *Professor and Division Head, Engineering*
School of Graduate Professional Studies
30 East Swedesford Road
Malvern, PA 19355
610-648-3335

Degree Conferred:

M.S. in Information Science

The Graduate Faculty

- Adrian Barb, Ph.D. (University of Missouri) *Assistant Professor of Information Science*
- Joanna Defranco, Ph.D. (New Jersey Institute of Technology) *Assistant Professor of Information Science*
- Nil H. Ergin, Ph.D. (University of Missouri-Rolla), *Assistant Professor of Systems Engineering*
- Kathryn Jablokow, Ph.D. (Ohio State) *Associate Professor of Mechanical Engineering*
- Phillip A. Laplante, Ph.D. (Stevens Institute of Tech) P.E. *Associate Professor of Software Engineering*
- John I. McCool, Ph.D. (Temple) *Distinguished Professor of Industrial and Manufacturing Engineering*
- Colin J. Neill, Ph.D. (Wales) *Associate Division Head and Professor of Software Engineering*
- James A. Nemes, D.Sc. (George Washington University) *Professor and Division Head*
- Michael J. Piovoso, Ph.D. (Delaware) *Professor of Electrical Engineering*
- Robin G. Qui, Ph.D. (Penn State) *Associate Professor of Information Science*
- David W. Russell, Ph.D. (CNAA, London) *Professor of Electrical Engineering*
- Raghvinder Sangwan, Ph.D. (Temple) *Associate Professor of Software Engineering*
- Kailasam Satyamurthy, Ph.D. (Clemson) *Assistant Professor of Engineering and Management*

The professional, nonthesis graduate program is designed to offer students a balance of information systems and management theories and emphasizes technical competence, leadership skills, and business expertise. Students gain insight in the role and management of emerging information technologies to gain competitive advantage.

Admission Requirements

Students who have a baccalaureate degree in data processing, information systems and/or other quantitative, scientific, or business discipline will be considered for admission to the program. Students should have earned at least a 3.00 junior/senior average in their baccalaureate program at a regionally accredited institution. It is recommended that scores from the Graduate Record Examinations (GRE) or the Graduate Management Admissions Test (GMAT) be submitted. Under special circumstances, exceptions to these requirements may be considered; students with a particularly strong undergraduate background may petition to substitute advanced courses for required ones. If the admissions committee determines an area of weakness or insufficient baccalaureate preparation, the student may be required to take preparatory courses prior to being admitted to the program. Scores from the Test of English as a Foreign Language (TOEFL) are required of international applicants at the time of application. The minimum TOEFL score is 550 (paper) or 213 (computer).

Program Requirements

The requirement for the degree is 39 credits of graduate course work and completion of a master's paper. The Master of Science in Information Science program is based on a sequence of 18 credits of required core courses. This is followed by 18 credits of approved electives, selected with the assistance of a graduate adviser, followed by an integrative capstone course (IN SC 539). Required and elective credits must be distributed so that a minimum of 12 and a maximum of 18 credits derive from the Management Division and the remainder from the Engineering Division. A grade-point average of at least 3.0 must be achieved, with at least 18 credits at the 500 level.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

INFORMATION SCIENCE (IN SC) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 6/1/04

Last updated Publications: 08/20/09

Information Sciences and Technology (IST)

DAVID L. HALL, *Interim Dean, College of Information Sciences and Technology*
JOHN YEN, *Associate Dean, Graduate Programs in Information Sciences and Technology*

Office of the Dean
College of Information Sciences and Technology
The Pennsylvania State University
332 Information Sciences and Technology Building
University Park, PA 16802-6823
Dean's office: 814-865-3528; Graduate office: 814-865-8711

Degree Conferred:

Ph.D., M.S., M.P.S. in Information Sciences

The Graduate Faculty

University Park:
Reka Albert, Ph.D. (Notre Dame) Affiliate Assistant Professor of Information Sciences and Technology; Assistant Professor of Physics
John W. Bagby, J.D. (Tulsa) Professor of Information Sciences and Technology
Christian Brady, Ph.D. (Oxford) Dean, Schreyer Honors College; Affiliate Professor of Information Sciences and Technology; Associate Professor of Classical Studies and Jewish Studies
Guoray Cai, Ph.D. (Pittsburgh) Associate Professor of Information Sciences and Technology, Geography, and Computer Science and Engineering
Brian Cameron, Ph.D. (Penn State) Professor of Practice in Information Sciences and Technology
John Carroll, Ph.D. (Columbia) Edward M. Frymoyer Chair Professor of Information Sciences and Technology
Chao-Hsien Chu, Ph.D. (Penn State) Professor of Information Sciences and Technology, and Management Science
Shawn Clark, Ph.D. (Penn State) Professor of Practice in Information Sciences and Technology
Henry C. “Hank ” Foley, Ph.D. (Penn State) Vice President for Research and Dean of the Graduate School; Professor of Information Sciences and Technology, and Chemical Engineering
Frederico T. Fonseca, Ph.D. (Maine) Associate Professor of Information Sciences and Technology, Geography, and Computer Science and Engineering
C. Lee Giles, Ph.D. (Arizona) David Reese Professor of Information Sciences and Technology; Professor of Computer Science and Engineering
David L. Hall, Ph.D. (Penn State) Interim Dean; Professor of Information Sciences and Technology, and Electrical Engineering
John Harwood, Ph.D. (Nebraska) Associate Professor of Information Sciences and Technology; Associate Professor of English
Steven R. Haynes, Ph.D. (London School of Economics) Assistant Professor of Information Sciences and Technology
Bernard James Jansen, Ph.D. (Texas A&M) Assistant Professor of Information Sciences and Technology
Lynette Kvasny, Ph.D. (Georgia State) Assistant Professor of Information Sciences and Technology
Dongwon Lee, Ph.D. (UCLA) Assistant Professor of Information Sciences and Technology, and Computer Science and Engineering
Peng Liu, Ph.D. (George Mason) Associate Professor of Information Sciences and Technology, and Computer Science and Engineering
David Mudgett, Ph.D. (Yale), Senior Instructor in Information Sciences and Technology
Carleen Maitland, Ph.D. (Delft University of Technology) Assistant Professor of Information Sciences and Technology
Alan MacEachren, Ph.D. (Kansas) Affiliate Professor of Information Sciences and Technology; E. Willard and Ruby S. Miller Professor of Geography
William McGill, Ph.D. (Maryland), Assistant Professor of Information Sciences and Technology
Michael D. McNeese, Ph.D. (Vanderbilt) Professor of Information Sciences and Technology, and Psychology
Prasenjit Mitra, Ph.D. (Stanford) Assistant Professor of IST and CSE
Tracy Mullen, Ph.D. (Michigan) Assistant Professor of IST
Kevin Murphy, Ph.D. (Penn State) Affiliate Professor of Information Sciences and Technology; Professor of Psychology
Irene Petrick, Ph.D. (Penn State) Professor of Practice in Information Sciences and Technology
Sandeep Purao, Ph.D. (Wisconsin--Milwaukee) Associate Professor of Information Sciences and Technology
Madhu Reddy, Ph.D. (California, Irvine) Assistant Professor of Information Sciences and Technology
Frank E. Ritter, Ph.D. (Carnegie Mellon) Associate Professor of Information Sciences and Technology, Computer Science and Engineering, and Psychology
Mary Beth Rosson, Ph.D. (Texas at Austin) Professor of Information Sciences and Technology
Gerald M. Santoro, Ph.D. (Penn State) Assistant Professor of Information Sciences and Technology, and Communication Arts and Sciences
Brian Smith, Ph.D. (Northwestern) Associate Professor of Information Sciences and Technology, and Information Systems
Anna Squicciarini, Ph.D. (University of Milan, Italy) Assistant Professor of Information Sciences and Technology
Andrea Tapia, Ph.D. (New Mexico) Assistant Professor of Information Sciences and Technology
Angsana Techatassanasoontorn, Ph.D. (Minnesota) Assistant Professor of Information Sciences and Technology
Eileen M. Trauth, Ph.D. (Pittsburgh) Professor of Information Sciences and Technology
James Z. Wang, Ph.D. (Stanford) Associate Professor of Information Sciences and Technology, and Computer Science and Engineering
Heng Xu, Ph.D. (National Singapore) Assistant Professor of Information Sciences and Technology
John Yen, Ph.D. (California, Berkeley) Associate Dean for Strategic Initiatives and University Professor of Information Sciences and Technology; Professor of Computer Science and Engineering
Xiaolong (Luke) Zhang, Ph.D. (Michigan) Assistant Professor of Information Sciences and Technology
Sencun Zhu, Ph.D. (George Mason) Assistant Professor of Information Sciences and Technology and Computer Science and Engineering

Great Valley:
Adrian Sorin Barb, Ph.D. (Missouri) Assistant Professor of Information Science
Kathryn W. Jablokow, Ph.D. (Ohio State) Associate Professor of Mechanical Engineering
Phillip A. Laplante, Ph.D. (Stevens Institute) P.E. Professor of Software Engineering
John I. McCool, Ph.D. (Temple) Distinguished Professor of Systems Engineering
Colin Neill, Ph.D. (Wales, United Kingdom) Associate Professor of Software Engineering
James Nemes, D.Sc. (George Washington) Division Head and Professor of Mechanical Engineering
Michael J.Piovoso, Ph.D. (Delaware) Professor of Electrical Engineering
Robin G. Qiu, Ph.D. (Penn State) Associate Professor of Information Science
David W. Russell, Ph.D. (Council for National Academic Awards, United Kingdom) Professor of Electrical Engineering
Raghvinder S. Sangwan, Ph.D. (Temple) Assistant Professor of Information Science

Harrisburg:
Gregory A. Crawford, Ph.D. (Rutgers) Librarian; Director, Penn State Harrisburg Library
Rhoda Joseph, Ph.D. (City University of New York, Baruch College), Assistant Professor of Information Systems
Parag C. Pendharkar, D.B.A. (Southern Illinois) Professor of Information Systems
Girish Subramanian, Ph.D. (Temple) Professor of Information Systems

Program Description

The Doctor of Philosophy degree in Information Sciences and Technology offers advanced graduate education for students contemplating careers in academic teaching and research, or research in a non-academic setting. The program is interdisciplinary in nature and expects scholarship at the highest level exhibiting depth of competency in at least one of the core areas of the Information Sciences and Technology and an understanding of the integration of the critical constructs that drive the field: people, information, and technology.

The Master of Science in Information Sciences and Technology is an interdisciplinary degree program that focuses on the theoretical, application-oriented, and educational issues facing a digital, global economy. The program is designed to build an understanding of how information and technology fundamentally impact (and are impacted by) people, organizations, and the world community. Topical areas within IST span a broad range including: human computer interaction, computational techniques, applications (e.g., bio-informatics and geographical information systems), societal issues (such as digital divide issues), user issues (e.g., computer-aided cognition), and information systems design and development providing exposure and grounding in many of the aspects of the information sciences. The program is especially attractive to students interested in gaining state-of-the-art understanding of information technology and its use as a solution in multiple venues.

The Master of Professional Studies in Information Sciences (also referred to as Master in Information Sciences as an abbreviated program name) is an innovative program that targets professionals and organizational leaders who wish to seek a professional education and training program that can (1) empower them to assume greater responsibilities related to information sciences and information technologies, and/or (2) assist them in transitioning into a career that utilizes information science and information technologies to deal with information-centric challenges. The purpose of the proposed professional master program is to produce professionals and organizational leaders who not only can select and draw upon the necessary foundations within the information sciences and information technology areas, test the applicability of these foundations for addressing a given issue, and apply resulted solutions, but also can be aware of the multitude of technological trends and environmental factors that organizations must address in the changing global economy.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*. Applicants are required to submit scores from the general portions of the Graduate Record Examinations (GRE) or the Graduate Management Admissions Test (GMAT), three letters of reference, and a one-three page personal statement of relevant experience and goals; In addition, applicants to the Ph.D. and M.S. programs are required to submit a current resume, statement of research interests, and a sample of applicant's writing (e.g., technical paper, etc.). The GRE or GMAT requirement can be waived for applicants to the Professional Master Program if the student has five or more years of relevant information sciences and technology working experience.

Since the program is multidisciplinary in nature, students from almost any discipline may be acceptable for entry into the program. A bachelor's degree in a related area (e.g., engineering and science), while not necessary for admission, is helpful in the successful completion of the degree. It is expected that students will have a basic level of competency in statistics, computer language, and information technology (related work experience can be used to demonstrate such competency). A student may be accepted into the program with "provisional status" for no more than one year while work is completed to meet these expectations.

It is expected that a successful applicant has an overall grade point average of 3.00 (on a 4.00 scale) or higher for their undergraduate study (and/or graduate-level studies). However, accomplishments demonstrated through work experience and recommendation letters from the applicant's academic advisor or employer will also play an important role in making the admission decision. The most qualified applicants will be accepted into the program until all spaces for new students are filled.

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, a total score of 80 with a 20 on the speaking section for the Internet-based test (iBT) or a minimum composite score for the IELTS of 6.5.. Applicants with iBT speaking scores between 15 and 19 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work.

Degree Requirements

Doctoral Degree Requirements

The doctoral degree requirements include the general requirements of the Graduate School as listed under the Doctoral Degree Requirements. To qualify for a Ph.D. degree, each student must take 12 credits of courses IST 501, IST 511 or IST 512, IST 521 or IST 522, IST 531 or IST 532; plus four (4) credits of IST 590 (colloquium); 12 credits of graduate-level courses to supporting the primary field research methods, (one of these courses, 3 credits, must focus on the philosophy of science); and 12 to 30 additional credits of nonthesis graduate courses that support the student's IST research program. In addition, all candidates must be competent in the English language and must have demonstrated skills in the communication of ideas both verbally and in writing commensurate with the requirement of scholarly and professional work. The candidacy examination will be used as an occasion to assess English proficiency and plan for remediation (including additional courses, mentoring, or experiences) for all students. A short essay will be included as part of the assessment process. The foreign language and communication requirement may be fulfilled through demonstrating computer language proficiency (assessed through courses taken) or a minimum of 9 credits of 500-level statistics courses. Students must pass the Ph.D. candidacy examination at the end of their second regular semester after entering the program. Students must pass the Ph.D. comprehensive examination after completion of most of the course work, usually at the end of the student's second year in the program. A research-based dissertation must be completed under the direction of the Ph.D. committee, with the student submitting a dissertation proposal and defending that proposal in the defense examination.

M.S. Degree Requirements

The M.S. in Information Sciences and Technology requires a minimum of 32 credits, 27 of which must be earned at University Park. These credits are distributed among the following requirements:

Core Courses (14 credits). All candidates are expected to develop a broad understanding of the core constructs of people, information, technology, and the significant interactions among those elements through taking IST 501, IST 511 or IST 512, IST 521 or IST 522, IST 531 or IST 532 plus two graduate colloquia offered by the college.

Support Area (6 credits). A candidate is expected to choose an area customized to support the thesis requirement. A support area could be a selection of courses in law, business, education, engineering, the liberal arts, science, or any area that is linked to the information sciences.

Research Methods (6 credits). All candidates must develop a basic understanding of the scientific research process, statistical techniques, and research methods utilized in the information sciences.

Thesis (6 credits). All students must write a thesis. The thesis should focus on a well-defined problem relevant to the information sciences. The student must present the thesis in a public presentation and successfully defend the thesis to the adviser and committee.

Language and Communication. All candidates must be competent in the English language and must have demonstrated skills in the communication of ideas both orally and in writing commensurate with the requirement of professional work. The foreign language and communication requirement may be fulfilled through demonstrating computer language proficiency (assessed through courses taken).

M.P.S. Degree Requirements

The Master in Information Sciences program requires a minimum of 3 3 credits, 2 4 of which must be earned at Penn State. Up to 9 graduate credits may be transferred in from an accredited institution (as is permissible by the Graduate School). At least 18 credits must be courses at the 500 level and above. A student will first take 9-credits of core courses. The student will then take 12 credits of prescribed courses for the base program or a specialized option . Currently, two specialized options are available: the Information Assurance and Decision Support (IADS) option and the Software Development (SD) option. The remaining 9 course credits of electives are chosen in consultation with the student's advisor. Lastly, the student must complete a master project guided by the student's adviser. A student can choose to be in the Base Program or in an Option. These credits are distributed among the following requirements:

Core Courses (9 credits). The core of the Master in Information Sciences program consists of four courses -- IST 552 (or INFSY 540), IST 554, IST 562, and IST 594 -- for a total of 12 credits. These courses represent the core technical foundations to study Information Sciences and Technology.

The Base Program (12 credits of prescribed courses and 9 credits of electives). The base program consists of four prescribed (required) courses, IST 516, IST 521 (or IST 522), IST 532 (or IST 531) and IST 564 and 9 credits of elective courses, in addition to the 9-credit core and three-credit capstone course. It is designed for students who do not have a special interest in mind. The elective courses are chosen in consultation with the student's advisor. Hence, it offers the flexibility that enables the student to build an in-depth knowledge and skills about information sciences tailored to his/her interests and background. Students from Harrisburg region can also select courses from Harrisburg Campus to fulfill the prescribed courses (by substitution) and 9 credits of electives.

Information Assurance and Decision Support (IADS) Option (12 credits of prescribed courses and 9 credits of electives). The IADS option consists of four prescribed (required) courses, IST 515, IST 555, IST/STAT 557, and IST 885, and 9 credits of elective courses, in addition to the 9-credit core and three-credit capstone courses. These courses enable the student to focus on developing knowledge and skills for information analysis, information assurance and decision support including theories, techniques, and applications of data mining, data fusion, information search, information security, and intelligent resource allocation. Students who prefer more flexibility in time and location can take the online courses, offered through World Campus as meeting elective requirements.

Software Development (SD) Option (12 credits of prescribed courses and 9 credits of electives). The SD option consists of four prescribed (required) courses, IST 411, IST 412, SWENG 586 and SWENG 587, and 9 credits of elective courses, in addition to the 9-credit core and three-credit capstone courses. This option prepares IT professionals to develop software products and services for industry and government through software analysis, design and architecture; system verification; data storage and retrieval; and managing globally-distributed development. During the course of study, students will be involved in e licitation of requirements, legacy system analysis and repair, service-oriented applications, agile development projects, and open-source software development. Students who prefer more flexibility in time and location can also select the seven-week online courses from World Campus (developed by Penn State Great Valley) as part of the elective requirements.

Master Project (3 credits). The project requires all students in the Master in Information Sciences program to focus on a well-defined issue or problem relevant to the information sciences and technology. The student will submit a project proposal to his/her faculty advisor for approval. Upon completion of the project, the student will share or present the project results at a final presentation as a component of IST 594.

Language and Communication. All candidates must be competent in the English language and must have demonstrated skills in the communication of ideas both orally and in writing commensurate with the requirement of professional work. The foreign language and communication requirement may be fulfilled through demonstrating computer language proficiency (assessed through courses taken).

Courses

Graduate courses carry numbers from 500 to 599 or 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

INFORMATION SCIENCES AND TECHNOLOGY (IST) course list

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 37-06-087

Review Date: 4/14/09

Last updated by Publications: 01/20/10 (new dean only)

Information Systems (INFSY)

Program Home Page (Opens New Window)

GAYLE J. YAVERBAUM, *Director, Information Technology Programs*
Penn State Harrisburg
School of Business Administration
777 W. Harrisburg Pike
Middletown, PA 17057-4898
717-948-6140
MSIShbg@psu.edu

Degree Conferred:

M.S.

The Graduate Faculty

- Melvin Billingsley, Ph.D. (Yale) Professor of Biotechnology and Entrepreneurship
- Gregory A. Crawford, Ph.D. (Rutgers) Associate Librarian
- Rhoda Joseph, Ph.D. (City University of New York, Baruch College), Assistant Professor of Information Systems
- Parag C. Pendharkar, D.B.A. (Southern Illinois) Associate Professor of Information Systems
- Girish Subramanian, Ph.D. (Temple) Associate Professor of Information Systems
- Gayle J. Yaverbaum, Ph.D. (Temple) Professor of Information Systems

The Program

Operating under the auspices of the School of Business Administration, Penn State Harrisburg's master's degree program in information systems is designed to meet the rapidly increasing need for technically grounded, upper-level information resources managers within business organizations. With the exception of a small percentage of students who are full-time, the students served by the M.S.I.S. program are employees of area businesses, state and local governments, and not-for-profit organizations who study on a part-time basis. In order to accommodate both full- and part-time students, courses are primarily offered in the evening.

The two-fold nature of the program requires a manager to have competence both in information technology and in management theory; therefore, the curriculum combines the highly technical content of information science with the managerial emphasis of information systems. Unlike computer science programs, which tend to focus on computer hardware and architecture, this program is organized around applied computer-based activities, the development of communication skills, and managerial principles.

Students may elect to take one of two options in the program: Information Systems in Health Care Management and Delivery, or Information Systems in the Life Sciences. Each of these options requires a total of 36 credits. Alternatively, students can earn the degree without notation of an option; the total credits required for the degree under this choice are 30 credits.

Admission Requirements

Applicants to the program must hold a baccalaureate degree in any field from a regionally accredited, college-level institution. Students who apply for the option in Life Sciences must hold a baccalaureate degree in life sciences or a related field from a regionally accredited college-level institution. Decisions are based primarily on undergraduate junior-senior grade-point average and the Graduate Management Admissions Test (GMAT) scores. (Please visit www.gmac.com for more information on the GMAT). Post-baccalaureate course work, professional experience, and the statements provided in the application are also taken into account.

Students are also required to submit the following:

- a completed application form with application fee
- two copies of official transcripts from all colleges or universities attended;
- official scores from the GMAT test (the test must have been taken within the past five years);
- letters of recommendation (optional);
- supplemental application;

An application is available on the web at www.hbg.psu.edu or by calling 717-948-6250.

The Test of English as a Foreign Language (TOEFL) (www.toefl.org) must be taken by applicants for whom English is not their first language or whose language of instruction was not English. Submit the results of that test with the application for admission. A TOEFL score of 550 (paper-based test) or 213 (computer-based test) or higher is required for admission.

All students with international credentials must submit transcripts to Educational Credential evaluators, Inc. (ECE) for a "course by course" academic evaluation of transcripts and degree. An ECE application can be obtained on the web at: www.ece.org.

Application Dates

Candidates may enter the program at the beginning of the fall, spring, or summer session. To allow time for applications to be processed, all information, including GMAT score, must be received by Enrollment Services no later than July 18 for admission to the fall semester, November 18 for admission to the spring semester, and April 18 for admission to the summer session.

Applicants from outside the United States must follow the early admission dates in order to allow the necessary clearances and paperwork to be processed in time.

Entry Requirements

Analytic Skills Requirement: Prior to enrolling in their M.S.I.S. course work, students are required to demonstrate competence in Analytic skills. This requirement may be demonstrated by: (1) satisfactory completion of college-level courses in calculus and statistics such as QUANT 310 or MATH 110 plus STAT 200 or (2) successful completion of a calculus and statistics proficiency examination approved by

the M.S.I.S. program. This requirement must be taken either during the first semester or summer session of the student's matriculation and completed with a grade of C or better.

Credit by Examination: Interested students should obtain a Credit by Examination form from Enrollment Services and should consult with the M.S.I.S. Program to schedule the exam and obtain a list of suggested preparatory materials.

Computer Skills Requirement: Students are required to demonstrate proficiency in the use of Microcomputer Applications. This requirement can be satisfied through completion of a college-level microcomputer applications course within the past five years with a grade of B or higher or by documented significant computer-related work experience. If this requirement has not been met prior to admission, a college-level microcomputer course such as M I S 103 or CMPSC 203--Microcomputers in Business--is required. Course work must be taken either during the first semester or summer session of the student's matriculation and completed with a grade of B or higher.

Communication Skills Requirement: Successful completion of the M.S.I.S. program requires the ability to think clearly and to write and speak persuasively. Part of this requirement can be met by obtaining a score of "4" or more on the Graduate Management Admission Test (GMAT) Analytical Writing Assessment (AWA). If this score is not achieved, students must satisfy this requirement through additional course work in writing skills or other work developed in consultation with the M.S.I.S. Program. This requirement must be satisfied during the first semester or summer session of the student's matriculation and completed with a grade of B or higher. The speech component of this requirement is satisfied through individual and group presentations in courses in the M.S.I.S. Program.

Pre-Program Requirement: The Pre-program requirement provides a basic foundation in theory, tools and techniques required for the management of profit and non-profit organizations. It also provides a basic understanding of applications of financial accounting, the creation and distribution of goods and services, and how people relate to others in various organizations, helping to merge two related disciplines: business and information systems. Students who have completed the appropriate pre-program courses previously must have completed the courses with a grade of B or higher within seven years prior to admission, or through equivalent graduate course work completed with a B or higher within seven years prior to admission or college level course work validated by recent work experience. Students who have not met these tests of relevancy, grade or currency, prior to admission to the program must take these courses at the graduate level and early in Program. Students choosing an option in life sciences are required to have a baccalaureate degree in life sciences or a related field.

Pre-Program Requirement: 9 credits
ACCT 501, BUS 505, MGMT 511, BUSEC 502

Degree Requirements

The M.S.I.S. program requires, excluding prerequisite requirements, 30-36 credits of course work at the graduate level (500-level or higher). Options require 36 credits.

These are distributed over three groups of courses: Prescribed Courses, Additional Courses, and Electives.

M.S.I.S. Degree Program

Master of Science in Information Systems

Pre-Program Courses
ACCT 501. Financial Analysis (3)
BUS 505. Data Analysis for Business Decisions (2)
BUSEC 502. Prices, Markets, and Competitive Strategy (2)
MNGMT 511. Organizational Behavior (2)

Prescribed Courses
INFSY 535. Object-Oriented Design and Program Development (3)
INFSY 540. Information Technology and Knowledge Management (3)
INFSY 554. Master's Project (3)

Additional Courses (choose 15 credits)
INFSY 543. Electronic Commerce (3)
or
INFSY 550. Strategic Information Systems (3)
or
INFSY 587. Global Information Technology (3)
INFSY 545. Program, Data, and File Structures (3)
INFSY 547. WEB Enabled Technologies (3)
INFSY 555. Data Management (3)
INFSY 556. Data Warehousing (3)
INFSY 560. Data Communications Systems and Networks (3)
INFSY 562. Network Protocols (3)
or
INFSY 563. Network Security Management (3)
or
INFSY 564. Mobile computing (3)
INFSY 565. Intelligent Systems (3)
INFSY 566. Data Mining and Knowledge Discovery (3)
INFSY 570. Software Engineering in the Analysis and Design of Information Systems (3)
INFSY 575. Seminar in Information Technology Management (3) (as approved for major by Program)
INFSY 597. Special Topics (3)

Electives (6 credits)

Elective courses allow students to select additional elective courses of interest. Six credits of elective courses should be taken from 500-level courses offered by Penn State Harrisburg's School of Business Administration.

M.S.I.S. Degree with Options

Information Systems in Health Care Management and Delivery Option

Pre-Program Courses
ACCT 501. Financial Statement Analysis (3)
BUS 505: Data Analysis for Business Decisions (2)
BUSEC 502. Prices, Markets, and Competitive Strategy (2)
MNGMT 511. Organizational Behavior (2)

Prescribed Courses
INFSY 535. Object-Oriented Design and Program Development (3)
INFSY 540. Information Technology and Knowledge Management (3)
INFSY 554. Master's Project (3)

Additional Courses
INFSY 555. Data Management (3)
INFSY 556. Data Warehousing (3)
INFSY 560. Data Communications Systems and Networks (3)
INFSY 565. Intelligent Systems (3)
INFSY 566. Data Mining and Knowledge Discovery (3)

Option Courses
H ADM 539. Health Systems Organizations (3)
INFSY 585. Advanced Applications in Medical Informatics (3)

Select 6 credits from:
H ADM 540. Health Administrative Policy Formulation (3)
H ADM 541. Health Economics (3)
H ADM 542. Health Care Politics (3)
H ADM 543. Long-Term Care Administration (3)
H ADM 548. Health Care Quality (3)
H ADM 551. Health Care Law (3)
H ADM 552. Health Delivery Systems: managed care (3)
HES 570. Health Economics (3)
INFSY 575. Seminar in Information Technology Management (3) (as approved for option by Program)
INFSY 597. Special Topics (3) (as approved for option by Program)

Information Systems in Life Sciences Option

Prerequisite
A baccalaureate degree in a life sciences field

Pre-Program Courses
ACCT 501. Financial Analysis (3)
BUS 505. Data Analysis for Business Decisions (2)
BUSEC 502. Prices, Markets, and Competitive Strategy (2)
MNGMT 511. Organizational Behavior (2)

Prescribed Courses
INFSY 535. Object-Oriented Design and Program Development (3)
INFSY 540. Information Technology and Knowledge Management (3)
INFSY 554. Master's Project (3)

Additional Courses
INFSY 555. Data Management (3)
INFSY 556. Data Warehousing (3)
INFSY 560. Data Communications Systems and Networks (3)
INFSY 565. Intelligent Systems (3)
INFSY 566. Data Mining and Knowledge Discovery (3)

Option Courses
INFSY 578. Technology and Life Sciences (3)

Select 9 credits from:
BUSAD 534. Ethical Dimensions of Management in the Biotechnology and Health Industry (3)
BUSAD 583. Future of the Biotechnology and Health Industry: Strategic Implications (3)
INFSY 575. Seminar in Information Technology Management (3) (as approved for option by Program)
INFSY 597. Special Topics (3) (as approved for option by Program)
S T S 589. Ethics and Values in Science and Technology (3)
SWENG 552. Bioinformatics (3)

Students electing an option in the M.S.I.S. program must complete a total of 36 credits in the major to obtain the degree.

A minimum 3.0 grade-point average is required before a student is awarded an M.S. degree in Information Systems.

All course work must be completed within six years, or seven consecutive summers of matriculation.

Transfer Credits

Up to 10 transfer credits may be applied toward the degree. However, credits used to complete a previous graduate degree may not be applied. These courses must have been taken within the past five years, appear on a graduate transcript, and have been passed with a B grade or higher. It must be the opinion of the reviewing faculty that these courses are equivalent in quality to those offered at Penn State Harrisburg. Credit will not be given for any class used to complete a previous degree.

Course Substitutions

Because some students enter the Program with advanced knowledge in one or more subject areas, up to six credits in prescribed or additional courses may be replaced with more advanced graduate courses in the same subject area. Except for INFSY 554, which must be

taken at the College, INFSY prescribed and additional courses, in cases where there is equivalent knowledge, must be replaced with more advanced courses in the same field. Substitutions are based on a minimum of six credits of advanced undergraduate course work in an area of concentration or credits earned in an equivalent graduate-level program at a regionally accredited, college-level institution. These courses must have been completed within the past five years and have earned a grade of B or better. Substituted courses must be replaced with other advanced graduate courses in the field for which the substitute is the foundation/prerequisite. Substitutions are based on past academic performance. An examination cannot be used for earned graduate course credit.

Grade-Point Average and Time Limit

A 3.00 (out of 4.00) minimum grade-point average is required FOR THE AWARD OF THE M.S.I.S. degree. All course work must be completed within six years, or seven consecutive summers, of matriculation.

Financial Aid

There are a limited number of scholarships, fellowships, and research grants available, as well as several graduate assistantships. For more information on these, contact Penn State Harrisburg's School of Business Administration.

Many students work full-time and take classes part-time. In many cases, employers have a tuition-reimbursement plan paying for partial or full tuition.To find other options available to you, contact one of the following offices: Financial Aid Office, 717-948-6307 or Enrollment Services, 717-948-6250.

Graduate School Assistantships

Full time graduate students who are interested in an assistantship should contact the graduate program coordinator. Students must be nominated for an assistantship by their program coordinator.

Students applying for an assistantship should submit scores from the Graduate Management Admissions Test (GMAT), or similar examinations by January 30.

CONCURRENT DEGREE OFFERINGS WITH THE DICKINSON SCHOOL OF LAW

Penn State Harrisburg, School of Business Administration
The Dickinson School of Law

Degrees Conferred:

J.D. (Dickinson)
M.B.A. (Penn State Harrisburg)
M.S.I.S. (Penn State Harrisburg)

Concurrent Degree Programs

The Dickinson School of Law and the School of Business Administration of Penn State Harrisburg offer cooperative programs leading to the degrees of Juris Doctor (J.D.) to be granted by the Dickinson School of Law, and either the Master of Business Administration (M.B.A.) or Master of Science in Information Systems (M.S.I.S.) to be granted by Penn State Harrisburg. These concurrent degree opportunities facilitate the completion of both a law degree and a professional degree in business or information systems. The programs are designed primarily for location-bound students who enter law school with an undergraduate degree in business, information systems or related fields.

Admission Requirements

The concurrent programs require that the student first be admitted to the Dickinson School of Law. Subsequently, the student is recommended for and applies for admission to the graduate school for the Penn State Harrisburg M.B.A. program or M.S.I.S. program.

The following are required for applicants:

The Dickinson School of Law: Completed Law School application; Law School Admission Test (LSAT) score; Law School Data Assembly Service (LSDAS) report; one page personal statement; employment record since high school; two letters of recommendation.

M.B.A. And M.S.I.S. Programs: Completed Graduate School application; Graduate Management Admission Test (GMAT); letter of recommendation from the associate dean of the Dickinson School of Law; evidence of proficiency in analytic skills through college-level calculus and statistics demonstrated either by completion of courses or successful completion of a mathematics proficiency examination approved by the program; evidence of proficiency in microcomputer applications skills; proficiency in writing evidenced by a score of "4" or higher on the analytical writing assessment portion of the GMAT; proficiency in entry-level financial accounting as demonstrated by completion of college-level course work; completion of a set of pre-program business core requirements demonstrated by completion of a minimum of six credits of advanced undergraduate work in each core areas. Each course must have been completed with a grade of B or higher within seven years prior to admission to the M.B.A. or M.S.I.S. program. The School of Business Administration will review the applicant's transcripts for acceptability of the courses.

No courses from the M.B.A program or M.S.I.S. program may count toward the J.D. program until the student is matriculated at The Dickinson School of Law. However, graduate-level courses taken in either in the M.B.A. or M.S.I.S. program at Penn State Harrisburg or at another graduate-level institution may be applied to the M.B.A. or M.S.I.S. in accordance with the transfer policies of the Graduate School.

Transfer of Credits

For those students meeting the entry and pre-program requirements of the M.B.A. and M.S.I.S. programs, 30 additional credits are required. Nine credits of course work at the Dickinson School of Law may be transferred toward the M.B.A. or the M.S.I.S. degrees, subject to program approval. Students must obtain a grade satisfactory to the M.B.A. and M.S.I.S. program in order for the credits to be transferable. Nine credits of M.B.A. or M.S.I.S. courses may be transferred for credit toward the J.D. degree at the Dickinson School of Law, subject to the approval of the school of law.

Advising of Students

All students in the concurrent program have two advisers, one in the School of Business Administration and one from the faculty at the Dickinson School of Law. Because the concurrent program is designed to be taken in synchrony with the objective that both degrees will be earned simultaneously, students who do not demonstrate progress toward completion of both degrees may be denied continuation in the concurrent program. Such a decision will rest jointly with the faculties of the M.B.A. or M.S.I.S. program and the J.D. program.

Tuition

The Dickinson School Of Law and Penn State Harrisburg will each charge their own tuition to students in the J.D./M.B.A. and J.D./M.S.I.S. programs.

Additional Information

For more information and the latest updates on the concurrent programs, call the law school at 717-240-5207 or 800-840-1122, or visit the Web sites at:
http://www.dsl.psu.edu
http://www.hbg.psu.edu

CONCURRENT DEGREE OFFERINGS WITH THE PENN STATE COLLEGE OF MEDICINE, THE DEPARTMENT OF PHARMACOLOGY

Penn State Harrisburg, School of Business Administration
The Penn State College of Medicine, The Department of Pharmacology

Degrees Conferred:

Ph.D. (College of Medicine)
M.B.A. or M.S.I.S. (Penn State Harrisburg)

Concurrent Degree Programs

The Penn State College of Medicine, Department of Pharmacology, and The School of Business Administration of Penn State Harrisburg offer cooperative programs leading to the degrees of Doctor Of Philosophy (Ph.D.) to be granted by the Penn State College of Medicine, and either the Master of Business Administration (M.B.A.) or Master of Science in Information Systems (M.S.I.S.) to be granted by Penn State Harrisburg. These concurrent degree opportunities facilitate the completion of both a pharmacology doctorate and a professional degree in business administration or information systems. The programs are designed primarily for students interested in pursuing a career involving high-quality independent research and positions of management responsibility within the pharmacological community.

Admission Requirements:

The concurrent programs require that the student first be admitted to the pharmacology program. Subsequently, the student is recommended for and applies for admission to the graduate school for the Penn State Harrisburg M.B.A. or M.S.I.S. program.

The following are required for applicants:

Pharmacology: Completed application; Graduate Record Examination (GRE) Score; A bachelor's degree reflecting a reasonable background in zoology or biology, mathematics and chemistry; a minimum junior/senior grade point average of 3.00 and with appropriate course backgrounds; two letters of recommendation; a curriculum vitae; a description of career goals. Reading knowledge of one or two foreign languages is recommended.

M.B.A. and M.S.I.S. Programs: Completed Graduate School application; Graduate Management Admission Test (GMAT) score; letter of recommendation from the department chair of the pharmacology department; evidence of proficiency in analytic skills through college-level calculus and statistics demonstrated either by completion of courses or successful completion of a mathematics proficiency examination approved by the program; evidence of proficiency in microcomputer applications skills; proficiency in writing evidenced by a score of "4" or higher on the writing assessment portion of the GMAT; proficiency in entry-level financial accounting as demonstrated by completion of college-level course work; completion of a set of pre-program business core requirements demonstrated by completion of a minimum of six credits of advanced undergraduate work in each core area. Each course must have been completed with a grade of B or higher within seven years prior to admission to the M.B.A. or M.S.I.S. program. The School of Business Administration will review the applicant's transcripts for acceptability of the courses.

No courses from the M.B.A program or M.S.I.S. program may count toward the Ph.D. until the student is admitted to the Pharmacology Program. However, graduate-level courses taken in either in the M.B.A. or M.S.I.S. program at Penn State Harrisburg or at another graduate-level institution may be applied to the M.B.A. or M.S.I.S. in accordance with the transfer policies of the Graduate School.

It is anticipated that most students in the concurrent programs will require additional graduate credits in order to satisfy the entry and pre-program requirements in business administration. Nine credits of course work in pharmacology may be transferred toward the M.B.A. or M.S.I.S. Students must obtain a grade satisfactory to the program in order for the credits to be transferable. Nine credits of M.B.A. or M.S.I.S. course work may be transferred for credit toward the Ph.D. degree, subject to the approval of the department of pharmacology.

All students in the concurrent program have two advisers, one in the School of Business Administration and one from the faculty in the department of Pharmacology. Because the concurrent program is designed to be taken in synchrony with the objective that both degrees will be earned simultaneously, students who do not demonstrate progress toward completion of both degrees may be denied continuation in the concurrent program. Such a decision will rest jointly with the faculties of the M.B.A. or M.S.I.S. and the Ph.D. programs.

The Course Matrix

For more information and the latest updates on the concurrent programs, call the department of pharmacology at 717-531-8285 or visit the Web sites at:
http://www.hmc.psu/pharmacology_.program.index.html (Opens New Window)
http://www.hbg.psu.edu (Opens New Window)

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BUSINESS ADMINISTRATION (BUSAD) course list

HEALTH ADMINISTRATION (H ADM) course list

INFORMATION SYSTEMS (INFSY) course list

SCIENCE, TECHNOLOGY AND SOCIETY (S T S) course list

SOFTWARE ENGINEERING (SWENG) course list

Last Revised by the Department: Fall Semester 2006

Blue Sheet Item #: 34-07-473

Review Date: 6/13/06

Last updated by Publications: 1/21/10 (link check)

Instructional Systems (INSYS)

Program Home Page (Opens New Window)

PRIYA SHARMA, *In Charge of Graduate Programs in Instructional Systems*
314 Keller Building
814-865-0473
nxc1@psu.edu

Degrees Conferred:

Ph.D., D.Ed., M.S., M.Ed. (Penn State University Park); M.S., M.Ed. (Penn State Great Valley)

The Graduate Faculty

- Alison A. Carr-Chellman, Ph.D. (Indiana) *Professor of Education*
- Roy B. Clariana, Ed.D. (Memphis) *Professor of Education*
- Barbara L. Grabowski, Ph.D. (Penn State) *Professor of Education*
- Simon R. Hooper, Ph.D. (Penn State) *Associate Professor of Education*
- Susan M. Land, Ph.D. (Florida State) *Associate Professor of Education*
- Doris Lee, Ph.D. (Texas) *Associate Professor of Education*
- Orrin Murray, Ph.D. (Michigan) *Assistant Professor of Educaiton*
- Kyle L. Peck, Ph.D. (Colorado) *Professor of Education*
- Priya Sharma, Ph.D. (Georgia) *Associate Professor of Education*
- Heather Zimmerman, Ph.D. (Washington) *Assistant Professor of Education*

This program provides advanced professional preparation in the development of effective, efficient instructional materials and the use of technology in educational settings. Skill and knowledge in the fields of educational psychology, instructional design, computer technologies, development of educational materials, and evaluation of educational outcomes combine to prepare graduates for a variety of roles and professional environments. Graduates are employed by corporate, agency, and military training departments; entrepreneurial consulting companies; public school districts, community college learning resource centers, and colleges and universities. At the University Park campus, the program offers an M.S. degree for students who will continue into the Ph.D. program and a career in higher education, and two options within the M.Ed., Instructional Systems Design and Educational Technology. At Penn State Great Valley (Opens New Window), the program offers the M.S. and M.Ed. degrees listed above, as well as M.Ed. degrees with corporate Training Design and Development and Leadership in Technology Integration emphases.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) (for master's or doctorate) or Miller Analogies Test (for master's), transcripts, letters of reference, application letter, and writing assignment are required for admission.

Master's Degree Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*. For the M.S. degree, EDPSY 400 or its equivalent is prerequisite. M.Ed. and M.S. candidates are expected to complete the following courses: INSYS 415, INSYS 521, INSYS 522, INSYS 525 or INSYS 527, four INSYS emphasis courses, and 6 credits of professional orientation in Educational Psychology, Educational Administration, Workforce Education and Development, and/or Adult Education. Other courses may be substituted with approval from the candidate's adviser. The Leadership in Technology Integration emphasis requires INSYS 471 instead of INSYS 521.

The M.S. degree requires: as core courses INSYS 415 and EDPSY 421; as required courses INSYS 575 or EDPSY 475, and 6 credits of INSYS 600/610; and a master's project paper, internship and paper, or design apprenticeship.

The M.Ed. Instructional Systems Design option requires: as core courses INSYS 415, INSYS 521, INSYS 522, and INSYS 525; as required courses , INSYS 527, and EDPSY 421; and a master's project paper, internship and paper, or design apprenticeship.

The M.Ed. with an Educational Technology option requires: as core courses INSYS 415 and EDPSY 421; as required courses AEE 521 or STAT 500; EDTEC 448, EDTEC 561, EDTEC 562; EDTEC 566 or EDTEC 566; and EDTEC 567; and a master's paper documenting the effectiveness of a technology-related intervention in an educational setting.

Doctoral Degree Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*. In addition to those requirements for a master's degree, D.Ed. and Ph.D. candidates are expected to complete the following courses: EDPSY 421, two doctoral CORE courses (INSYS 581, INSYS 583, or INSYS 586), 12 credits of Instructional Systems emphasis courses, and a 15-credit minor or supporting field.

The Ph.D. candidate is expected to complete four research design courses covering both quantitative and qualitative methods. The communication requirement must be satisfied by completing one course in applied statistics, and either one course in advanced statistics or one course in advanced qualitative data analysis. The Ph.D. candidate is also expected to complete a research apprenticeship working directly with a faculty member.

The D.Ed. candidate is expected to complete two research design courses, choosing from experimental, qualitative, or survey research design, and a 9- to 15-credit internship.

As part of the candidacy exam, candidates are required to prepare residency plans indicating how they will be professionally immersed during their residency period. This plan is then reviewed again prior to graduation.

Candidates for doctoral degrees with a minor in Instructional Systems must take a minimum of 15 credits approved in advance by the professor in charge of the Instructional Systems program.

Student Aid

A limited number of graduate assistantships are available to students in this program. These and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

INSTRUCTIONAL SYSTEMS (INSYS) course list

EDUCATIONAL TECHNOLOGY (EDTEC) course list

Last Revised by the Department: Spring Semester 2008

Blue Sheet Item #: 36-03-084

Review Date: 11/27/07

Date last reviewed by Graduate School: 6/14/05

Last updated by Publications: 11/11/09

Integrative Biosciences Graduate Program (IBIOS)

Program Home Page (Opens New Window)

Peter Hudson, *Chair, IBIOS Graduate Education*
201 Life Sciences Building
University Park, PA 16802
1-866-PS-IBIOS; 1-866-77-42467 (toll-free in USA)
gradinfo@huck.psu.edu

Degree Conferred:

Ph.D.gradinfo@huck.psu.edu

The Integrative Biosciences Graduate Faculty

- Raj Acharya, Ph.D. (Minnesota) Professor of Computer Science and Engineering
- Hiroshi Akashi, Ph.D. (Chicago) Assistant Professor of Biology
- Reka Albert, Ph.D. (Notre Dame) Assistant Professor of Physics
- Naomi Altman, Ph.D. (Stanford) Associate Professor of Statistics
- Sarah Assmann, Ph.D. (Stanford) Professor of Biology
- Stephen Benkovic, Ph.D. (Cornell) Evan Pugh Professor and Eberly Chair in Chemistry
- Piotr Berman, Ph.D. (MIT) Associate Professor of Computer Science and Engineering
- Maria Bewley, Ph.D. (University of Leeds) Assistant Professor of Biochemistry
- Judith Bond, Ph.D. (Rutgers) Professor and Chair, Biochemistry and Molecular Biology
- Donald Bryant, Ph.D. (California, Los Angeles) Ernest C. Pollard Professor of Biotechnology, and Professor of Biochemistry and Molecular Biology
- John Carlson, Ph.D. (Illinois) Professor of Molecular Genetics; Director, Schatz Center for Tree Molecular Genetics
- Laura Carrel, Ph.D. (Stanford Reserve) Assistant Professor of Biochemistry and Molecular Biology
- Douglas Cavener, Ph.D. (Georgia) Professor of Biology
- Francesca Chiaromonte, Ph.D. (Minnesota) Associate Professor of Statistics
- Keith Cheng, M.D.; Ph.D. (NYU; U Washington) Professor of Pathology; Adjunct Professor of Biochemistry and Molecular Biology
- Surinder Chopra, Ph.D. (Vrje U of Brussels, Belgium) Associate Professor of Maize Genetics
- Michael Chorney, Ph.D. (Cornell, Sloan Kettering Cancer Center) Professor of Microbiology
- Daniel Cosgrove, Ph.D. (Stanford) Professor of Biology
- Claude de Pamphilis, Ph.D. (Georgia) Associate Professor of Biology
- Nina Fedoroff, Ph.D. (Rockefeller) Willaman Professor of Life Sciences; Director, Biotechnology Institute
- Gregory Ferry, Ph.D. (Illinois) Stanley Person Professor of Molecular Biology
- John Flanagan, Ph.D. (Tennessee) Professor of Biochemistry and Molecular Biology
- Majid R. Foolad, Ph.D. (California, Davis) Professor of Plant Genetics
- David Geiser, Ph.D. (Georgia) Associate Professor of Plant Pathology
- Channe Gowda, Ph.D. (Mysore, India) Professor of Biochemistry and Molecular Biology
- Mark Guiltinan, Ph.D. (California, Irvine) Professor of Plant Molecular Biology; Director, Endowed Program in the Molecular Biology of Cocoa
- Ross Hardison, Ph.D. (Iowa) Professor of Biochemistry
- Terryl J. Hartman, Ph.D.; M.P.H., (Minnesota; Harvard School of Public Health) Assistant Professor of Nutrition
- S. Blair Hedges, Ph.D. (Maryland) Professor of Biology
- Christopher H. House, Ph.D. (California) Associate Professor of Geosciences
- Peter Hudson, F.R.S. (UK) Willaman Professor of Biology
- Leonard Jefferson, Ph.D. (Vanderbilt) Evan Pugh Professor; Chair of Cellular and Molecular Physiology
- Byron Jones, Ph.D. (Arizona) Professor of Biobehavioral Health and Pharmacology
- Seogchan Kang, Ph.D. (Wisconsin) Associate Professor of Plant Pathology
- Teh-hui Kao, Ph.D. (Yale) Professor of Biochemistry and Molecular Biology
- Ermine Koc, Ph.D. (New Mexico State) Assistant Professor of Biochemistry and Molecular Biology
- Kathryn LaNoue, Ph.D. (Yale) Professor of Cellular and Molecular Physiology
- Arthur Lesk, Ph.D. (Princeton) Professor of Biochemistry and Molecular Biology
- Jia Li, Ph.D. (Stanford) Associate Professor of Statistics
- Bruce G. Lindsay, Ph.D. (Washington) Willaman Professor and Head of Statistics
- Hong Ma, Ph.D. (MIT) Professor of Biology
- George Makhatadze, Ph.D. (Moscow Physico-Technical Institute) Professor of Biochemistry and Molecular Biology
- Kateryna Makova, Ph.D. (Texas Tech) Assistant Professor of Biology
- Costas Maranas, Ph.D. (Princeton) Professor of Chemical Engineering
- Timothey McNellis, Ph.D. (Yale) Assistant Professor of Plant Pathology
- Webb C. Miller, Ph.D. (Washington), Professor of Biology and Computer Science and Engineering
- Kathleen Mulder, Ph.D. (SUNY, Buffalo) Professor of Pharmacology
- Masatoshi Nei, Ph.D. (Kyoto University, Japan) Evan Pugh Professor of Biology
- Anton Nekrutenko, Ph.D. (Texas Tech) Assistant Professor of Biochemistry and Molecular Biology
- Karl M. Newell, Ph.D. (Illinois) Professor of Kinesiology and Biobehavioral Health
- Randen Patterson, Ph.D. Assistant Professor of Biology
- Anthony Pegg, Ph.D. (Cambridge) Evan Pugh Professor of Cellular and Molecular Physiology, and Pharmacology; J. Lloyd Huck Professor of Cell and Molecular Biology
- B. Franklin Pugh, Ph.D. (Wisconsin, Madison) Associate Professor of Biochemistry and Molecular Biology
- Calyampudi Rao, Sc.D. (Cambridge) Eberly Professor Emeritus of Statistics
- W. Brian Reeves, M.D. (Thomas Jefferson) Staff Physician
- Gavin Robertson, Ph.D. (California, Riverside) Associate Professor of Pharmacology
- Ira Ropson, Ph.D. (Johns Hopkins) Associate Professor of Biochemistry and Molecular Biology
- James Rosenberger, Ph.D. (Cornell) Professor of Statistics
- Stephen Schaeffer, Ph.D. (Georgia) Associate PRoefessor of Biology
- Cara-Lynne Schengrund, Ph.D. (Seton Hall) Professor of Biochemistry and Molecular Biology
- Stephan Schuster, Ph.D. (University of Munich, Germany) Professor of Biochemistry and Molecular Biology
- Cooduvalli Shashikaut, Ph.D. (Osmania University, India) Associate Professor of Molecular and Developmental Biology

- Mark Shriver, Ph.D. (U of Texas Health Science Center) Associate Professor of Anthropology
- Thomas Spratt, Ph.D. (Chicago) Associate Professor of Biochemistry
- Jack Vanden Heuvel, Ph.D. (Wisconsin) Professor of Molecular Toxicology
- David J. Vandenbergh, Ph.D. (Penn State) Associate Professor of Biobehavioral Health
- George Vogler, Ph.D. (Colorado, Boulder) Professor of Biobehavioral Health
- Kent Vrana, Ph.D. (Louisiana State) Medical Center Professor and Chair of Pharmacology
- James Wang, Ph.D. (Stanford) Associate Professor of Information Sciences and Technology
- Kenneth Weiss, Ph.D. (Michigan) Evan Pugh Professor of Anthropology and Genetics

Calling upon the expertise of more than seventy faculty members representing twenty-seven different departments among eight different colleges between two different campuses, the Integrative Biosciences (IBIOS) Graduate Program offers a unique opportunity to learn about and work in multiple disciplines. This graduate education component of the Huck Institutes of the Life Sciences is supported by modern telecommunications facilities and equipment. Doctoral students not only explore new conceptual connections, but also engage in active group learning experiences and explore a variety of potential career opportunities before graduation. Two unique aspects are (1) dual mentors who will expose students to complementary viewpoints and encourage students to pursue problems at the interface between traditional disciplines, and (2) an optional internship that provides a mechanism for students to obtain “real world” experience in future professional settings.

The program offers the following areas of research emphasis (called options): Bioinformatics and Genomics, and Chemical Biology.

General Admission Requirements

Faculty begin reviewing applications December 1.

1. Completed official Penn State Graduate School application
2. Paid nonrefundable application fee ($45 U.S.)
3. Two official transcripts from each institution attended
4. Completed Integrative Biosciences Graduate Degree Program application
5. Application for a U.S. visa (International applicants only)
6. Graduate Record Examinations (GRE) general test
7. Three letters of recommendation
8. Statement of goals that pertains to the life sciences
9. All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) examination. A minimum TOEFL score of 600 on the paper test, 250 on the computer-based test, or 100 (including 23 on the speaking component) on the Internet-based test is required.
10. Students must have completed a bachelor's degree at an accredited college or university and have a minimum of a 3.0/4.0 junior/senior undergraduate grade-point average.

Prescribed (Required) Courses:

1. Foundation of basic knowledge in molecular biology, cell biology, biochemistry, and computational methods in the life sciences. The IBIOS Graduate Program expects at least 6 credits (or the equivalent) in one or more of these disciplines, taken either as an undergraduate or as a part of the graduate curriculum. The specific courses are left to the discretion of each option.
2. IBIOS 590 COLLOQUIUM (4 credits, 2 per semester during any of the first four semesters in residence), a monthly colloquium that will present life science topics of general interest to all faculty and graduate students in the Huck Institutes of the Life Sciences.
3. IBIOS 591 ETHICS IN LIFE SCIENCES (1 credit), an examination of integrity and misconduct in life sciences research, including issues of data collection, publication, authorship, and peer review.
4. IBIOS 595 INTERNSHIP (optional, 1 credit), an external work assignment relevant to individual research or career goals. (Register for IBIOS 595 in 520 Thomas Building)
5. IBIOS 596 INDIVIDUAL STUDIES: Laboratory Rotations (1-3 credits per semester, depending upon option)
6. IBIOS 600 THESIS RESEARCH (variable credits)
7. IBIOS 601 Ph.D. DISSERTATION FULL-TIME (0 credits)
8. IBIOS 602 SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1 credit each semester), two semesters or the equivalent is required after the first year in residence. International Fellows must pass an English proficiency exam before teaching.

The Graduate School requires all graduate students to maintain a 3.0 grade-point average. Individual options may require a higher GPA.

Students must present their thesis in accordance with the Penn State guidelines as described in the *THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses*. Current copies may be obtained from the web site www.gradsch.psu.edu/current/thesisguide or the Thesis Office, 115 Kern Building, University Park, PA 16802; 814-865-5448.

Elective courses. Studenst may select any 400- to 500-level courses pending approval by the Faculty Mentor and the Option Director - available elective courses vary from year to year.

BIOINFORMATICS AND GENOMICS (BG) OPTION

College of Medicine (Hershey)
Prescribed (Required) Courses:

- IBIOS stable number Genomics (3 credits), currently offered as 598B, a special topics course. Videoconferenced between UP and COM
- GEN 520. Genetics (Offered at COM and now planned to be videoconferenced between COM and UP.)
- BCHEM 502. Biological Chemistry (3 credits)
- IBIOS 591. Ethics (1 credit)
- IBIOS 590. Colloquium (1 credit)
- HES 615. Statistical Genetics
- CMBIO 520. Genetic Analysis (3 credits)
- Electives: Choose at least three credits from courses that support the chosen thesis research.

University Park
Prescribed (Required) Courses:

- IBIOS stable number Genomics (3 credits), currently offered as 598B, Bioinformatics I - BIOL 597F, CSE/STAT 598 (3 credits)

- IBIOS 591. Ethics (1 credit)
- IBIOS 590. Colloquium (1 credit)
- Electives. Choose at least three credits from the following courses.
  - BIOL 597F, CSE 598F, STAT 597F Bioinformatics II
  - GEN 520. Genetics (Offered at COM and now planned to be videoconferenced between COM and UP.)
  - STAT 597D. Genometrics
  - BIOL 497D. Practical Bioinformatics
  - BIOL 497G/597G. Computer Programming in C: Biological Applications
  - BIOL 505. Statistical Methods in Evolutionary Genetics
  - B M B 597C. Computers for biochemists and molecular biologists
  - CSE 598E, STAT 597E. Data Mining
  - IBIOS 597G, HORT 597A, and AGRO 597G. Plant Genomics
  - BMMB 597A or BMMB 501. Core Concepts in Biomolecular Science

See also BIOTECHNOLOGY.

CHEMICAL BIOLOGY (CB) OPTION

Prescribed (Required) Courses:

- Graduate level courses in biochemistry or molecular biology (6 credits, 3 per semester of the first year)
- Chemical Biology elective (6 credits, 3 per semester of the first year)

Last Revised by the Department: Summer Session 2007

Blue Sheet Item #: 35-07-441

Review Date: 6/12/07

Last updated by Publications: 8/19/09

We weren't able to find Intercollege Master of Professional Studies in Homeland Security in the current listings.

Intercollege Program in Materials (MATL)

Program Home Page (Opens New Window)

BARBARA SHAW, *Chair*
403A Earth and Engineering Science Building
814-865-1451

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- James Adair, Ph.D. Professor of Materials Science and Engineering
- Dinish K. Agrawal, Ph.D. Professor of Materials
- David L. Allara, Ph.D. Professor of Materials Science and Chemistry
- Harry L. Allcock, Ph.D. Evan Pugh Professor of Chemistry
- Maurice F. Amateau, Ph.D. Professor of Engineering Science and Mechanics
- S. Ashok, Ph.D. Professor of Engineering Science
- John V. Badding, Ph.D. Assistant Professor of Chemistry
- Andrzej R. Badzian, Ph.D. Professor of Materials
- Charles Bakis, Ph.D. Associate Professor of Engineering Science and Mechanics
- Jayanth R. Banavar, Ph.D. Professor of Physics
- Anthony Baratta, Ph.D. Professor of Nuclear Engineering
- Uma Belegundu, Ph.D. Research Associate in Materials
- Amar S. Bhalla, Ph.D. Professor of Materials and Electrical Engineering
- William R. Bitler, Ph.D. Professor Emeritus of Metallurgy
- Paul R. Blankenhorn, Ph.D. Professor of Wood Technology
- Andre L. Boehman, Ph.D. Associate Professor of Fuel Science
- Susan L. Brantley, Ph.D. Associate Professor of Geosciences
- Paul W. Brown, Ph.D. Professor of Materials Science and Engineering
- Wenwu Cao, Ph.D. Professor of Mathematics, and Materials Research
- Gary L. Catchen, Ph.D. Professor of Nuclear Engineering
- Moses H. W. Chan, Ph.D. Evan Pugh Professor of Physics
- Subhash Chander, Ph.D. Professor of Mineral Processing
- Long-Qing Chen, Ph.D. Professor of Materials Science and Engineering
- Ralph Colby, Ph.D. Professor of Materials Science and Engineering
- Milton W. Cole, Ph.D. Distinguished Professor of Physics
- Lance Collins, Ph.D. Professor of Chemical Engineering
- Robert W. Collins, Ph.D. Professor of Physics and Materials Research
- Joseph C. Conway, Jr., Ph.D. Professor of Engineering Science and Mechanics
- Vincent Crespi, Ph.D. Professor of Physics
- L. Eric Cross, Ph.D. Evan Pugh Professor Emeritus of Electrical Engineering
- Paul H. Cutler, Ph.D. Professor Emeritus of Physics
- Makunda B. Das, Professor Emeritus of Electrical Engineering
- Tarasankar DebRoy, Ph.D. Professor of Materials Science and Engineering
- Elizabeth Dickey, Ph.D. Assistant Professor of Materials Science and Engineering
- Renee D. Diehl, Ph.D. Professor of Physics
- Joseph P. Dougherty, Ph.D. Associate Professor of Materials and Electrical Engineering
- Moustafa El-Gindy, Ph.D. Senior Research Associate in Mechanical Engineering
- Renata S. Engel, Ph.D. Professor of Engineering Science and Mechanics
- Wolfgang E. Ernst, Ph.D. Professor of Physics and Chemistry
- Kristen A. Fichthorn, Ph.D. Professor of Chemical Engineering and Physics
- Stephen J. Fonash, Ph.D. Kunkle Chair; Professor of Engineering Science
- Barbara J. Garrison, Ph.D. Shapiro Professor of Chemistry
- Randall German, Ph.D. Brush Chair; Professor of Materials
- Venkatraman Gopalan, Ph.D. Assistant Professor of Materials Science and Engineering
- Eark K. Graham, Jr., Ph.D. Professor of Geosciences
- David J. Green, Ph.D. Professor of Ceramic Science and Engineering
- Michael K. Grutzeck, Ph.D. Professor of Materials
- Ruyan Guo, Ph.D. Associate Professor of Electrical Engineering
- Ian R. Harrison, Ph.D. Professor of Polymer Science
- Donald Heaney, Ph.D. Research Associate in Materials
- John R. Hellmann, Ph.D. Associate Professor of Ceramic Science and Engineering
- Paul R. Howell, Ph.D. Professor of Metals Science and Engineering
- Thomas N. Jackson, Ph.D. Professor of Electrical Engineering
- Gerald G. Johnson, Ph.D. Associate Professor Emeritus of Computer Science and Engineering
- Sridhar Komarneni, Ph.D. Professor of Clay Mineralogy
- Iam-Choo Khoo, Ph.D. Professor of Electrical Engineering
- Donald A. Koss, Ph.D. Professor of Metals Science and Engineering
- Sanat Kumar, Ph.D. Professor of Materials Science and Engineering
- Kenneth K. Kuo, Ph.D. Distinguished Professor of Mechanical Engineering
- Peter Labosky, Ph.D. Professor of Wood Science and Technology
- Akhlesh Lakhtakia, Ph.D. Professor of Engineering Science and Mechanics
- Michael Lanagan, Ph.D. Associate Professor of Materials Science and Engineering
- George A. Lesieutre, Ph.D. Professor of Aerospace Engineering
- Qi Li, Ph.D. Associate Professor of Physics
- Ying Liu, Ph.D. Associate Professor of Physics
- Zi-Kiu Liu, Ph.D. Assistant Professor of Materials Science and Engineering
- Digby D. Macdonald, Ph.D. Professor of Materials Science and Engineering

- Thomas E. Mallouk, Ph.D. DuPont Professor of Materials Chemistry
- Harvey Manbeck, Ph.D. Distinguished Professor of Agricultural Engineering
- Evangelos Manias, Ph.D. Virginia and Philip L. Walker Faculty Fellow; Assistant Professor of Materials Science and Engineering
- William D. Mark, Professor of Mechanical Engineering; Senior Scientist
- Theresa S. Mayer, Associate Professor of Electrical Engineering
- Julian D. Maynard, Jr., Distinguished Professor of Physics
- Russell F. Messier, Professor of Engineering Science and Mechanics
- Gary L. Messing, Professor of Ceramic Science and Engineering; Head, Materials Science and Engineering
- Suzanne E. Mohney, Ph.D. Associate Professor of Materials Science and Engineering
- Arthur M. T. Motta, Ph.D. Associate Professor of Nuclear Engineering
- Karl T. Mueller, Ph.D. Associate Professor of Chemistry
- Michael J. Natan, Ph.D. Professor of Chemistry
- Robert N. Pangborn, Ph.D. Professor of Engineering Mechanics; Associate Dean
- Carlo Pantano, Ph.D. Distinguished Professor of Materials Science and Engineering; Director, Materials Research Institute
- Seung-Eek Park, Ph.D. Professor of Materials
- Howard W. Pickering, Ph.D. Distinguished Professor of Metals Science and Engineering
- Lawrence J. Pilione, Ph.D. Professor of Physics
- V. M. Puri, Ph.D. Professor of Agricultural Engineering
- Richard A. Queeney, Ph.D. Professor of Engineering Mechanics
- Ljubisa R. Radovic, Ph.D. Associate Professor of Fuel Science
- Clive A. Randall, Ph.D. Professor of Materials Science and Engineering
- Asok Ray, Ph.D. Professor of Mechanical Engineering
- Joan M. Redwing, Ph.D. Assistant Professor of Materials Science and Engineering
- Joseph L. Rose, Ph.D. Paul Morrow Professor of Engineering Science and Mechanics
- Della M. Roy, Ph.D. Professor Emerita of Materials Science
- Rustum Roy, Ph.D. Evan Pugh Professor Emeritus of the Solid State
- James P. Runt, Ph.D. Professor of Polymer Science
- Clayton O. Ruud, Ph.D. Professor of Industrial Engineering
- Earle Ryba, Ph.D. Associate Professor of Metallurgy
- Nicholas J. Salamon, Ph.D. Professor of Engineering Science and Mechanics
- Nitin Samarth, Ph.D. Professor of Physics
- Robert J. Santoro, Ph.D. Professor of Mechanical Engineering
- Barry E. Scheetz, Ph.D. Professor of Materials, Civil and Environmental Engineering, and Nuclear Engineering
- Darrell G. Schlom, Ph.D. Associate Professor of Materials Science and Engineering
- Harold Schobert, Ph.D. Professor of Fuel Science
- Barbara Shaw, Ph.D. Associate Professor of Engineering Science and Mechanics; Chair, Intercollege Graduate Program in Materials
- Thomas R. Shrout, Ph.D. Professor of Materials
- Michael R. Silsbee, Ph.D. Associate Professor of Materials
- George Simkovich, Ph.D. Professor Emeritus of Metallurgy
- Jogender Singh, Ph.D. Professor of Metals Science; Senior Scientist
- Deane K. Smith, Ph.D. Professor Emeritus of Mineralogy
- Paul Sokol, Ph.D. Professor of Physics
- Karl E. Spear, Ph.D. Professor Emeritus of Materials Science and Engineering
- Donald B. Thompson, Ph.D. Professor of Food Science
- Bernhard R. Tittmann, Ph.D. Schell Professor of Engineering Science and Mechanics
- Richard E. Tressler, Ph.D. Professor Emeritus of Materials Science and Engineering
- Susan Troiler-McKinstry, Ph.D. Corning Faculty Fellow and Professor of Ceramic Science and Engineering
- Kenji Uchino, Ph.D. Professor of Electrical Engineering
- M. Urquidi-Macdonald, Ph.D. Professor of Engineering Science and Mechanics
- Vasundara V. Varadan, Ph.D. Distinguished Alumni Professor of Engineering Science and Mechanics, and Electrical Engineering
- Vijay Varadan, Ph.D. Distinguished Alumni Professor of Engineering Science and Mechanics, and Electrical Engineering
- Robert C. Voight, Ph.D. Professor of Industrial Engineering
- William B. White, Ph.D. Professor of Geochemistry
- Roy F. Willis, Ph.D. Professor of Physics
- Nicholas Winograd, Ph.D. Evan Pugh Professor of Chemistry
- Christopher R. Wronski, Ph.D. Leonhard Professor of Electrical Engineering
- Xiaoxing Xi, Ph.D. Associate Professor of Physics
- Qiming Zhang, Ph.D. Professor of Electrical Engineering
- Gregory R. Ziegler, Ph.D. Associate Professor of Food Science

The aim of the intercollege program in Materials is to provide an opportunity for the student interested in the structure, properties, and behavior of solid materials to obtain an integrated program of courses encompassing both the necessary fundamentals of chemistry, physics, and mathematics and their technological and engineering applications.

The program is designed to encourage graduate study and research that cut across the traditional engineering disciplines and scientific inquiry related to materials. Faculty members associated with the program come from several colleges and many research centers at the University.

In order to maintain focus for the selection of core courses and for the administration of the comprehensive examination, formal options have been established (i.e., Materials Science and Materials Engineering). These options differ in the specification of core courses and in the focus of the research. Other program requirements are common for the two options.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are recommended but not required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Entering students should hold a bachelor's degree in chemistry, physics, mathematics, geological science, engineering, ceramics, or metallurgy, or in a closely related field that will have included in it mathematics at least through integral calculus and a minimum of one year of physics and one year of chemistry. Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. Exceptions to the 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. The applicant should be interested specifically in an interdisciplinary program of study and research.

Master's Degree Requirements

The program for the M.S. degree must include a total of 30 credits as outlined in the GENERAL INFORMATION section of the *Graduate Bulletin*. The candidate must prepare a thesis proposal and list of courses for approval by the program faculty constituting the student's M.S. committee. A thesis describing original work performed by the student shall be written and defended before the M.S. committee.

Doctoral Degree Requirements

Acceptance into the Ph.D. program is based on the student's performance on the Ph.D. candidacy exam administered by a rotating committee of program faculty. The examination is designed to evaluate the student's potential for original and successful Ph.D. research and is composed of a written proposal and oral presentation. Detailed plans for thesis research and course work consistent with the student's declared option are to be presented to the Ph.D. committee following successful completion of the candidacy exam, and the student is to present periodic progress reports to the committee until the thesis is defended. Near the end of the period of formal course work, each student will take a comprehensive exam. The examination consists of a written part administered by a rotating committee of program faculty, based on specific areas of knowledge depending on the chosen option, and an oral part, administered by the candidate's Ph.D. committee, that will emphasize an understanding of both fundamentals and the student's area of specialization. At the culmination of the Ph.D. research experience, each candidate must write a thesis, present it to his/her Ph.D. committee, and defend it at a public, oral presentation, followed by an examination by the committee. All candidates must demonstrate proficiency in English in both written and oral form, which is established formally in conjunction with the candidacy exam.

Other Relevant Information

Seminar series are offered on various materials topics under the course listing MATL 590 Colloquium, and students are encouraged to enroll in these courses or to take materials-related seminar courses offered by other departments. The program offers instruction on special topics under the designation MATL 597, or students may explore such areas individually under a faculty member's supervision, receiving credit under the designation MATL 596.

Thesis research on various aspects of the solid state may be conducted in the Intercollege Materials Research Laboratory, Applied Research Laboratory, or appropriate departments in the Colleges of Earth and Mineral Sciences, Engineering, or Science. A wide variety of experimental facilities for materials research are available.

Student Aid

Assistance is provided by the program office in identifying and applying for fellowships and scholarships from internal and external sources, and in facilitating linkages with faculty and units that can offer support in the form of graduate assistantships for research in specific topical areas. These and other types of financial aid are described in the STUDENT AID section of the*Graduate Bulletin*.

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/24/04

DATE LAST REVIEWED BY PUBLICATIONS: 7/7/05

International Affairs (INTAF)

Program Home Page (Opens New Window)

Tiyanjana Maluwa, *Director, School of International Affairs*
252 Lewis Katz Building
814-865-8971

Degree Conferred:

M.I.A.

The Graduate Faculty

- David Blandford, Ph.D. (Manchester) *Professor of Agricultural Economics*
- William Butler, LL.D. (London) *John Edward Fowler Distinguished Professor of Law*
- Dennis C. Jett, Ph.D. (Witwatersrand) *Professor of International Affairs*
- John A. Kelmelis, Ph.D. (Penn State) *Professor of International Affairs*
- Flynt L. Leverett, Ph.D. (Princeton) *Professor of International Affairs*
- Jill Findeis, Ph.D. (Washington State) *Professor of Agricultural, Environmental and Regional Economics and Demography*
- Fariborz Ghadar, D.B.A. (Harvard) *Professor of Global Management Studies*
- C. Gregory Knight, Ph.D. (Minnesota) *Professor of Geography*
- Gerald LeTendre, Ph.D. (Stanford) *Associate Professor of Educational Theory and Policy*
- Quan Li, Ph.D. (Florida State) *Associate Professor of Political Science*
- Tiyanjana Maluwa, Ph.D. (Cambridge) *Professor of Law*
- Denis F. Simon, Ph.D. (California, Berkeley) *Professor of International Affairs*
- John Nichols, Ph.D. (Minnesota) *Professor of Communications and Associate Dean for Graduate Studies and Research*
- Eileen Trauth, Ph.D. (Pittsburgh) *Professor of Information Sciences and Technology*
- Mirna Urquidi-MacDonald, Ph.D. (Paris-Sud) *Professor of Engineering Science and Mechanics*

The School of International Affairs (SIA) is designed to prepare students for occupations involving public service, private enterprise, nonprofit organizations, and international organizations worldwide. The Master's in International Affairs (MIA) degree program will provide students with a substantial knowledge base in international systems, institutions, issues and history and the advanced analytical tools and cross-cultural skills and competencies necessary for these occupations. Students will work closely with faculty to design a curriculum around their core course work, which incorporates a functional or regional theme and provides the opportunity to apply and enhance the core knowledge component with a thematically based set of graduate courses from across Penn State's existing graduate and professional curriculum.

Admission Requirements

Admission to the MIA degree program will require: (i) a bachelor's degree from a U.S. regionally accredited institution or (ii) a postsecondary degree that is equivalent to a U.S. baccalaureate degree earned from an officially recognized degree-granting international institution. All applicants will submit GRE scores, two letters of recommendation and a personal statement addressing their reasons for pursuing a graduate degree in international affairs and discussing their plans and goals.

International applicants whose native language is not English will submit a satisfactory TOEFL or IELTS score from a test taken within two years of application. A satisfactory TOEFL score is 550 or above on the paper test, 213 or above on the computer-based test or 80 or above on the new internet-based test (with a minimum of 23 points on the new speaking portion). A satisfactory IELTS score is a minimum composite score of 6.5. If the applicant's qualifying degree is from a country where English is the native language and the degree is from an institution where English is the language of instruction, the applicant may apply for an exemption from these requirements.

Admissions will be based on a review of all submitted materials and spaces will be offered to the best qualified applicants, taking into account academic achievement, relevant work experience and other indices of aptitude for advanced study in international affairs.

Master's Degree Requirements

M.I.A. degree candidates must take a total of 30 units of graduate credit, including 18 credits of required core courses. M.I.A. degree candidates must take the six core courses described below plus an additional 12 credits or more of graduate level course work with a faculty-approved theme and content. The six courses that compose the core curriculum of the M.I.A. are: (i) INTAF 801, (ii) INTAF 802, (iii) INTAF 803, (iv) INTAF 804, (v) INTAF 805, and (vi) INTAF 590.

Students will choose their elective courses, with faculty guidance, from a substantial list of graduate courses. The advanced course work usually will be clustered around areas of concentration designated by the SIA's Faculty Governing Council, but students also will be permitted to design an independent interdisciplinary curriculum with faculty approval. The areas of concentration will take advantage of Penn State's rich graduate curriculum by aggregating in appropriate thematic clusters pre-existing and specially created graduate-level classes.

In addition to the core curriculum and elective courses, degree candidates must complete either: (i) a master's paper or (ii) a supervised internship placement. If the first option is chosen and the candidate opts to complete a paper, he or she must enroll in 3 credits of INTAF 594. The master's paper will involve integrating and showing mastery of the subject matter of the student's curricular emphasis, and may also involve original research. If the second option is chosen, the candidate will enroll in 3 credits of INTAF 595. The student will participate in a supervised internship placement of sufficient depth and professionalism that would allow the student to experience the integration of their curricular studies in an actual professional environment. A reflective paper will be submitted as a part of this credit requirement.

In order to graduate, students also will need to demonstrate proficiency in a language other than English. Proficiency will be defined as follows: (i) four semesters of a Penn State language *sequence* or its equivalent (15 credits); (ii) native acquisition, as shown by the candidate's personal history and approved by the SIA faculty; or (iii) performance on a proficiency evaluation sufficient to equal four semesters of language learning: for this purpose, either Penn State's proficiency certification process*(described below)* or another pre-approved proficiency *assessment* may be used.

Penn State's language proficiency certification process, for students seeking a noncredit evaluation of their proficiency in languages other

than English, is established by the School of Languages and Literatures (SLL) and is described briefly as follows. Requests are submitted to the department that offers the language curriculum, on a form available on the SLL website, at least three weeks prior to the time when the certification will be needed. It is not guaranteed that all requests for evaluation will be fulfilled; for example, a tester may not be available. If the language department cannot fulfill the request for an evaluation, the student will be notified and can seek alternative means of documenting proficiency (such as taking an external standardized exam in the language). If the language department can fulfill the request, an evaluation fee (currently $60) must be paid before the evaluation occurs.

Joint Degree Program between The Pennsylvania State University Dickinson School of Law (J.D.) and the School of International Affairs (M.I.A.)

Joint Degree Program:

The Dickinson School of Law (DSL) and the School of International Affairs (SIA) are offering a joint degree program that will enable a student to complete in four academic years both a Juris Doctor degree (J.D.) and a Master's in International Affairs (M.I.A.). A J.D./M.I.A. graduate will have the education and skills background to practice law in the United States, to work in an international context and to assume a leadership role in international affairs. The student will complete a minimum of 109 credits including eleven required law courses, two of which involve skills training, and seven required international affairs courses, one of which involves either an internship or a master's paper.

Admission Requirements

Students applying to the joint degree program must be admitted separately into both DSL and SIA. Students must first be admitted into the law school and will always complete their first two semesters in law before commencing the M.I.A. component. Credits earned towards an M.I.A. prior to entry into DSL will not be credited towards the J.D.

College Specific Admission Requirements

DSL: The DSL admissions process considers academic transcripts, leadership activities, community activities, work experience, personal background, letters of recommendation, the personal statement, LSAT scores and the LSAT writing sample. An admissions committee identifies candidates who are academically prepared for law study and who will contribute to the promotion of diversity and excellence in the student body and the legal profession. There is no standard prescribed undergraduate curriculum. The following are required of J.D. degree applicants: a completed application form, an LSAT score, an LSDAS report, a one-page personal statement and two letters of recommendation.

SIA: The following are required of M.I.A. applicants: (1) a bachelor's degree from a U.S. regionally accredited institution or (2) a postsecondary degree that is equivalent to a U.S. baccalaureate degree earned from an officially recognized degree-granting international institution. There is no standard prescribed undergraduate curriculum. All applicants will submit GRE scores, two letters of recommendation and a personal statement addressing their reasons for pursuing a graduate degree in international affairs and discussing their plans and goals. Upon the student's request, the LSAT may replace the GRE for joint degree admissions purposes.

International applicants who are applying to the Joint Degree program, and who do not qualify for the English exemption, must provide a satisfactory English test score. Joint degree applicants will be required to achieve a minimum TOEFL score of 575 on the paper test, 230 on the computer-based test or 88 on the internet-based test (with a minimum speaking score of 20); a minimum of 6.5 on the IELTS will also be acceptable.

Residency

A typical J.D./M.I.A. joint degree student will be in residence at DSL for six semesters and at SIA for two semesters.

Liaisons

The respective liaisons for DSL and SIA shall be as follows: the department and faculty liaisons for DSL shall be the Associate Dean for Academic Affairs and the student adviser will be the Associate Dean for Academic Affairs or such other faculty member(s) as may be designated by the Dean. The liaison for SIA shall be the Director or such faculty member(s) as may be designated by the Director.

Interprogram Transfer of Credits

DSL: A maximum of nine credits for M.I.A. course work may be transferred for credit toward the J.D. degree at DSL. Courses eligible for cross-counting towards the J.D. and M.I.A. include the courses on the M.I.A. Electives list (Appendix A-31) and any other courses taken as M.I.A. electives with the express written permission of the M.I.A. and J.D. advisers. Students must obtain a grade satisfactory to DSL for the course work to be credited towards the J.D. degree.

SIA: Because of the interdisciplinary nature of the M.I.A. degree, courses taken in DSL as a part of the elective component of the M.I.A. automatically count towards the M.I.A. Courses eligible for cross-counting towards the J.D. and M.I.A. include the courses on the M.I.A. Electives list (Appendix A-31) and any other courses taken as M.I.A. electives with the express written permission of the M.I.A. and J.D. advisers.

Sequence

The sequence of courses will be determined by the students and their advisers. However, students are required to complete the first year of the DSL program before beginning the M.I.A. program. It is expected that most joint degree students will complete the first two semesters of the M.I.A. consecutively in either the first or second year after completion of the first year of the J.D. degree.

Recommended Program of Study and Advising

All students in the program will have two advisers, one from DSL and one from SIA. Periodic interaction between the two advisers will be encouraged. A program of study will developed for each student, taking into account the fact that some courses at both locations are offered on a rotating or intermittent basis. Many courses are offered every year but some are offered every two or three years. Advisers will have available a list of projected relevant courses or educational experiences in order to work with the student on an individualized program of study. The standard committee structure will apply to the SIA programs.

Tuition

Students will be charged the applicable DSL tuition to cover the J.D. program and the applicable SIA tuition to cover the M.I.A. degree program. The DSL tuition will be paid for the semesters that the student is in residence at DSL, and the SIA tuition will be paid for the semesters that the student is in residence there. A student may take up to one course (3 credit hours) per semester in the school where the student is not in residence without any change in tuition, but must pay additional tuition to the non-residential program if he or she wishes to take additional course work at that campus during that semester.

Financial Aid and Assistantships

Decisions on financial aid and assistantships will be made by each school according to that school's procedures.

Fulfillment of Degree Requirements and Graduation

A student in the program may complete the requirements for one of the degrees and be awarded that degree prior to completing all the requirements for the other degree; provided, however, that the student shall have successfully completed at least two semesters of work towards the other degree. All courses in one program that will count towards meeting the requirements of the other must be completed before the awarding of either degree. Students will be required to fulfill all requirements for each degree in order to be awarded that degree, subject to the inter-program transfer of credits.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

INTERNATIONAL AFFAIRS (INTAF) course list

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-07-010

Review Date: 6/17/08

Last updated by Publications: 9/9/09

Kinesiology (KINES)

Program Home Page (Opens New Window)

KARL M. NEWELL, *Head of the Department*
275 Recreation Building
814-863-1163
kinesgrad@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- April Armstrong, M.D. (Western Ontario) Assistant Professor of Orthopaedics
- Cynthia Bartok, Ph.D. (Wisconsin) Assistant Professor of Kinesiology
- Kathryn A. Bonnett, M.D. (Wright State) Adjunct Assistant Professor of Kinesiology
- W. E. Buckley, Ph.D. (Penn State) Professor of Exercise and Sport Science, and Health Education
- John H. Challis, Ph.D. (Loughborough University of Technology) Professor of Kinesiology
- David E. Conroy, Ph.D. (Utah) Associate Professor of Kinesiology
- Mary Jane De Souza, Ph.D. (Connecticut) Professor of Kinesiology
- Danielle Symons Downs, Ph.D. (Florida) Associate Professor of Kinesiology
- Mark Dyreson, Ph.D. (Arizona) Associate Professor of Kinesiology
- Robert B. Eckhardt, Ph.D. (Michigan) Professor of Developmental Genetics and Evolutionary Morphology
- Steriani Elavsky, Ph.D. (Illinois) Assistant Professor of Kinesiology
- Jinger S. Gottschall, Ph.D. (Colorado) Assistant Professor of Kinesiology
- George M. Graham, Ph.D. (Oregon) Professor of Kinesiology
- Douglas R. Hochstetler, Ph.D. (Penn State) Associate Professor of Kinesiology
- Lacy A. Holowatz, Ph.D. (Penn State) Assistant Professor of Kinesiology
- W. Larry Kenney, Ph.D. (Penn State) Professor of Physiology and Kinesiology
- Donna H. Korzick, Ph.D. (Penn State) Associate Professor of Kinesiology and Physiology
- R. Scott Kretchmar, Ph.D. (Southern California) Professor of Exercise and Sport Science
- Teresa Lang, Ph.D. (Penn State) Research Associate
- Mark L. Latash, Ph.D. (Rush) Distinguished Professor of Kinesiology
- John A. Lucas, Ed.D. (Maryland) Professor Emeritus of Exercise and Sport Science
- Nicole McBrier, Ph.D. (Ohio State) Assistant Professor of Kinesiology
- Sayers John Miller, Ph.D. (Penn State) Assistant Professor of Kinesiology
- Karl M. Newell, Ph.D. (Illinois) Professor of Kinesiology and Biobehavioral Health
- James A. Pawelczyk, Ph.D. (North Texas) Associate Professor of Physiology and Kinesiology
- Stephen J. Piazza, Ph.D. (Northwestern) Associate Professor of Kinesiology
- David N. Proctor, Ph.D. (Kent State) Associate Professor of Kinesiology
- Robert L. Sainburg, Ph.D. (Rutgers) Associate Professor of Kinesiology
- George F. Salvaterra, Ph.D. (Penn State) Affiliate Assistant Professor of Kinesiology
- Neil A. Sharkey, Ph.D. (California, Davis) Professor of Kinesiology
- Semyon M. Slobounov, Ph.D. (Illinois) Professor of Kinesiology
- Ronald A. Smith, Ph.D. (Wisconsin) Professor Emeritus of Exercise and Sport Science
- Karl G. Stoedefalke, Ph.D. (Illinois) Professor Emeritus of Exercise and Sport Science
- Kenneth L. Swalgin, Ph.D. (Ohio) Assistant Professor of Kinesiology
- James G. Thompson, Ph.D. (Penn State) Professor of Exercise and Sport Science
- Richard L. Tutwiler, Ph.D. (Penn State) Adjunct Research Associate
- Nancy I. Williams, Sc.D. (Boston U) Professor of Kinesiology
- David Yukelson, Ph.D. (North Texas State) Affiliate Assistant Professor of Exercise and Sport Science
- Vladimir M. Zatsiorsky, Ph.D. (Central Institute of Physical Culture, Moscow) Professor of Kinesiology

The graduate programs in Kinesiology are research oriented and are designed to meet the specific goals and interests of the student. The primary goal of the overall program is to provide students the opportunity to study in depth one area of specialization and to develop necessary research skills to enhance their professional competence. The master's program is designed to prepare students for future graduate study, while the doctoral program is directed toward careers in research and in teaching at the advanced undergraduate and graduate levels in colleges and universities. Six areas of study are available at both the master's and doctoral levels: (1) athletic training and sports medicine, (2) biomechanics, (3) exercise physiology, (4) history and philosophy of sport, (5) motor control, and (6) psychology of movement and sport. Several well-equipped research facilities are available to support graduate study, including the Biomechanics Laboratory, Motor Behavior Laboratory, and Noll Physiological Research Center.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Scores from the Graduate Record Examinations (GRE) are required for admission. The minimum requirements for admission to the master's program include a 3.00 junior/senior grade-point average (on a 4.00 scale), satisfactory recommendations, a total of 1000 or higher on the verbal and quantitative sections of the GRE, and appropriate background courses in physical, biological, behavioral, and/or social science, depending on the intended area of specialization. Candidates from majors other than exercise and sport science/physical education are welcome to apply. In addition, doctoral applicants are expected to meet more stringent admission standards, including documented research capabilities (e.g., from an M.S. degree). Experience is highly desirable. Admission is highly competitive and the best-qualified students will be admitted subject to space availability and compatibility of the student with the department's research mission.

Master's Degree Requirements

All master's candidates are required to complete a research methods course and an acceptable statistics course; show proficiency in the English language; and write a thesis. In addition, each specialization may require specific courses. All specializations require a minimum of 30 credits.

Doctoral Degree Requirements

A program to meet the individual needs of each student is planned with the adviser in consultation with the doctoral committee members. Students should elect at least 15 credits from courses within the department and at least 6 credits from courses outside the department. It is expected that the depth of knowledge in each area of study comes from independent study and research experiences, in addition to the dissertation, which are under the direction of the faculty. Specific required courses include the Colloquium and Proseminar.

Student Aid

Graduate assistantships that are available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

KINESIOLOGY (KINES) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/21/04

Last updated by Publications: 12/18/09

Laboratory Animal Medicine (L A M)

Program Home Page (Opens New Window)

RONALD P. WILSON, *Professor and Chair of the Department of Comparative Medicine*
Department of Comparative Medicine, H054
College of Medicine
P.O. Box 850
500 University Drive
Hershey, PA 17033-0850
717-531-8462

Degree Conferred:

M.S.

Graduate Faculty

- Catherin S. Beckwith, D.V.M. (Illinois), Ph.D. (Missouri) Associate Professor of Comparative Medicine
- Xuwen Peng, D.V.M. (Huazhong Agricultural U), Ph.D. (Penn State) Associate Professor of Comparative Medicine
- Ronald P. Wilson, V.M.D. (Pennsylvania) Professor and Chair of Comparative Medicine

All students entering the program must have completed a professional degree program in veterinary medicine and must hold the degree of D.V.M., V.M.D., or equivalent.

The Department of Comparative Medicine is a basic science, academic department of the College of Medicine. It is concerned with the range of variation of normal and abnormal structure, function, and behavior in a variety of species of animals used for teaching, testing, and research. Its faculty, staff, and students work in a multidisciplinary and collaborative fashion with all other departments in the college to advance the research mission.

Graduate study in laboratory animal medicine consists of advanced training in biology, medicine and methodology pertinent to animal-based research, and the development of scholarship and research capabilities within the specialty. The general plan is one that provides a broad, basic foundation upon which the individual can build a career in teaching and research and/or in the professional direction of research animal facilities.

The curriculum of this training program includes:

First Year:

COMPARATIVE MEDICINE (C MED)
501. Biology and Care of Laboratory Animals (3)
503. * Laboratory Animal Genetics (3)
507. * Techniques of Laboratory Animal Experimentation (3)
515. Experimental Surgery of Laboratory Animals (3)
530. Diseases of Laboratory Animals I (3)
531. Diseases of Laboratory Animals II (3)
535.* Comparative Pathology (3)
590. Colloquium (1 credit per semester)
600. (3)

INTEGRATED BIOSCIENCES (IBIOS)
591. Ethics in the Life Sciences (1)

*Courses offered every other year on an alternating basis; thus students entering program on even numbered years will take during second year.

Second Year:

COMPARATIVE MEDICINE (C MED)
590. Colloquium (1 credit/semester)
600. Research project for M.S. thesis (6-9)

This program is offered only at the Penn State Milton S. Hershey Medical Center.

DATE LAST REVIEWED BY GRADUATE SCHOOL: 6/1/04

Date last updated by Publications: 7/27/09

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-04-067

Review Date: 1/15/08

Landscape Architecture (LARCH)

Program Home Page

BRIAN ORLAND, *Head*
121 Stuckeman Family Building
814-865-9511

Degree Conferred:

- M.L.A., M.S.

The Graduate Faculty

- Peter J. Aeschbacher, M.Arch., M.U.P. (UCLA) Assistant Professor of Landscape Architecture
- C. Timothy Baird, M.L.A. (Pennsylvania) Associate Professor of Landscape Architecture
- Mallika Bose, Ph.D. (Wisconsin) Associate Professor of Landscape Architecture
- Caru Bowns, Ph.D. (California, Davis) Assistant Professor of Landscape Architecture
- C. Andrew Cole, Ph.D. (Southern Illinois) Assistant Professor of Landscape Architecture and Ecology
- George Dickie, M.L.A. (Pennsylvania) Professor Emeritus of Landscape Architecture
- James R. DeTuerk, M.L.A. (Michigan) Professor Emeritus of Landscape Architecture
- Stuart Echols, Ph.D. (Virginia Tech) Assistant Professor of Landscape Architecture
- Kelleann Foster, M.L.A. (Massachusetts) Associate Professor of Landscape Architecture
- Larry Gorenflo, Ph.D. (UCSB) Associate Professor of Landscape Architecture
- Timothy P. Johnson, M.L.A. (Ohio State) Associate Professor of Landscape Architecture
- Daniel R. Jones, M.L.A. (Harvard) Professor Emeritus of Landscape Architecture
- Barry W. Kew, M.L.A. (Virginia) Assistant Professor of Landscape Architecture
- Neil P. Korostoff, M.L.A. (Pennsylvania) Associate Professor of Landscape Architecture
- Timothy M. Murtha, Ph.D. (Penn State) Assistant Professor of Landscape Architecture
- M. Eliza Pennypacker, M.L.A. (Virginia) Professor of Landscape Architecture
- Madis Pihlak, M.L.A., M.C.P. (California, Berkeley) Associate Professor of Landscape Architecture and Architecture
- Cecilia Rusnak, M.A. (Iowa) Associate Professor of Landscape Architecture
- Bonj Szczygiel, M.L.A. (Penn State) Associate Professor of Landscape Architecture
- Ken Tamminga, M.P.L. (Queen's) Professor of Landscape Architecture
- Thomas C. Yahner, M.L.A. (Penn State) Associate Professor of Landscape Architecture

M.L.A. (Professional Degree)

The M.L.A. program is an accredited professional degree program focused on preparation to practice landscape architecture for students who hold a bachelor's degree in another field.

M.S. in Landscape Architecture (Research Degree)

The M.S. in Landscape Architecture program is a research focused degree program designed to offer students graduate level research inquiry into landscape architecture for students who hold a bachelor's degree.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

To be admitted to the program, applicants must be able to meet the following requirements:

- For admission to the M.L.A. applicants must have completed a bachelor's degree from any discipline prior to entry into the M.L.A. program.
- For admission to the M.S. in Landscape Architecture, applicants must have completed a bachelor's degree in Landscape Architecture or a closely related discipline (e.g., geography, ecology, and anthropology).

All submission for admission must include:

1. A graduate school application
2. Evidence of creativity (portfolio or other), evidence of analytical ability (research paper or other), and an essay explaining why the individual seeks to study landscape architecture at Penn State
3. Official undergraduate transcript
4. GRE scores
5. TOEFL scores (see below)
6. 3 letters of recommendation

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination, are required for admission. At the discretion of the program, a student may be admitted provisionally for graduate study without these scores.

Students with a 3.00 junior/senior average (on a 4.00 scale) will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

M.L.A. Degree Requirements

The M.L.A. curriculum requires completion of 34 credits of graduate work at the 400-level and above, including a minimum of 18 at the 500-level and above. In addition, to fulfill the requirements of professional accreditation, students must undertake 49 credits of prerequisite classes. Students can be provisionally admitted to the M.L.A. until the prerequisites have been met.

Students will be required to take the following classes:

Prerequisites:
LANDSCAPE ARCHITECTURE (LARCH)
060. History of Landscape Architecture (3)
065. Built Environment and Culture (3)
231. Introduction to Design Implementation (3)
232. Landscape Architectural Design Implementation I (3)
241. Vegetation Ecology and Landscape Design (3)
251. Design Visualization and Graphics I (3)
272. Landscape Architecture Field Trip (1)
311. Design and Theory III: Site Planning and Design (4)
312. Design and Theory IV: Site and Regional Planning (4)
321. Design Theory Seminar (1)
322. Design Theory Seminar (1)
331. Landscape Architectural Design Implementation III (3)
332. Landscape Architectural Design Implementation II (3)
341. Plants, People and Place: Plants in Landscape Architectural Design (3)
361W. Historic Issues in Landscape Architecture (3)
382. Professional Practice (3)

Graduate requirements:
LANDSCAPE ARCHITECTURE (LARCH)
400. Introduction to Design and Theory (IUG) (5)
414. Design and Theory V: Advanced Landscape Architectural Design (10)
502. Intellectual History and Theory of Landscape Architecture (3)
510. Graduate Seminar in Landscape Architecture (6)
550. Graduate Studio IV (7)
590. Colloquium (6)

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

M.S. in Landscape Architecture Degree Requirements

The core curriculum is a two-year research focused 40 credit minimum program including a minimum of 18 credits at the 500-level and above. Students are required to take graduated level coursework, including graduate seminars (12 credits), graduate colloquium (4 credits), research design (3 credits), and a course in quantitative/qualitative analysis (3 credits minimum). Students must also complete a M.S. Thesis.

Core graduate requirements:
LANDSCAPE ARCHITECTURE (LARCH)
501. Research Writing in Landscape Architecture (3)
502. Intellectual History and Theory of Landscape Architecture (3)
510. Graduate Seminar (12)
590. Graduate Colloquium (4)
600. Thesis Research (1- 15)

The student and the student's adviser, subject to the approval of the departmental Graduate Program Committee, determine specific course requirements.

Option 1: M.S. in Landscape Architecture (Community and Urban Design)

The Community and Urban Design (CUD) Option provides students with in-depth inquiry into the theory and practice of community-based and urban design that responds to trends related to urban growth and change, the rise of the non-profit sector in community governance, and poverty and environmental degradation in urbanized and urbanizing areas. The intent of the CUD Option is to introduce students to theory, methods, and research surrounding specific topics in CUD. Students undertake hands-on design work and research as well as coursework in methods and computer applications, planning and policy, and ethics and society.

The CUD Option offers a topical curricular "track" within the M.S. in Landscape Architecture program. The core degree requirements for the CUD Option are the same as for the M.S.: 40 credits, comprising seminars, electives, design, and research, but focuses student core seminars and methods on CUD specific courses. Twenty-four credits of the following coursework must be completed for the CUD option:

- Depth and Hands-on Experience in Design and Research Inquiry
- 9 credits of breadth at 400-500 level are required in the following subject areas:
  - 3 credits in Methods and Computer Applications
  - 3 credits in Community and Urban Design in Planning
  - 3 credits in Ethics and Society

Additional CUD-oriented breadth electives are recommended, but optional, within the remaining elective credits required in the M.S. in Landscape Architecture.

Students are expected to complete the requirements of the M.S. in Landscape Architecture with CUD option in four semesters.

Option 2: M.S.in Landscape Architecture (Watershed Stewardship)

The pedagogic foundation of the Graduate Option in Watershed Stewardship is the integration of depth, breadth, and experience for each student. From their undergraduate background students will bring a focus which will be enhanced via graduate level coursework in their field. They will also be required to take graduate courses in watershed-related disciplines outside their own major: the breadth requirements. And through community focused experience of at least 8 credits of Keystone Projects (FOR 570 and FOR 571) and at least 2 credits of seminars (LARCH 510 or FOR 591A and FOR 591B), students will be challenged to analyze and understand watersheds and creatively synthesize community-appropriate solutions.

The degree requirements for Graduate Option in Watershed Stewardship are the same as those for the Master of Science in Landscape Architecture degree program with the addition of a minimum of 2 credits of FOR 591A and FOR 591B Watershed Stewardship Graduate

Seminar sections focused on watershed stewardship in their first year, and at least 8 credits of FOR 570 and FOR 571 Watershed Stewardship sections for the Keystone Project in their second year .

Students in the Graduate Option in Watershed Stewardship will be required to take a minimum of 9 credits of elective course work to ensure breadth of training in essential watershed stewardship subjects. Three credits of 400- or 500-level course work will be required from each of the following three subject categories: (1) Water Resources Sciences, (2) Social Science, Public Policy, or Economics, and (3) Humanities.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

TOEFL Information

The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the Internet-based test (iBT). Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

LANDSCAPE ARCHITECTURE (LARCH) course list

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 37-07-032

Review Date: 6/16/09

Last updated by Publications: 1/21/10 (link check)

Dual-Title Graduate Degree in Language Science

PHILIP BALDI, *Director*
Program in Linguistics
323 Weaver Building
814-863-7891
phb@psu.edu

Degrees Conferred

Students electing this degree program through participating programs earn a degree with a dual-title at the Ph.D. level, i.e., Ph.D. in (graduate program name) and Language Science.

The following graduate programs offer dual degrees in Language Science: German and Psychology.

The Graduate Faculty

Marc Authier (University of Southern California) Associate Professor of French and Linguistics
*Philip Baldi (University of Rochester), Professor of Linguistics and Classics
*Barbara Bullock (University of Delaware) Professor of French and Linguistics
*Paola Dussias (University of Arizona) Associate Professor of Spanish, Psychology and Linguistics
*Henry Gerfen (University of Arizona) Associate Professor of Spanish and Linguistics
*Carol Scheffner Hammer (University of Iowa) Associate Professor of Communication Sciences and Disorders and Linguistics
*Carrie Jackson (University of Wisconsin) Assistant Professor of German and Linguistics
*Judith Kroll (Brandeis University) Distinguished Professor of Psychology, Linguistics, and Women's Studies
*Ping Li (Leiden University) Professor of Psychology and Linguistics
*John Lipski (University of Alberta) Edwin Erle Sparks Professor of Spanish and Linguistics
*Elina Mainela-Arnold (University of Wisconsin) Assistant Professor of Communication Sciences and Disorders and Linguistics
*Carol A. Miller (University of Pennsylvania) Associate Professor of Communication Sciences and Disorders and Linguistics
*Maya Misra (Tufts University) Assistant Professor of Communication Sciences and Disorders and Linguistics
*B. Richard Page (University of Wisconsin) Associate Professor of German and Linguistics
Lisa Reed (University of Ottawa) Associate Professor of French and Linguistics
Gonzalo Rubio (Johns Hopkins), Associate Professor of Classics and Ancient Mediterranean Studies and Linguistics
Aaron Rubin (Harvard University) Assistant Professor of Classics and Ancient
Mediterranean Studies, Jewish Studies and Linguistics
*Nuria Sagarra (University of Illinois) Assistant Professor of Spanish Linguistics and Applied Linguistics
*Robert Schrauf (Case Western Reserve University), Associate Professor of Applied Linguistics
*Susan Strauss (University of California Los Angeles), Associate Professor of Applied Linguistics and Asian Studies
Jacqueline Toribio (Cornell University) Professor of Spanish and Linguistics
*Janet van Hell (University of Amsterdam) Visiting Professor of Psychology and Linguistics
*Daniel Weiss (Harvard University) Assistant Professor of Psychology and Linguistics

* Member of Center for Language Science

Program Objectives of the Dual-Title Degree in Language Science

A dual-title degree program in participating programs and Language Science will prepare students to combine the theoretical and methodological approaches of several disciplines in order to contribute to research in the rapidly growing area of Language Science. This inherently interdisciplinary field draws on linguistics, psychology, speech-language pathology, and cognitive neuroscience, as well as other disciplines, to address both basic and applied research questions in such areas as first and second language acquisition, developmental and acquired language disorders, literacy, and language pedagogy. Dual-title degree students will receive interdisciplinary training that will enable them to communicate and collaborate productively with a wide range of colleagues across traditional discipline boundaries. Such training will open up new employment opportunities for students and give them the tools to foster a thriving interdisciplinary culture in their own future students. The dual-title program will facilitate the formation of a cross-disciplinary network of peers for participating students as part of their professional development.

The dual-title degree program will not duplicate other degree programs in the University.

Admission Requirements

To pursue a dual-title degree under this program, the student must first apply to the Graduate School and be admitted through one of the participating graduate degree programs (see Appendix E for admissions requirements of potential participating programs). Upon admission to one of the above programs and with a recommendation from a Language Science program faculty member in that department, the student's application will be forwarded to a committee that will include the Director of the Linguistics Program, one of the Co-Directors of the Center for Language Science, and a third elected faculty member within the Center for Language Science. All three committee members will be affiliated with the Program in Linguistics. Upon the recommendation of this committee, the student will be admitted to the dual-title degree program in Language Science.

Doctoral Degree Requirements

The dual-title Ph.D. degree in Language Science will have the following requirements.

Course work (21 credits of 500-level courses)
6 credits, Proseminar in the Language Science of Bilingualism (LING 521), Proseminar in Professional Issues in Language Science (LING 522)
3 credits, Research methods/statistics in Language Science (such as LING 525, PSY 507, PSY 508)
3 credits in theoretical linguistics (students will choose between LING 500 or LING 504)
3 credits, Cognitive Neuroscience or Psycholinguistics (such as PSY/LING 520, PSY 511)
6 credits, Research internships (students will choose one course among the following: CSD 596, GER 596, LING 596, PSY 596, SPAN 596)

Language Science Research Meetings

Students must participate in weekly Language Science Research meetings each semester in residence.

Foreign Language and English Competency Requirements

The student will fulfill the language requirement specified by the participating department through which the student is admitted to the dual-title degree program.

Candidacy Examination

In order to be admitted to doctoral candidacy in the dual-title degree program, students will take a candidacy examination that is administered by the primary program. However, the dual-title degree student may require an additional semester or more to fulfill requirements for the primary program and dual-title program; therefore, the candidacy examination may be delayed. In addition, the student will be required to present a portfolio of work in Language Science to their committee. Such a portfolio would include a statement of the student's interdisciplinary research interests, a plan of future study, and samples of writing that indicate the student's work in Language Science. The candidacy examination committee will be composed of faculty from the primary program, as well as at least one faculty member affiliated with Language Science. The designated Language Science faculty member may be appointed in the student's primary program, but he or she may also hold a formal appointment with Linguistics. The Language Science member will participate in constructing and grading candidacy examination questions in the area of Language Science.

Doctoral Committee Composition

A doctoral committee consisting of at least four members of the Graduate Faculty must be appointed and will include a representative of the Language Science dual-title program. In addition, an official "outside member" must be appointed as one of the four members. The student's doctoral committee will include faculty from the primary program as well as faculty from Language Science. Faculty members who hold appointments in both the primary program and Language Science may serve in a combined role.

Comprehensive Examination

The student's doctoral committee will include faculty from the primary program as well as faculty from Language Science. Faculty members who hold appointments in both the primary program and Language Science may serve in a combined role. The Language Science representative(s) will help to insure that the field of Language Science is integrated into the comprehensive examination.

Dissertation

A dissertation on a topic related to Language Science is required for a dual-title Ph.D. degree in Language Science.

Linguistics Minor

The doctoral minor provides interested students with an opportunity to complete a program of scientific study focused on the nature, structure, and use of human language. The minor is designed to cover the foundations of the discipline of linguistics by reviewing fundamental core areas such as phonology and syntax. Course work is also available in many additional areas of linguistics such as semantics, morphology, language variation, historical linguistics, and discourse analysis.

The minor requires a minimum of 15 credits, 6 of which must be at the 500 level. Nine credits are prescribed in syntax (LING 402), phonology (LING 404), and a general introduction to linguistics (LING 401), although a linguistics course at the 500 level may be substituted for LING 401 with the approval of the director of the program in Linguistics.

Student Aid

Most students will be funded through their primary departments, and will be considered for graduate assistantships according to the procedures of those departments. The Center for Language Science currently has two graduate assistantships for which dual-title degree students will be eligible.

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 37-07-033

Review Date: 6/16/09

Last updated by Publications (including formatting cleanup): 3/2/10

Leadership Development (LEAD)

DANIEL C. INDRO, *Academic Division Head*
School of Graduate Professional Studies
Penn State Great Valley
30 East Swedesford Road
Malvern, PA 19355-1443
610-648-3229
www.sgps.psu.edu

Degree Conferred:

M.L.D.

The Graduate Faculty

- Janice L. Dreachslin, Ph.D. (Wayne State) Professor of Health Policy and Administration
- Janet M. Duck, Ph.D. (Penn State) Assistant Professor of Management and Organization
- Kathryn Jablokow, Ph.D. (Ohio State) Associate Professor of Engineering
- Barrie E. Litzky, Ph.D. (Drexel) Associate Professor of Management and Organization
- Denise Potosky, Ph.D. (Rutgers) Associate Professor of Management and Organization
- John J. Sosik, Ph.D. (SUNY, Binghamton) Professor of Management and Organization
- Eric W. Stein, Ph.D. (Pennsylvania) Associate Professor of Management Science and Information Systems

The Penn State Great Valley Master of Leadership Development (MLD) program is a 36-credit interdisciplinary professional program that blends the social and behavioral sciences with ethical studies to develop outstanding organizational and community leaders. As part of the School's Management Division, the program is accredited under the specialized accreditation received from the Association to Advance Collegiate Schools of Business International (AACSB).The program is designed to meet the educational needs of professionals at the middle to senior levels of management. Note that the focus of this program is different from that of the MBA offered by the School: While the MBA program provides an overview of leadership, the purpose of the MLD program is to provide an in-depth analysis of the theory and practice of authentic transformational leadersthip by providing an environment in which faculty and students can have a complete and open collaboration on what constitutes exemplary leadership. The MLD curriculum emphasizes strategic leadership and the creation of wealth in organizations, balancing financial measure of performance with learning and growth, and customer and external process perspectives. The program builds on the mid- and high-level managerial and administrative experience of students in order to achieve its goal of promoting positive change in individuals, teams, organizations, and communities.

The program provides training in leadership-relevant research, and some students continue on to pursue a doctoral degree. Required research may be conducted in Penn State Great Valley's Library and Computer Center, which provide local research support as well as access to the library and computer resources of the entire Penn State system.

The MLD program is geared primarily toward the needs of part-time students who are employed full-time. Courses in the program, which are offered at Great Valley, are scheduled for the convenience of adult learners, mainly in the evening or on Saturdays.

Admission Requirements

Admission is granted only to candidates who demonstrate high promise of success for graduate work. Requirements listed here are in addition to the Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

An undergraduate and/or graduate GPA of at least 3.0 on a 4.0 scale is required for admission. It is strongly preferred that applicants present at least five years of related professional work experience.

All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) and receive a minimum of 570 (paper score), or 230 (electronic score), or 80 points on the new Internet-based test with a minimum of 23 points on the speaking portion; or the International English Language Testing System (IELTS) with a minimum composite score of 6.5 for admission and submit the results of that test with the application for admission.

Admission decisions are based on a review of the applicant’s professional and academic accomplishments as presented in the Admissions Dossier and the quality of the applicant's credentials in relation to those of other applicants who meet the requirements for admission. A complete Admissions Dossier includes the following:

- Online application and non-refundable application fee;
- current resume, preferably indicating at least five years of related work experience;
- two official transcripts from each regionally-accredited college or university attended, (both undergraduate and graduate),with credit conditions equivalent to those required by Penn State; or a postsecondary degree that is equivalent to a U.S. baccalaureate degree earned from an officially recognized degree-granting international institution.
- completion of two 300-word leadership essay questions developed by the faculty to assess an applicant’s logical reasoning and writing skills;
- two confidential evaluation forms/letters of endorsement from executives or community leaders detailing their evaluation of the applicant's leadership ability and potential.

Application Filing Dates: Penn State Great Valley's MLD program has a rolling admissions policy. Students may be admitted and enroll in classes in early September or early January. More detailed information about the program may be found at http://www.sgps.psu.edu/prospective/academicprograms/leadership/mld.ashx. More detailed information about the application process and the application requirements may be found athttp://www.sgps.psu.edu/prospective/academicprograms/leadership/mld/admission.ashx.

Degree Requirements

Thirty-six (36) credits are required to complete the MLD degree. A series of leadership cornerstone (12 credits) and leadership competency courses (9 credits) are required to provide all MLD students with a common body of knowledge. Leadership Context courses

(12 credits) and a Capstone course (3 credits) round out the program.

Leadership Cornerstone courses (12 credits) provide a foundation for leadership development studies. They include: LEAD 501 (Leadership Across the Lifespan), BUSAD 555/LEAD 555 (Full-Range Leadership Development), BUSAD 556/LEAD 556 (Diversity Leadership***),*** and LEAD 557 (Leadership Models and Methods).

Leadership Competency courses (9 credits) build a foundation for effective leadership communication, creativity/innovation, and moral development. They include: LEAD 561 (Dynamic Communication in Leadership Contexts), [MGMT 573 (Corporate Innovation Strategies or SYSEN 550 (Creativity, Innovation, and Change) or BUSAD/LEAD 519 (Developing Creative High Performance Organizations)], and [BUSAD 534 (Ethical Dimensions of Management in the Biotechnology and Health Industry) or PHIL 597 (Ethical Dimensions of Leadership) or BUSAD 576 (Ethical Issues in Information Technology)].

Leadership Context courses (12 credits) provide an overview of the situations in which leadership processes are embedded. They include: LEAD 562 (Strategic Leadership), [BUSAD 551 (Business Environment) or BUSAD 530 (Biotechnology and Health Industry Overview)], and a choice of 2 context-specific electives (6 credits).

All students must complete a capstone course that provides students with an opportunity to enact what they have learned in their course work in the context of promoting positive change in their community, LEAD 582 (Social Entrepreneurship and Community Leadership).

Student Aid

There are a limited number of scholarships, fellowships, and graduate assistantships available. For more information on these, contact the Financial Aid Office at Penn State Great Valley.

Most students work full-time and take classes part-time. In many cases, employers have a tuition-reimbursement plan paying for partial or full tuition. To learn more about payment options for students who receive employer tuition reimbursement benefits, or for more information on other payment options that may be available to you, contact the Great Valley Financial Aid Office, 610-648-3311.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BUSINESS ADMINISTRATION (BUSAD) courses

INTERNATIONAL BUSINESS (I B) courses

LEADERSHIP (LEAD) courses

MANAGEMENT (MGMT) courses

SYSTEMS ENGINEERING (SYSEN) courses

Last Revised by the Department: Spring Semester 2010

Blue Sheet Item #: 38-06-138

Review Date: 04/13/2010

Date last updated by Publications: 8/21/09

Literacy Education (LEDUC)

BARBARA A. MARINAK, *Graduate Program Coordinator, Reading*
Penn State Harrisburg
Middletown, PA 17057
717-948-6367
literacy@psu.edu

Degree Conferred:

M.Ed.

The Graduate Faculty

- Richard I. Ammon, D.Ed. (Penn State) Associate Professor Emeritus of Education
- Shanetia P. Clark, Ph.D. (Penn State) Assistant Professor of Education
- Ernest K. Dishner, Ed.D. (Georgia) Professor of Education and Reading
- Betty C. Fortner, Ph.D. (Texas) Associate Professor Emeritus of Education and Reading
- Xiaoming Liu, Ph.D. (Texas Tech) Assistant Professor of Education and Reading
- Barbara A. Marinak, Ph.D. (Maryland) Assistant Professor of Reading Education
- Mary Napoli, Ph.D. (Penn State) Assistant Professor of Education

The Master of Education in Literacy Education at Penn State Harrisburg is designed to provide full-time and part-time graduate students with a focused program of study in the field of reading education. The program is aligned with the standards of the Pennsylvania Department of Education. Following successful completion of the program, students are eligible to take the Praxis examination for certification as a reading specialist (K-12). Specifically, the goals of the program are to develop in students: (1) specialized, in-depth knowledge about the teaching of reading and writing; (2) the clinical skills necessary for diagnosing and intervening with reading disabled students; (3) the ability to interpret and to evaluate literacy research, (4) the literacy leadership skills necessary to support the professional practices in a K-12 setting; (5) provide rigorous offerings aligned with the standards of the International Reading Association (IRA) and the National Council for the Accreditation of Teacher Education (NCATE); and (6) prepare students for the complexities they will face as reading specialists in schools serving the K-12 population.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Admissions

The M.Ed. Program in Literacy Education has five important admission requirements.

First, candidates must have achieved an overall junior/senior grade point average of 3.00 or higher. For candidates applying for admission who have completed credits beyond the baccalaureate degree, we will evaluate the last (approximately) 60 credits completed.

Second, candidates must submit two letters of recommendation. These letters must be from former professors who can attest to the academic ability and potential of the candidate.

Third, candidates must submit a 200-300 word personal statement that addresses their career goals and reasons for pursuing a graduate degree.

Fourth, candidates must have a valid Pennsylvania Teaching Certificate and present evidence that they have completed a course in the methods of teaching reading such as EDUC 320 (Methods in Teaching Beginning Readers) or 321 (Methods in Teaching Intermediate and Advanced Readers) with a grade of C or better.

Fifth, candidates must submit test scores from one of the following: Graduate Record Examination, Miller Analogies Test, or Praxis examinations completed for certification. In addition, the language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer based test, or a total score of 80 with a 20 on the speaking section for the internet-based test. The minimum composite score for the IELTS is 6.5. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a masters degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States and Wales.

Retention

Candidates must maintain a minimum 3.00 grade point average, satisfactorily complete all required key assessments, attain a grade of "C" or better in all required core courses. Candidates who do not make satisfactory progress will be notified in writing noting the specific deficiencies and requesting that they meet with the program coordinator to develop a remediation plan. Failure to meet or to satisfactorily complete the remediation plan will result in termination from the program.

All persons enrolled in Teacher Education Programs at Penn State Harrisburg are expected to demonstrate the professional dispositions that are aligned with the unit's vision statement. The faculty shall evaluate the approved dispositions demonstrated by the candidates in class and during field experiences. Candidates may be rated as exemplary, acceptable, or unacceptable. Candidates are expected to attain acceptable or exemplary ratings in order to graduate.

Degree Requirements

The Master of Education degree in Literacy Education consists of 42 credits that prepare candidates for the Pennsylvania Reading Specialist Certification (K-12). The degree requirements for the Master of Education in Literacy Education includes 36 credits in foundational, pedagogical, and advanced theoretical work in reading, writing and educational research design and a 6 credit capstone

clinical practicum for a total of 42 credits. A minimum grade-point average of 3.00 for work done at the University and acceptable or higher ratings on the professional dispositions are required for graduation.

Prescribed Core Course Requirements (39 Credits)

EDUCATION (EDUC)

422. Literature for Children and Adolescents (3)
425. Literacy Assessment (3)
452. Teaching Writing (3)
466. Foundations of Teaching English as a Second Language (3)
471. Best Practices in Literacy (3)
477. Teaching Struggling Readers and Writers (3)
561. Psychology of Reading (3)
562. Diagnostic Evaluation of Reading Problems (3)
563. Advanced Methods of Teaching Reading (3)
564. Reading Clinic (6)
565. Literacy Leadership (3)
586. Educational Research Designs (3)

Electives

(Choose 3 credits from the following)
Students can choose either one of two electives in the program. Both elective courses (ENGL 409 or EDUC 432) require specialized study in the teaching of writing. ENGL 409 (taken concurrently with EDUC 452) will allow the student to complete a writing fellowship with the Capital Area Writing Project. Or, EDUC 432 allows for the in-depth study of writing through children's literature.

EDUC 432 Children's Literature in the Writing Curriculum (3)
ENGL 409 Composition Theory and Practice for Teachers (3)

Transfer Credits

Subject to the limitations given below, a maximum of 10 credits of high-quality graduate work done at a regionally accredited institution may be applied toward the requirements for the master's degree. However, credits earned to complete a previous master's degree, whether at Penn State or elsewhere, may not be applied to a second master's degree program at Penn State. The student should distinguish carefully between the transferability of credit and its applicability in a particular degree program. Approval to apply any transferred credits toward a degree program must be granted by the student's academic adviser, the program head or graduate officer, and the Graduate School. Transferred academic work must have been completed within five years prior to the date of first degree registration at the Graduate School of Penn State, must be of at least B quality (grades of B- are not transferable), and must appear on an official graduate transcript of an accredited university. Pass-fail grades are not transferable to an advanced degree program unless the "Pass" can be substantiated by the former institution as having at least B quality.

A maximum of 15 graduate credits taken as a nondegree student prior to admission to a graduate degree program may be applied to a graduate program, with departmental approval. The credits must have been earned within five years preceding entry into the degree program.

Forms for transfer of credit can be obtained from the Office of Graduate Enrollment Services, 114 Kern Building.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit courses below the 400 level in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-06-189

Review Date: 4/15/08

Manufacturing Systems Engineering (MFGSE)

KENNETH J. FISHER, *Director of MFGSE Program*
School of Engineering and Engineering Technology
Penn State Erie, The Behrend College
Station Road
Erie, PA 16563
814-898-6153

Degree Conferred:

M.Eng.

The Graduate Faculty

- Chris Coulston, Ph.D. (Penn State) Assistant Professor of Electrical and Computer Engineering
- Kenneth J. Fisher, M.S. (Purdue) Professor of Engineering
- Ralph Ford, Ph.D. (Arizona) Associate Professor of Electrical and Computer Engineering
- Robert Gray, Ph.D. (Ohio) Assistant Professor of Engineering
- Thomas L. Hemminger, Ph.D. (Case Western Reserve) Associate Professor of Computer and Electrical Engineering
- Amir Khalilollahi, Ph.D. (Penn State) Assistant Professor of Mechanical Engineering
- Paul Koch, Ph.D. (Lowell) Associate Professor of Engineering
- William C. Lasher, Ph.D. (SUNY, Buffalo) Associate Professor of Mechanical Engineering
- Diane Parente, Ph.D. (SUNY, Buffalo) Associate Professor of Management
- Jeffrey K. Pinto, Ph.D. (Pittsburgh) Professor of Management
- John Roth, Ph.D. (Michigan) Assistant Professor of Mechanical Engineering
- Robert Simoneau, Ph.D. (North Carolina State) Professor of Mechanical Engineering
- Russell Warley, Ph.D. (Case Western Reserve) Assistant Professor of Mechanical Engineering
- Robert S. Weissbach, Ph.D. (Arizona) Assistant Professor of Engineering

The master of engineering (M.Eng.) degree program in Manufacturing Systems Engineering is a professionally oriented graduate engineering program designed to enhance the technical and business capabilities of its graduates.

Five core courses focus on the structure and operation of a manufacturing business; the development of the skills required to identify newly emerging process and systems technologies; and the managed integration of these technologies into today's modern manufacturing environment. In addition, emphasis is directed toward reinforcing the latest quality practices currently being adopted by U.S. manufacturers. Courses emphasize practical concerns as well as relevant theoretical background. The program meets the needs of diverse manufacturing enterprises through the selection of elective courses, including a master's project focusing on the practical application of advanced technology into local industry.

The program is designed to meet the needs of working professionals in the tri-state region. To this end, classes are offered during a late afternoon/evening timeframe, allowing students to attend on a part-time basis. Part-time students can complete the program in three years, with full-time students finishing in less than two years.

Admission Requirements

Students can apply for admission to the program for the fall or spring semesters or summer session. Applicants are encouraged to apply at least one month prior to the start of classes.

Applicants to the M.Eng. program in Manufacturing Systems Engineering should have an undergraduate degree in engineering or engineering technology from an ABET-accredited program. Students who lack specific technical or mathematical background deemed necessary for success in this program will be required to take foundation courses as prerequisites.

The following materials are required to be considered for admission: Penn State Graduate School application; a nonrefundable application fee; official copies of all undergraduate transcripts; a minimum grade-point average of 3.0 on a 4.0 scale in the junior/senior years of baccalaureate study and evidence of completion of a math sequence that includes introduction to differential equations; three letters of recommendation, at least one of which is from an academic source; personal statement outlining significant work history and experience, academic and career goals, and a description of the applicant's current position and professional affiliations.

NOTE: International students must submit an official TOEFL score report.

Applicants who do not meet the minimum 3.0 grade-point average or who have not graduated from an ABET-accredited undergraduate program will be reviewed on an individual basis. The Graduate Record Examinations (GRE) or comparable exam may be required for those applicants who do not meet the minimum admission requirements stated above.

The Educational Testing Service (ETS) administers the GRE and TOEFL. Arrangements for taking these tests are to be made directly with the Educational Testing Service. Information about the GRE may be obtained at www.gre.org or by calling 609-771-7670. Information about the TOEFL may be obtained by visiting www.toefl.org or by calling 609-771-7760. Applicants are urged to take the tests at least three months prior to the semester they would like to begin study at Penn State Erie.

International students applying for admission to the Penn State Erie M.Eng. program must hold a bachelor's degree from an accredited United States college or university, or its equivalent from a recognized foreign institution of higher learning. An applicant must have a minimum TOEFL score of 550 (paper-based exam) or 213 (computer-based exam) to be considered for admission. Applications without the $50 application fee cannot be processed, and the fee is not refundable for any reason. International students must also complete the Application for Visa Document and provide proof of financial support with an official bank letter. Additional information can be found on the Office of International Students home page at www.international.psu.edu/iss/ (Opens New Window).

Master's Degree Requirements

The M.Eng. in Manufacturing Systems Engineering degree program consists of five core courses, three elective courses, and a required project. A total of 30 credits is required.

Core courses focus on the critical principles of management, including quality and supply chain management, marketing and operations, project management, the development of statistical methods used in manufacturing and design including design of experiments and process optimization, exposure to a variety of manufacturing processes, and the managed integration of these technologies into today's modern manufacturing environment using Design for Manufacturing principles.

Elective courses allow students to place added emphasis in the focus areas of engineering management, product realization, or on gaining added technical depth in the mechanical, electrical, or plastics manufacturing fields. Electives are offered within the School of Business or the School of Engineering and Engineering Technology.

PRESCRIBED COURSES (21 credits)

Core Courses (12 credits)
B ADM 502. DEMAND, OPERATIONS, AND FIRM PERFORMANCE (6)
MANGT 510. PROJECT MANAGEMENT (3)
MFGSE 520. ANALYTICAL TECHNIQUES IN MANUFACTURING AND DESIGN (3)

Project (3 credits)
MFGSE 580. MASTER'S PROJECT (3)

Additional Courses (6 credits): Select two courses from: MFGSE 530, 550, 551

Elective Courses (9 credits)

Electives are selected from a school-approved list. Courses offered from outside the School of Engineering and Engineering Technology will be considered on an individual basis and in consultation with the graduate adviser.

Course Descriptions

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BUSINESS ADMINISTRATION (B ADM) course list

MANAGEMENT (MANGT) course list

MANUFACTURING SYSTEMS ENGINEERING (MFGSE) course list

Last Revised by the Department: Summer Session 2004

Blue Sheet Item #: 32-06-454

Last updated by Publications:01/21/10 (link check)

Mass Communications (MASSC)

Program Home Page (Opens New Window)

JOHN S. NICHOLS, *Associate Dean for Graduate Studies*
College of Communications
201 Carnegie Building
814-865-3070; commgpo@psu.edu

Degree Conferred:

Ph.D.

The Graduate Faculty

- Lee Ahern, Ph.D. (Penn State) Assistant Professor of Communications
- Douglas Anderson, Ph.D. (Southern Illinois) Dean; Professor of Communications
- George Anghelcev, Ph.D. (Minnesota) Assistant Professor of Communications
- Robert A. Baukus, Ph.D. (Massachusetts) Associate Professor of Communications
- Ronald Bettig, Ph.D. (Illinois) Associate Professor of Communication
- Barbara Bird, M.F.A. (Northwestern) Associate Professor of Communications
- Denise Bortree, Ph.D. (Florida) Assistant Professor of Communications
- Colleen Connolly-Ahern, Ph.D. (Florida) Assistant Professor of Communications
- Jeremy Cohen, Ph.D. (Washington) Professor of Communications
- Frank Dardis, Ph.D. (South Carolina) Associate Professor of Communications
- Dennis K. Davis, Ph.D. (Minnesota) Professor of Communications
- Marcia DiStaso, Ph.D. (Miami) Assistant Professor of Communications
- Lyn Elliot, Ph.D. (Iowa) Associate Professor of Communications
- Michael Elavsky, Ph.D. (Illinois) Assistant Professor of Communications
- Russell Frank, Ph.D. (Pennsylvania) Associate Professor of Communications
- Robert M. Frieden, J.D. (Virginia) Cable TV Pioneers Chair Professor in Telecommunications Studies and Law
- Jeanne Hall, Ph.D. (Wisconsin) Associate Professor of Media Studies
- Martin E. Halstuk, Ph.D. (Florida) Associate Professor of Communications
- Marie Hardin, Ph.D. (Georgia) Associate Professor of Communications
- R. Dorn Hetzel, M.F.A. (New York) Associate Professor of Film and Video
- Anne Hoag, Ph.D. (Michigan) Associate Professor of Communications
- Matthew Jackson, Ph.D. (Indiana) Associate Professor of Communications
- Krishna Jayakar, Ph.D. (Indiana) Associate Professor of Communications
- Matthew Jordan, Ph.D. (Claremont) Assistant Professor of Communications
- Ann Marie Major, Ph.D. (Southern Illinois) Associate Professor of Communications
- Matthew P. McAllister, Ph.D. (Illinois) Professor of Communications
- John S. Nichols, Ph.D. (Minnesota) Professor of Communications
- Mary Beth Oliver, Ph.D. (Wisconsin) Distinguished Professor of Communications
- Anthony A. Olorunnisola, Ph.D. (Howard) Associate Professor of Communications
- Jeremy S. Packer, Ph.D. (Illinois) Assistant Professor of Communications
- Patrick R. Parsons, Ph.D. (Minnesota) Don Davis Professor in Ethics
- Robert D. Richards, J.D. (American) John and Ann Curley Professor of First Admendment Studies
- Ford Risley, Ph.D. (Florida) Associate Professor of Communications
- Michelle Rodino-Colocino, Ph.D. (Pittsburgh) Assistant Professor of Communications
- Amit M. Schejter, Ph.D. (Rutgers) Associate Professor of Communications
- Jorge Reina Schement, Ph.D. (Stanford) Professor of Communications
- Michael Schmierbach, Ph.D. (Wisconsin) Assistant Professor of Communications
- Fuyuan Shen, Ph.D. (North Carolina, Chapel Hill) Associate Professor of Communications
- Richard Sherman, M.F.A. (Ohio) Assistant Professor of Communications
- Susan M. Strohm, Ph.D. (Minnesota) Assistant Professor of Communications
- S. Shyam Sundar, Ph.D. (Stanford) Distinguished Professor of Communications and Communication Arts and Sciences
- Richard D. Taylor, J.D. (New York) Palmer Chair of Telecommunications Studies and Law
- Bu Zhong, Ph.D. (Maryland) Assistant Professor of Communications

Doctoral Degree Requirements

The Ph.D. Program in Mass Communications is administered by the College of Communications. All students seeking admission to the program are required to submit Graduate Record Examination scores, transcripts of all previous undergraduate and graduate work, and three letters of recommendation from individuals qualified to comment on their ability to perform successfully at the doctoral level. Students whose native language is not English must present a minimum TOEFL score of 600 to be considered for admission. In most cases, a completed master's degree is required for admission to the program. In addition, applicants are required to submit a formal statement indicating what they expect to achieve and how their educational background qualifies them for doctoral-level study in mass communications. Admission decisions are made by the college admissions committee.

Requirements listed above are in addition to general Graduate School requirements listed in the GENERAL INFORMATION section of the *Graduate Bulletin*. Students admitted to the doctoral program must complete a candidacy examination. For students with a master's degree or equivalent, this examination ordinarily will occur before the student has completed 10 credits of doctoral-level work. For individuals admitted with only a baccalaureate degree and no graduate-level work, the candidacy examination will be administered after 30 credits and before 40 credits of graduate-level work, have been completed. The committee designated to conduct the examination will determine whether the student's knowledge of mass communications is adequate for doctoral-level study, specify what deficiencies, if any, must be removed, and pass judgment on a proposed plan of study.

The program requirements include both semesters of the Mass Communications Proseminar (COMM 501.1 and COMM 501.2), a foundation course and other courses selected by the student, with committee approval, that collectively constitute a coherent sequence appropriate to the advanced study of mass communications. Students are expected to take a minimum of 20 credits in communications-related courses. No more than 6 credits can be taken as independent study credits. Students also are required to take at

least one course in research methods approved by the doctoral committee. Upon completion of the course work approved for the plan of study, the candidate will take a comprehensive examination. Following the comprehensive examination, doctoral candidates schedule a dissertation proposal meeting at which the research plan for their dissertation is reviewed and approved by their committee. Upon completion of the dissertation, doctoral candidates present a final oral defense of their dissertations before their committees.

The communication and foreign language requirement for the Ph.D. degree may be satisfied by intermediate knowledge of one foreign language or by an equivalent research skill relevant to the student's field of study.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMMUNICATIONS (COMM) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/12/04

Last updated by Publications: 1/12/10

Materials Science and Engineering (MATSC)

JOAN M. REDWING, *Chair, Intercollege Graduate Degree Program in Materials Science and Engineering; Professor of Materials Science and Engineering*
101 Steidle Building
814-865-8665

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- James H. Adair (The College of Earth and Mineral Sciences)
- Dinesh K. Agrawal (Intercollege Graduate Degree Programs)
- David Allara (The Eberly College of Science)
- Harry R. Allcock (The Eberly College of Science)
- S. Ashok (The College of Engineering)
- John V. Badding (The Eberly College of Science)
- Andrzej R. Badzian (Intercollege Graduate Degree Programs)
- Charles E. Bakis (The College of Engineering)
- Jayanth R. Banavar (The Eberly College of Science)
- Anthony J. Baratta (The College of Engineering)
- Amar S. Bhalla (The College of Engineering)
- Paul R. Blankenhorn (The College of Agricultural Sciences)
- Andre L. Boehman (The College of Earth and Mineral Sciences)
- Susan L. Brantley (The College of Earth and Mineral Sciences)
- Paul W. Brown (The College of Earth and Mineral Sciences)
- Wenwu Cao (The Eberly College of Science)
- A. Welford Castleman, Jr. (The Eberly College of Science)
- Gary Lee Catchen (The College of Engineering)
- Moses Hung-Wai Chan (The Eberly College of Science)
- Long-Qing Chen (The College of Earth and Mineral Sciences)
- Tze-Chiang Chung (Mike) (The College of Earth and Mineral Sciences)
- Ralph H. Colby (The College of Earth and Mineral Sciences)
- Milton W. Cole (The Eberly College of Science)
- Vincent H. Crespi (The Eberly College of Science)
- Leslie Eric Cross (The College of Engineering)
- Paul H. Cutler (The Eberly College of Science)
- Tarasankar DebRoy (The College of Earth and Mineral Sciences)
- Melik Demirel (The College of Engineering)
- Elizabeth C. Dickey (The College of Earth and Mineral Sciences)
- Renee D. Diehl (The Eberly College of Science)
- Qiang Du (The Eberly College of Science)
- Peter C. Eklund (The Eberly College of Science)
- Moustafa El-Gindy (The College of Engineering)
- Renata S. Engel (The College of Engineering)
- Semih Eser (The College of Earth and Mineral Sciences)
- Kristen Ann Fichthorn (The College of Engineering)
- Joseph R. Flemish (The College of Earth and Mineral Sciences)
- Stephen J. Fonash (The College of Engineering)
- Barbara J. Garrison (The Eberly College of Science)
- Venkatraman Gopalan (The College of Earth and Mineral Sciences)
- Earl K. Graham (The College of Earth and Mineral Sciences)
- David J. Green (The College of Earth and Mineral Sciences)
- Craig A. Grimes (The College of Engineering)
- Michael Grutzeck (Intercollege Graduate Degree Programs)
- Ruyan Guo (The College of Engineering)
- Donald F. Heaney (The College of Engineering)
- Ronald C. Hedden (The College of Earth and Mineral Sciences)
- John R. Hellmann (The College of Earth and Mineral Sciences)
- Paul R. Howell (The College of Earth and Mineral Sciences)
- Thomas N. Jackson (The College of Engineering)
- John J. Janowiak (The College of Agricultural Sciences)
- Gerald G. Johnson (The Eberly College of Science)
- Thomas Juska (The College of Earth and Mineral Sciences)
- Iam-Choon Khoo (The College of Engineering)
- Sridhar Komarneni (The College of Agricultural Sciences)
- Donald A. Koss (The College of Earth and Mineral Sciences)
- Kevin L. Koudela (The College of Engineering)
- Kenneth K. Kuo (The College of Engineering)
- Peter Labosky (The College of Agricultural Sciences)
- Akhlesh Lakhtakia (The College of Engineering)
- Michael T. Lanagan (The College of Earth and Mineral Sciences)
- Patrick Lenahan (The College of Engineering)
- George A. Lesieutre (The College of Engineering)
- Qi Li (The Eberly College of Science)
- Ying Liu (The Eberly College of Science)
- Zi-Kui Liu (The College of Earth and Mineral Sciences)
- Angela D. Lueking (The College of Earth and Mineral Sciences)

- Digby D. Macdonald (The College of Earth and Mineral Sciences)
- Thomas Edward Mallouk (The Eberly College of Science)
- Evangelos Manias (The College of Earth and Mineral Sciences)
- Janna Maranas (The College of Engineering)
- William D. Mark (The College of Engineering)
- Theresa Stellway Mayer (The College of Engineering)
- R. Messier (The College of Engineering)
- Gary Lynn Messing (The College of Earth and Mineral Sciences)
- Richard J. Meyer (The College of Engineering)
- Ari Mizel (The Eberly College of Science)
- Suzanne Mohney (The College of Earth and Mineral Sciences)
- Arthur Moses T. Motta (The College of Engineering)
- Karl T. Mueller (The Eberly College of Science)
- Christopher L. Muhlstein (The College of Earth and Mineral Sciences)
- Kwadwo Osseo-Asare (The College of Earth and Mineral Sciences)
- Paul C. Painter (The College of Earth and Mineral Sciences)
- R. N. Pangborn (The College of Engineering)
- Carlo G. Pantano (The College of Earth and Mineral Sciences)
- Howard W. Pickering (The College of Earth and Mineral Sciences)
- Michael Pishko (The College of Engineering)
- Virendra M. Puri (The College of Agricultural Sciences)
- Ljubisa R. Radovic (The College of Earth and Mineral Sciences)
- Clive A. Randall (The College of Earth and Mineral Sciences)
- Joan M. Redwing (The College of Earth and Mineral Sciences)
- J. L. Rose (The College of Engineering)
- Della M. Roy (The College of Earth and Mineral Sciences)
- Rustum Roy (The College of Earth and Mineral Sciences)
- James P. Runt (The College of Earth and Mineral Sciences)
- Clayton O. Ruud (The College of Engineering)
- Jerzy Ruzyllo (The College of Engineering)
- Earle R. Ryba (The College of Earth and Mineral Sciences)
- N. J. Salamon (The College of Engineering)
- Nitin Samarth (The Eberly College of Science)
- Robert J. Santoro (The College of Engineering)
- Barry Earl Scheetz (The College of Engineering)
- Peter E. Schiffer (The Eberly College of Science)
- Darrell G. Schlom (The College of Earth and Mineral Sciences)
- Harold H. Schobert (The College of Earth and Mineral Sciences)
- Albert E. Segall (The College of Engineering)
- Barbara A. Shaw (The College of Engineering)
- David L. Shelleman (The College of Earth and Mineral Sciences)
- Thomas R. Shrout (Intercollege Graduate Degree Programs)
- Elzbieta Sikora (The College of Engineering)
- Jogender Singh (The College of Engineering)
- Ivica Smid (The College of Engineering)
- Jorge O. Sofo (The Eberly College of Science)
- Chunshan Song (The College of Earth and Mineral Sciences)
- Vladimir Stubican (The College of Earth and Mineral Sciences)
- Donald B. Thompson (The College of Agricultural Sciences)
- Bernhard R. Tittmann (The College of Engineering)
- Judith A. Todd (The College of Engineering)
- Richard E. Tressler (The College of Earth and Mineral Sciences)
- Susan Trolier-McKinstry (The College of Earth and Mineral Sciences)
- Kenji Uchino (The College of Engineering)
- Kenan Unlu (The College of Engineering
- Mirna Urquidi-Macdonald (The College of Engineering)
- Erwin Vogler (The College of Earth and Mineral Sciences)
- Robert C. Voigt (The College of Engineering)
- Chao-Yang Wang (The College of Engineering)
- Qing Wang (The College of Earth and Mineral Sciences)
- Paul S. Weiss (The Eberly College of Science)
- William B. White (The College of Earth and Mineral Sciences)
- Mary Elizabeth Williams (The Eberly College of Science)
- Roy F. Willis (The Eberly College of Science)
- Nicholas Winograd (The Eberly College of Science)
- Chris R. Wronski (The College of Engineering)
- Xiaoxing Xi (The Eberly College of Science)
- Qiming Zhang (The College of Engineering)
- Gregory R. Ziegler (The College of Agricultural Sciences)

The Intercollege Graduate Degree Program in Materials Science and Engineering offers comprehensive graduate education in the fundamentals of materials science (synthesis-structure-property-performance relationships). Faculty have interests in many research areas including biomaterials, ceramics, composites and hybrids, computational materials science, electronic and photonic materials, materials chemistry and physics, metals, nanostructured and nanoscale materials, piezoelectrics and ferroelectrics, polymers and soft materials. Students may choose to study across the major themes of materials today including materials in energy applications, nanotechnology, materials in medicine, materials in communications, materials for sensor applications, structural materials, etc., by using a combination of MATSE courses and a myriad of materials-related courses offered in the science and engineering departments at Penn State.

Admission Requirements

Scores for the Graduate Record Examinations (GRE) are required for admission, though this requirement may be waived at the discretion of the departmental graduate admission committee. The best-qualified applicants will be accepted up to the number of spaces available for new students. The degree requirements listed here are in addition to the general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Master's Degree Requirements

The graduate program for the M.S. degree must include a total of at least 30 credits. Subject to the approval of the graduate program coordinator, a maximum of 10 credits of high-quality graduate work done at an accredited U.S. institution may be applied toward the requirements for the master's degree. A minimum of 6 research credits (MATSE 600) is required. The minimum number of formal course credits (excluding seminar MATSE 590) required is 18 for all students. All candidates for advanced degrees are also expected to attend MATSE 590 colloquium. A thesis describing independent research performed by the student shall be written and defended at an oral examination. Bound copies will be made available for the University Libraries and the thesis adviser. A thesis committee shall administer the final oral examination of the thesis. The committee shall consist of at least three graduate faculty members.

M. S. Requirements (Summary)-minimum total credits: 30; minimum research credits: 6; minimum formal course credits: 18; minimum 500-level credits: 12; minimum credits in the major: 12; seminar: 2 credits per year; minimum GPA: 3.00.

Doctoral Degree Requirements

The general requirements are based upon a period of residence, the writing of a satisfactory thesis and its acceptance by the doctoral committee and the Graduate School, and the passing of the comprehensive examination. A doctoral program consists of a combination of courses, seminars, and research that fulfills the minimum requirements of the Graduate School and is approved by the doctoral committee for each individual student. A master's degree is not a prerequisite for the doctorate. However, the first year of graduate study leading to the Ph.D. may be the same as that provided for the M. S. degree.

Acceptance into the Ph.D. program is based on the student's performance on the Ph.D. candidacy exam, which is administered by a graduate candidacy exam committee of the department. Although there is no specified requirement by the graduate school for the number of course credits for a Ph.D. degree, the department requires a minimum of 18 credits of 500-level courses courses for completing a doctoral degree. The specific courses are determined by the student and the adviser in consultation with the student's doctoral committee. A student with a M. S. degree from Penn State can use the 500-level credits earned during his or her M. S. study to fulfill the course requirements. Upon approval by the doctoral committee and the graduate program coordinator, a student with an M. S. degree from another U.S. university may use a maximum of 10 credits from that school to partially fulfill the course requirement.

- Candidacy exam: (Offered twice a year: at the beginning of spring and fall semesters) Students will write a research proposal and give a presentation on the proposal to three members of the candidacy committee, whose members will ask questions about the proposal and the student's prior course work. The student will choose a topic for the proposal from three provided by the faculty committee, chosen to reflect the interest area(s) of the individual candidate. Students will be given three weeks to write the proposal and turn it into the MATSE graduate office. The oral presentation will take place seven to ten days after the written paper is submitted.
- Minimum formal course requirement (This is not required by the University, but required by the department): 18 credits of 500-level courses after B. S. (The courses to be taken are determined by the adviser and a thesis committee, having a minimum of four members with at least one outside of the department.)
- Comprehensive exam: Progress report and thesis proposal (five to ten pages) provided to the student's doctoral committee. An oral presentation is given to the research committee, followed by questions on the written and oral presentations.
- Seminar: 2 credits of MATSE 590 per year, until comprehensive exam is passed
- Minimum GPA: 3.0
- Thesis: A written thesis and an oral defense administrated by the doctoral committee

Biogeochemistry Dual-Title Degree Program

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree Program. Students in the Biogeochemistry Dual Title program are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. Additional coursework from an approved list of courses is required. All students must pass a candidacy examination that includes an assessment of their potential in the field of biogeochemistry. A single candidacy examination that includes biogeochemistry will be administered for admission into the student's Ph.D. program, as well as the biogeochemistry dual-title. The structure and timing of this exam will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise in biogeochemistry. The field of biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of biogeochemistry is required.

Student Aid

Top graduate applicants will be automatically nominated for a number of graduate fellowships in the department, including the University Graduate Fellowship, the Materials Research Institute Fellowship, the Wilson Fellowship of the College of Earth and Mineral Sciences, and the University Minority Scholar Fellowship. Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

MATERIALS SCIENCE AND ENGINEERING (MATSE) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/14/03

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Mathematics (MATH)

Program Home Page (Opens New Window)

DMITRI BURAGO, *In Charge of Graduate Programs in Mathematics*
224 McAllister Building
814-865-7529
gradstudies@math.psu.edu

Degrees Conferred:

Ph.D., D.Ed., M.A., M.Ed.

The Graduate Faculty

- Joel H. Anderson, Ph.D. (Indiana) Professor of Mathematics
- George E. Andrews, Ph.D. (Pennsylvania) Evan Pugh Professor of Mathematics
- Augustin Banyaga, Ph.D. (Geneva) Professor of Mathematics
- Paul F. Baum, Ph.D. (Princeton) Evan Pugh Professor of Mathematics
- Andrew Belmonte, Ph.D. (Princeton) Associate Professor of Mathematics
- Leonid Berlyand, Ph.D. (Kharkov State) Professor of Mathematics
- Nathaniel Brown, Ph.D. (Purdue) Assistant Professor of Mathematics
- W. Dale Brownawell, Ph.D. (Cornell) Distinguished Professor of Mathematics
- Dmitri Burago, Ph.D. (St. Petersburg State) Professor of Mathematics
- Wenwu Cao, Ph.D. (Penn State) Professor of Mathematics and Materials
- John Clemens, Ph.D. (California, Berkeley) Assistant Professor of Mathematics
- Qiang Du, Ph.D. (Carnegie Mellon) Professor of Mathematics
- Edward Formanek, Ph.D. (Rice) Professor of Mathematics
- Moses Glasner, Ph.D. (California, Los Angeles) Associate Professor of Mathematics
- Diane M. Henderson, Ph.D. (California, San Diego) Associate Professor of Mathematics
- Nigel Higson, Ph.D. (Dalhousie) Distinguished Professor of Mathematics
- Robert P. Hunter, Ph.D. (Louisiana State) Professor of Mathematics
- Anatole Katok, Ph.D. (Moscow State) Shibley Professor of Mathematics
- Bryna Kra, Ph.D. (Stanford) Associate Professor of Mathematics
- Svetlana Katok, Ph.D. (Maryland) Professor of Mathematics
- Gerald Lallement, Doc. es Mathematiques (Paris) Professor of Mathematics
- Marc Levi, Ph.D. (Courant) Professor of Mathematics
- Jenny Xiaoe Li, Ph.D. (Cornell) Associate Professor of Mathematics and Economics
- L. C. Li, Ph.D. (Courant) Associate Professor of Mathematics
- W. C. Li, Ph.D. (California, Berkeley) Professor of Mathematics
- Chun Liu, Ph.D. (Courant) Associate Professor of Mathematics
- Anna Mazzucato, Ph.D. (North Carolina, Chapel Hill) Assistant Professor of Mathematics
- Gary L. Mullen, Ph.D. (Penn State) Professor of Mathematics
- Victor Nistor, Ph.D. (California, Berkeley) Professor of Mathematics
- Alexei Novikov, Ph.D. (California, Berkeley) Assistant Professor of Mathematics
- Adrian Ocneanu, Ph.D. (Warwick) Professor of Mathematics
- Yakov Pesin, Ph.D. (Moscow State) Distinguished Professor of Mathematics
- Anton Petrunin, Ph.D. (Illinois) Assistant Professor of Mathematics
- John Roe, D.Phil. (Oxford) Professor of Mathematics
- James A. Sellers, Ph.D. (Penn State) Associate Professor of Mathematics
- Stephen G. Simpson, Ph.D. (MIT) Professor of Mathematics
- Gregory Swiatek, Ph.D. (Warsaw) Professor of Mathematics
- Sergei Tabachnikov, Ph.D. (Moscow State) Professor of Mathematics
- Arkady Tempelman, Ph.D. (Vilnius) Professor of Mathematics and Statistics
- Leonid N. Vaserstein Ph.D. (Moscow State) Professor of Mathematics
- Robert C. Vaughan, Ph.D. (London) Professor of Mathematics
- Aissa Wade, Ph.D. (Montpellier) Assistant Professor of Mathematics
- William C. Waterhouse, Ph.D. (Harvard) Professor of Mathematics
- Howard Weiss, Ph.D. (Maryland) Professor of Mathematics
- Jinchao Xu, Ph.D. (Cornell) Professor of Mathematics
- Ping Xu, Ph.D. (California, Berkeley) Professor of Mathematics
- Ae Ja Yee, Ph.D. (Korea Advanced Inst of Sci and Tech) Associate Professor of Mathematics
- Yuri G. Zarhin, Ph.D. (Leningrad State) Professor of Mathematics
- Yuxi Zheng, Ph.D. (Berkeley) Professor of Mathematics
- Ludmil Zikatanov, Ph.D. (Sofia) Assistant Professor of Mathematics

Graduate courses in all the principal branches of mathematics are offered regularly each year. The department is prepared to direct research in a variety of fields, including various branches of analysis, algebra, topology, number theory, applied analysis, and mathematical logic and foundations.

Admission Requirements

Scores from the Graduate Record Examinations Aptitude Test (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

To be admitted to the Ph.D., D.Ed., or M.A. program without undergraduate deficiency, an applicant should have completed at least 18 credits in mathematics at the advanced undergraduate level (400 series or their equivalents). The undergraduate student is urged to take at least 6 credits in foundations of analysis (MATH 401), 6 in modern algebra (MATH 435 and MATH 436), and 3 in topology (MATH 429) or their equivalents. These courses are essential preparation for the graduate program, and if they are taken after admission, a

maximum of 6 credits may be counted toward an advanced degree.

Students with a 3.00 junior/senior average and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Students applying to the graduate program in mathematics for whom English is not their native language are required to have a score of at least 550 (paper-based test) or 213 (computer-based test) on the Test of English as a Foreign Language (TOEFL) examination. The results of this examination must be submitted along with other requested items before the application deadline date.

Master's Degree Requirements

For the M.A. degree the department offers two options: (1) the thesis option requires 12 credits of approved 500-series course in mathematics, 6 to 9 credits of thesis, sufficient credits in approved 400- or 500-series courses to make a total of 30 credits, and a final oral examination based on the thesis and general course material; and (2) the nonthesis option requires 18 credits of 500-series courses in mathematics, sufficient credits in approved 400- or 500-series courses to make a total of 30 credits, and a term paper on an approved topic in mathematics. No final examination is given in this option. Under this option a student may also elect to take a minor in applied mathematics (9 credits with at least 6 at the 500 level) and may use these credits toward the necessary 30 credits. For both options, a grade of A or B is required in all courses.

To be admitted to the M.Ed. program without undergraduate deficiency, an applicant should have completed at least 15 credits in mathematics at the intermediate level beyond calculus. The M.Ed. program does not require any 500-series courses, but the student is encouraged to select some at this level. Special courses have been instituted for the training of teachers. Among these are MATH 470 and MATH 471. These are acceptable to satisfy credit requirements only for the M.Ed. degree.

Doctoral Degree Requirements

All doctoral students are required to take three qualifying examinations. Two of these examinations must be completed prior to the beginning of the student's second year of graduate study, and the third prior to the beginning of the third year. The qualifying examinations are in the areas of analysis, algebra, and topology/geometry, unless a student chooses to enroll in the Applied Mathematics option or the Logic and Foundations option. For the Applied Mathematics option, the qualifying examinations are in the areas of analysis, numerical analysis, and partial differential equations, and for the Logic and Foundations option, the areas are analysis, algebra, and logic and foundations. Students who wish to enroll in the Applied Mathematics option or the Logic and Foundations option must file a petition with the Graduate Studies Committee anytime between admission to the Ph.D. program and the add/drop deadline for the student's first semester.

The qualifying examinations are given twice a year--after the end of the spring semester and before the beginning of the fall semester. Basic, one-year sequences are offered in each subject annually to help students prepare for the examinations. Typically, an entering Ph.D. student takes two of the basic sequences in the first year and the third basic sequence in the second year of study, and takes the qualifying examinations in the spring after completing the corresponding courses. If an examination is failed, the student must take it again. Students who fail a qualifying examination in a given subject twice may not continue in the Ph.D. program.

Entering Ph.D. students may take one or more of the qualifying examinations on arrival in August without penalty. If they fail a pre-entrance exam, they still have two more opportunities to pass it. Entering Ph.D. students are advised to take at least two basic sequences (in the subjects they did not pass qualifying exams in on arrival) and the subsequent qualifying exams in the first year of graduate study.

After passing all three qualifying exams, students are expected to select a thesis adviser and form a doctoral committee. The committee administers the comprehensive exam (no later than the end of the seventh semester of study) and offers counsel of the student as his research progresses.

Other Relevant Information

Students in this program may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (*See also* Operations Research.)

Further information about hte graduate program in Mathematics may be found at the following Web site: www.math/psu.edu/grad.

Student Aid

Graduate assistantships available through this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

MATHEMATICS (MATH) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

Last updated by Publications: 01/21/10 (link check)

Mechanical Engineering (M E)

Program Home Page (Opens New Window)

KAREN A. THOLE, *Head of the Department of Mechanical and Nuclear Engineering*
137 Reber Building
814-865-2519

Degrees Conferred:

- Ph.D., M.S.
- Integrated B.S. and M.S. in Mechanical Engineering

The Graduate Faculty

- Cari Bryant Arnold, Ph.D. (Missouri-Rolla) Assistant Professor of SEDTAPP; Assistant Professor of Mechanical Engineering
- Ashok D. Belegundu, Ph.D. (Iowa) Professor of Mechanical Engineering
- André L. Boehman, Ph.D. (Stanford) Professor of Fuel Science, and Materials Science and Engineering
- James G. Brasseur, Ph.D. (Stanford) Professor of Mechanical Engineering, Bioengineering, and Mathematics
- Jack S. Brenizer, Ph.D. (Penn State) Professor of Mechanical and Nuclear Engineering
- Sean N. Brennan, Ph.D. (Illinois, Urbana-Champaign) Assistant Professor of Mechanical Engineering
- Liming Chang, Ph.D. (Illinois) Professor of Mechanical Engineering
- Fan-Bill Cheung, Ph.D. (Notre Dame) Professor of Mechanical Engineering
- John M. Cimbala, Ph.D. (Cal Tech) Professor of Mechanical Engineering
- Stephen A. Copley, Ph.D. (California, Berkeley) Senior Scientist, Applied Research Laboratory
- Edward C. De Meter, Ph.D. (Virginia Tech) Professor of Mechanical Engineering and Industrial Engineering
- Moustafa El-Gindy, Ph.D. (Tech Inst of Budapest) Senior Research Associate, Applied Research Laboratory
- Mary I. Frecker, Ph.D. (Michigan) Professor of Mechanical Engineering
- Amanul Haque, Ph.D. (Illinois, Urbana-Champaign) Assistant Professor of Mechanical Engineering
- Daniel C. Haworth, Ph.D. (Cornell) Professor of Mechanical Engineering
- Jun Huang, Ph.D. (California, Los Angeles) Assistant Professor of Mechanical Engineering, and Engineering Science and Mechanics
- Thomas G. Hughes, Ph.D. (Penn State) Senior Research Associate, Applied Research Laboratory
- Kathryn Jablokow, Ph.D. (Ohio State) Associate Professor of Mechanical Engineering (Great Valley)
- Seungjin Kim, Ph.D. (Purdue) Assistant Professor of Mechanical and Nuclear Engineering
- Gary H. Koopmann, Ph.D. (Catholic U) P.E. Distinguished Professor of Mechanical Engineering
- Anil K. Kulkarni, Ph.D. (Brown) Professor of Mechanical Engineering
- Kenneth K. Kuo, Ph.D. (Princeton) Distinguished Professor of Mechanical Engineering
- John S. Lamancusa, Ph.D (Wisconsin, Madison) P.E. Professor of Mechanical Engineering
- A. Scott Lewis, Ph.D. (Penn State) Research Associate, Applied Research Laboratory
- Thomas A. Litzinger, Ph.D. (Princeton) Professor of Mechanical Engineering
- Lyle N. Long, Ph.D. (George Washington) Distinguished Professor of Aerospace Engineering
- Eric R. Marsh, Ph.D. (MIT) Professor of Mechanical Engineering
- Matthew M. Mench, Ph.D. (Penn State) Associate Professor of Mechanical Engineering
- Panagiotis Michaleris, Ph.D. (Illinois, Urbana-Champaign) Associate Professor of Mechanical Engineering
- Timothy F. Miller, Ph.D. (Penn State) Senior Research Associate, Applied Research Laboratory
- Eric M. Mockensturm, Ph.D. (California, Berkeley) Associate Professor of Mechanical Engineering
- Michael F. Modest, Ph.D. (California, Berkeley) Professor of Mechanical Engineering
- Matthew B. Parkinson, Ph.D. (Michigan) Assistant Professor of SEDTAPP; Assistant Professor of Mechanical Engineering
- Eric G. Paterson, Ph.D. (Iowa) Senior Research Associate, Applied Research Laboratory
- Laura L. Pauley, Ph.D. (Stanford) P.E. Professor of Mechanical Engineering
- L. Joel Peltier, Ph.D. (Colorado) Research Associate, Applied Research Laboratory
- Horacio Perez-Blanco, Ph.D. (Illinois, Urbana-Champaign) Professor of Mechanical Engineering
- Stephen J. Piazza, Ph.D. (Northwestern) Associate Professor of Kinesiology, Bioengineering, and Mechanical Engineering
- Christopher D. Rahn, Ph.D. (California, Berkeley) Professor of Mechanical Engineering
- Asok Ray, Ph.D. (Northeastern) P.E. Distinguished Professor of Mechanical Engineering
- Domenic A. Santavicca, Ph.D. (Princeton) Professor of Mechanical Engineering
- Robert J. Santoro, Ph.D. (Boston College) George L. Guillet Professor of Mechanical Engineering
- Frank W. Schmidt, Ph.D. (Wisconsin) Professor Emeritus of Mechanical Engineering
- Gary S. Settles, Ph.D. (Princeton) Professor of Mechanical Engineering
- Alok Sinha, Ph.D. (Carnegie Mellon) Professor of Mechanical Engineering
- H. Joseph Sommer III, Ph.D. (Illinois, Urbana-Champaign) Professor of Mechanical Engineering
- Jelena Srebric, Ph.D. (MIT) Adjunct Professor of Mechanical Engineering; Associate Professor of Architectural Engineering
- Gita Talmage, Ph.D. (Illinois, Urbana-Champaign) Professor of Mechanical Engineering
- Karen A. Thole, Ph.D. (Texas, Austin) Professor of Mechanical Engineering
- Stefan T. Thynell, Ph.D. (North Carolina State) Professor of Mechanical Engineering
- Martin W. Trethewey, Ph.D. (Michigan Tech) Professor of Mechanical Engineering
- Stephen R. Turns, Ph.D. (Wisconsin) Professor of Mechanical Engineering
- Adri van Duin, Ph.D. (Delft U of Tech, The Netherlands) Associate Professor of Mechanical Engineering
- James C. Wambold, Ph.D. (New Mexico) Professor Emeritus of Mechanical Engineering
- Chao-Yang Wang, Ph.D. (Iowa) Professor of Mechanical Engineering and Materials Science
- Donghai Wang, Ph.D. (Tulane) Assistant Professor of Mechanical Engineering
- Kon-Well Wang, Ph.D. (California, Berkeley) William E. Diefenderfer Chaired Professor of Mechanical Engineering
- Qian Wang, Ph.D. (Princeton) Assistant Professor of Mechanical Engineering
- Ralph L. Webb, Ph.D. (Minnesota) Professor Emeritus of Mechanical Engineering
- David N. Wormley, Ph.D. (MIT) Harold and Inge Marcus Dean of Engineering; Professor of Mechanical Engineering
- John Wyngaard, Ph.D. (Penn State) Professor of Meteorology, Geo-Environmental Engineering, and Mechanical Engineering
- Vigor Yang, Ph.D. (Cal-Tech) Distinguished Professor of Mechanical Engineering
- Savas Yavuzkurt, Ph.D. (Stanford) Professor of Mechanical Engineering
- Richard A. Yetter, Ph.D. (Princeton) Professor of Mechanical Engineering

Graduate programs and research facilities are available in combustion, heat transfer, fluid mechanics, dynamic system analysis, robotics,

mechanical design, and energy systems. Air pollution control, automotive safety, tribology, designing for noise control and for reliability also provide many research and design opportunities.

Admission Requirements

Admission to the program is quite competitive. Entering students must hold a B.S. degree in engineering or physical science. Students with 3.0 or better (out of 4.0) junior/senior cumulative grade-point averages and appropriate course backgrounds will be considered for admission. The best-qualified applicants will be admitted. In addition, scores from the Graduate Record Examinations (GRE) are required. To qualify for admission, an international student must achieve a minimum score of 550 on the paper-based Test of English as a Foreign Language (TOEFL), or a minimum score of 213 on the computer-based test. Letters of recommendation and a statement of purpose written by the applicant are also required to complete the application pacakge.

Degree Requirements

The M.S. degree program is designed for students to gain advanced knowledge for research, analysis, and design in mechanical engineering. Students pursuing an M.S. degree may choose one of two options: completion of 24 course credits and the submission of a thesis (6 credits) to the Graduate School, or 30 course credits and the submission of a scholarly paper to the department. A Ph.D. thesis proposal may serve as the paper, provided the student has passed the Ph.D. candidacy examination.

Continuous registration is required of all Ph.D. graduate students until the thesis is approved.

The Ph.D. program emphasizes scholarly research and helps students prepare for research and related careers in industry, government, and academe. Students are admitted to candidacy after passing written and oral examinations. The Ph.D. program is quite flexible, with minimal formal requirements. The Ph.D. is awarded upon completion of a program of advanced study that includes a minimum period of residence, a satisfactory thesis, and the passing of comprehensive and final oral examinations as determined by the student's doctoral committee.

Generally, a Ph.D. student must have 30 credits above a master's degree before taking the comprehensive examination.

Integrated B.S. and M.S. in Mechanical Engineering

A limited number of undergraduate students in the B.S.M.E. program will be considered for admission to the integrated undergraduate/graduate program leading to the B.S.M.E. and the M.S.M.E. degrees. Students with a junior standing in the B.S.M.E. degree program may be admitted to the integrated B.S.M.E./M.S.M.E. program, following a positive review of an application specific to this program by the faculty committee on graduate admissions. Students must have attained a GPA of at least 3.0. Students admitted to the integrated program must maintain a GPA in all classes used toward the M.S.M.E. degree of at least 3.0.

Student Aid

Graduate students are supported by a variety of government and industry fellowships, traineeships, and research and teaching assistantships. Stipends vary depending on the source. Competition for support is extremely keen; however, outstanding students are considered for attractive offers of support, including various fellowships specifically for new students in the College of Engineering. By completing the department's application for financial assistance, you will automatically be considered for a graduate assistantship. To receive full consideration for financial aid, all application materials should be submitted by January 15.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

MECHANICAL ENGINEERING (M E) course list

Last Revised by the Department: Spring Semester 2007

Blue Sheet Item #: 35-04-252

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Last updated by Publications: 5/12/10

Media Studies (MEDIA)

Program Home Page (Opens New Window)

JOHN S. NICHOLS, Associate Dean for Graduate Studies
College of Communications
201 Carnegie Building
814-865-3070; commgpo@psu.edu

Degree Conferred:

- M.A.
- Integrated B.A/M.A. in Media Studies

The Graduate Faculty

- Lee Ahern, Ph.D. (Penn State) Assistant Professor of Communications
- Douglas Anderson, Ph.D. (Southern Illinois) Dean; Professor of Communications
- George Anghelcev, Ph.D. (Minnesota) Assistant Professor of Communications
- Robert A. Baukus, Ph.D. (Massachusetts) Associate Professor of Communications
- Ronald Bettig, Ph.D. (Illinois) Associate Professor of Communication
- Barbara Bird, M.F.A. (Northwestern) Associate Professor of Communications
- Denise Bortree, Ph.D. (Florida) Assistant Professor of Communications
- Colleen Connolly-Ahern, Ph.D. (Florida) Assistant Professor of Communications
- Jeremy Cohen, Ph.D. (Washington) Professor of Communications
- Frank Dardis, Ph.D. (South Carolina) Associate Professor of Communications
- Dennis K. Davis, Ph.D. (Minnesota) Professor of Communications
- Marcia DiStaso, Ph.D. (Miami) Assistant Professor of Communications
- Lyn Elliot, Ph.D. (Iowa) Associate Professor of Communications
- Michael Elavsky, Ph.D. (Illinois) Assistant Professor of Communications
- Russell Frank, Ph.D. (Pennsylvania) Associate Professor of Communications
- Robert M. Frieden, J.D. (Virginia) Cable TV Pioneers Chair Professor in Telecommunications Studies and Law
- Jeanne Hall, Ph.D. (Wisconsin) Associate Professor of Media Studies
- Martin E. Halstuk, Ph.D. (Florida) Associate Professor of Communications
- Marie Hardin, Ph.D. (Georgia) Associate Professor of Communications
- R. Dorn Hetzel, M.F.A. (New York) Associate Professor of Film and Video
- Anne Hoag, Ph.D. (Michigan) Associate Professor of Communications
- Matthew Jackson, Ph.D. (Indiana) Associate Professor of Communications
- Krishna Jayakar, Ph.D. (Indiana) Associate Professor of Communications
- Matthew Jordan, Ph.D. (Claremont) Assistant Professor of Communications
- Ann Marie Major, Ph.D. (Southern Illinois) Associate Professor of Communications
- Matthew P. McAllister, Ph.D. (Illinois) Professor of Communications
- John S. Nichols, Ph.D. (Minnesota) Professor of Communications
- Mary Beth Oliver, Ph.D. (Wisconsin) Distinguished Professor of Communications
- Anthony A. Olorunnisola, Ph.D. (Howard) Associate Professor of Communications
- Jeremy S. Packer, Ph.D. (Illinois) Assistant Professor of Communications
- Patrick R. Parsons, Ph.D. (Minnesota) Don Davis Professor in Ethics
- Robert D. Richards, J.D. (American) John and Ann Curley Professor of First Admendment Studies
- Ford Risley, Ph.D. (Florida) Associate Professor of Communications
- Michelle Rodino-Colocino, Ph.D. (Pittsburgh) Assistant Professor of Communications
- Amit M. Schejter, Ph.D. (Rutgers) Associate Professor of Communications
- Jorge Reina Schement, Ph.D. (Stanford) Professor of Communications
- Michael Schmierbach, Ph.D. (Wisconsin) Assistant Professor of Communications
- Fuyuan Shen, Ph.D. (North Carolina, Chapel Hill) Associate Professor of Communications
- Richard Sherman, M.F.A. (Ohio) Assistant Professor of Communications
- Susan M. Strohm, Ph.D. (Minnesota) Assistant Professor of Communications
- S. Shyam Sundar, Ph.D. (Stanford) Distinguished Professor of Communications and Communication Arts and Sciences
- Richard D. Taylor, J.D. (New York) Palmer Chair of Telecommunications Studies and Law
- Bu Zhong, Ph.D. (Maryland) Assistant Professor of Communications

The master's degree in Media Studies is an academic program that involves students in the systematic study of media. The objective of the course of study is to enable students to achieve a comprehensive understanding of the systems, networks, cultures, and information associated with media. The program prepares students for doctoral study in communications and for professional positions in business and government requiring a comprehensive understanding of the historical, social, and political implications of the media. This program helps prepare students to organize research projects, critically evaluate research reports, and directly influence media practices by the application of research findings.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Students with a 3.00 junior/senior grade-point average are eligible for admission. Three letters of recommendation are required. Applicants must also submit an autobiographical statement of about 1,000 words indicating the nature of the applicant's interest in Media Studies, reasons for wanting to do graduate work, and future aspirations relating to the field of mass communications. Experience shows that most applicants hold a bachelor's degree in a field of the liberal arts or the social and behavioral sciences, including journalism and mass communications. However, this does not preclude applicants with other backgrounds, abilities, and interests such as those whose undergraduate training may have been in a scientific or technical field. In every case, the applicant should explain in the autobiographical statement how his or her undergraduate education relates to the decision to seek admission to graduate study in mass communications.

Program of Study

The M.A. program seeks to integrate two areas of inquiry and analysis. The "Critical Studies" area centers on the expressive, creative, and linguistic dimensions of media as cultural processes. The "Political Studies" area focuses primarily on the political and economic dimensions of national and international communications systems and processes. The student is encouraged to combine courses from these and possibly other areas into a coherent package of course work culminating in a thesis.

Degree Requirements

For the M.A. degree, candidates must complete a one-course research core by taking either COMM 506 (quantitative research methods) or COMM 511 (qualitative research methods). The remaining credits are selected by the student in consultation with the adviser from the graduate courses listed in this section. Candidates must complete a minimum of 36 credits, including 6 for the thesis (COMM 600). At least 18 credits must be at the 500 level. Course work offered by departments outside the College of Communications may be scheduled as part of the student's program with prior approval of the student's academic committee. In some cases, students may be required to take additional credits in order to make up deficiencies in undergraduate course work. Students are required to schedule three separate, formal meetings with their advisers and the academic committees for (1) discussion and approval of the general program plan, (2) the thesis proposal, and (3) the defense of the thesis. In most cases, satisfactory completion of course work and thesis requires two years.

Integrated B.A/M.A. in Media Studies

The College of Communications offers academically qualified students enrolled in a bachelor of arts program in the College of Communications the opportunity to earn both the B.A and the M.A. upon completion of five years of study. The Integrated Undergraduate-Graduate Program in Media Studies would facilitate the advanced study of communications research and thesis development through a carefully organized selection of undergraduate courses, graduate seminars and directed research projects. The program would accelerate and enhance undergraduate students' appreciation for graduate level scholarship by involving them in the seminars, research activities, and the scholarly discourse of the college's community of master's- and doctoral-level scholars.

For the IUG Media Studies B.A./M.A. degree, a minimum of 120 credits is required for the B.A. and 36 credits for the M.A. Twelve graduate-level credits, in consultation with the adviser, can apply to both the B.A. and M.A. degrees. Six of these must be at the 500 level.

If for any reason a student admitted to the B.A./M.A. program is unable to complete the requirements for the master of arts degree program in Media Studies, the student will be permitted to receive the B.A. degree, assuming all degree requirements have been satisfactorily completed.

Application Process and Admissions Requirements

Applicants must complete 6 credits from the following lists of courses with a minimum GPA of 3.5 in order to be admitted: 3 credits from COMM 100, COMM 150, COMM 180, COMM 320, or COMM 370 and 3 credits from COMM 205, COMM 250, COMM 381, COMM 401, COMM 403, COMM 304, COMM 405, COMM 407, COMM 408, COMM 409, COMM 410, COMM 411, COMM 413W, COMM 417, COMM 418, COMM 419, COMM 451, COMM 452, COMM 453, COMM 454, COMM 455, COMM 484, or COMM 485. The minimum overall GPA required of applicants is 3.2. Admission to the program is based on the evaluation of the student's transcript, examples of completed writing and research projects, a narrative statement of objectives, and two letters of support from faculty with whom they have worked. One faculty member must be from the College of Communications. Students are expected to apply after completing 60 credits but before the completion of 100 credits. Candidates are expected to present records of outstanding scholarly achievement to qualify. Applications will be reviewed by the appropriate subset of members of the Graduate Committee of the college.

Applicants to the Integrated program:

1. Must be enrolled in a B.A. program in the College of Communications.
2. Must have completed 60 credits of the undergraduate degree program. (It is recommended that students apply prior to completing 100 credits.)
3. Must provide a narrative statement of objectives and two letters of endorsement from faculty with whom they have worked. One faculty member must be from the College of Communications.
4. Must present an approved plan of study in the application process.

Program of Study

The Integrated B.A./M.A. degree in Media Studies is an academic program that involves students in the systematic study of media. The objective of the course of study is to enable students to achieve a comprehensive understanding of the systems, networks, cultures, and information associated with media. The program prepares students for doctoral study in communications and for professional positions in business and government requiring a comprehensive understanding of the historical, social, and political implications of the media. This program helps prepare students to organize research projects, critically evaluate research reports, and directly influence media practices by the application of research findings. The program is specifically not intended for advanced professional education.

Undergraduate tuition rates will apply as long as the student is in undergraduate status, unless the student receives financial support, such as an assistantship requiring the payment of graduate tuition.

Degree Requirements

For the IUG Media Studies M.A. degree, a minimum of 120 credits is required for the B.A. and 36 credits for the M.A. At least 18 of the required 36 credits must be at the 500 level. Twelve graduate-level credits, in consultation with the adviser, can apply to both the B.A. and M.A. degrees. Six of these double-counted credits must be at the 500 level. A minimum of 12 credits of course work, as opposed to research credits, must be completed in Communications. COMM 515 and COMM 506 or COMM 511 are required. IUG students will prepare a thesis proposal in consultation with their advisers and are required to present the final thesis in a formal oral defense meeting to a committee of at least three members of graduate faculty, two of whom must be members of the college faculty. It is encouraged that one member of the committee be from outside the college.

Student Aid

Graduate assistantships and other forms of student aid available to students in this program are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMMUNICATIONS (COMM) course list

Last Revised by the Department: Summer Session 2005

Blue Sheet Item #: 33-04-274

Review Date: 1/18/05

Last updated by Publications: 1/12/10

Meteorology (METEO)

Program Home Page (Opens New Window)

WILLIAM H. BRUNE, *Head of the Department*
503 Walker Building
814-865-3286
meteograd@ems.psu.edu

Degrees Conferred:

- Ph.D., M.S.
- Integrated B.S./M.S. Program in Meteorology

The Graduate Faculty

- Peter R. Bannon, Ph.D. (Colorado) Professor of Meteorology
- Alfred K. Blackadar, Ph.D. (NYU) Professor Emeritus of Meteorology
- Craig F. Bohren, Ph.D. (Arizona) Distinguished Professor Emeritus of Meteorology
- William H. Brune, Ph.D. (Johns Hopkins) Professor of Meteorology
- John J. Cahir, Ph.D. (Penn State) Professor Emeritus of Meteorology
- Toby N. Carlson, Ph.D. (Imperial College-London) Professor Emeritus of Meteorology
- John H. E. Clark, Ph.D. (Florida State) Associate Professor of Meteorology
- Eugene Clothiaux, Ph.D. (Brown) Associate Professor of Meteorology
- Kenneth J. Davis, Ph.D. (Colorado) Associate Professor of Meteorology
- John A. Dutton, Ph.D. (Wisconsin) Professor Emeritus of Meteorology
- Jenni L. Evans, Ph.D. (Monash) Professor of Meteorology
- Steven B. Feldstein, Ph.D. (Penn State) Senior Scientist
- William M. Frank, Ph.D. (Colorado State) Professor of Meteorology
- J. Michael Fritsch, Ph.D. (Colorado State) Distinguished Professor Emeritus of Meteorology
- Jerry Y. Harrington, Ph.D. (Colorado State) Associate Professor of Meteorology
- Charles L. Hosler, Ph.D. (Penn State) Professor Emeritus of Meteorology
- James F. Kasting, Ph.D. (Michigan) Distinguished Professor of Geosciences and Meteorology
- Andrew Kleit, Ph.D. (Yale) Professor of Meteorology
- Dennis Lamb, Ph.D. (Washington) Professor of Meteorology
- Sukyoung Lee, Ph.D. (Princeton) Professor of Meteorology
- Paul Markowski, Ph.D. (Oklahoma) Assistant Professor of Meteorology
- Raymond G. Najjar, Ph.D. (Princeton) Associate Professor of Meteorology
- Yvette Pamela Richardson, Ph.D. (Oklahoma) Assistant Professor of Meteorology
- Nelson L. Seaman, Ph.D. (Penn State) Associate Professor of Meteorology
- Hampton N. Shirer, Ph.D. (Penn State) Associate Professor of Meteorology
- David R. Stauffer, Ph.D. (Penn State) Senior Research Associate and Associate Professor of Meteorology
- Dennis W. Thomson, Ph.D. (Wisconsin) Professor of Meteorology
- Johannes Verlinde, Ph.D. (Colorado State) Associate Professor of Meteorology
- John C. Wyngaard, Ph.D. (Penn State) Professor of Meteorology and Geo-Environmental/Mechanical Engineering
- George S. Young, Ph.D. (Colorado State) Professor of Meteorology and Geo-Environmental Engineering

The graduate program embraces topics that span atmospheric processes from those of the planetary boundary layer to those of the upper atmosphere, that encompass phenomena with molecular to planetary dimensions, and that range from practical to theoretical significance. The program develops and integrates approaches based on observational, computational and analytical techniques.

The major interests of the faculty and graduate students center on (1) analysis, modeling, and prediction of the evolution of synoptic-scale, or mesoscale weather systems, particularly those of significant impact on human activities; (2) observation and theoretical study of processes related to transmission of radiation through the atmosphere, including remote sensing through use of electromagnetic or acoustic systems; (3) observations, laboratory, and theoretical study of trace gases, particulates, and clouds and their consequences for air quality and climate; and (4) observation and theoretical study of atmospheric physics on a variety of scales, including phenomena of weather and climate, boundary layer physics, turbulence, convective systems, and severe storms.

The department encourages interdisciplinary studies and is expanding its programs in biometeorology, climate dynamics, atmospheric pollution prediction, atmospheric carbon cycling, forecast reliability and verification, mathematical study of fluid dynamical systems, and integrated atmosphere-ocean studies. The department is affiliated with the Earth and Environmental Sciences Institute, which conducts studies in Earth system science, including climate, large-scale dynamics, oceanography, and regional assessments.

For the M.S. program, a minimum of 30 credits is required. For the Ph.D. program, a minimum of 4 credits is required, plus 6 elective credits per academic year in consultation with the adviser until the comprehensive examination is passed.

Admission Requirements

The Meteorology program is open to all students with a baccalaureate degree and a strong interest in the atmospheric sciences. A degree in meteorology, science, mathematics, or engineering provides a particularly good background, although the department has had some students with arts and humanities degrees (such as Art History) who have done well. The minimum course requirements for admission are mathematics at least through differential equations and at least one year of physics. Scores from the Graduate Record Examinations (GRE) are required for the evaluation of all applicants. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

For admission to the program, the departmental admission committee considers courses taken, grade-point average, supporting letters, GRE scores, professional experience, and English proficiency. Rather than setting rigid standards in each category, the committee examines the overall record as a whole. The best-qualified applicants are accepted up to the number of spaces that are available for new students.

Generally, additional mathematics and physics beyond the minimum requirements listed above, as well as courses in statistics, chemistry, and computer programming, will strengthen the student's application. Courses in meteorology are not required for admission. Most

students admitted to the graduate program have GPA's of 3.50 or higher; particularly good grades in the sciences are desirable. Two recommendations are solicited from persons familiar with the student's academic competence, and the student is required to write a letter summarizing interests and goals. The General Test package containing the Mathematical Reasoning Test of the GRE is required of all applicants. A verbal and quantitative combined score of 1200 or greater is typical for the department's students. All international students whose native language is not English must take the Test of English as a Foreign Language (TOEFL). A minimum TOEFL score of 550 points on the paper test, of 213 points on the computer-based test, or of 80 points on the Internet-based test together with a minimum score of 23 points on the speaking portion, is required for admission.

Master's Degree Requirements

The degree is offered with both thesis and research paper options. For both options, a core curriculum is required that is composed of METEO 520, 521, 533, 535, and 580 that is supplemented by 5 elective credits from 500-level Meteorology courses, for a total of 18 credits.

All students must take a minimum of 12 additional elective credits for a total of 30 credits, which are distributed as follows. Students in the master's thesis option must select 6 additional credits from 400- and 500-level course work in Meteorology or related disciplines, and 6 quality-graded credits of METEO 600 (quality-graded credits count toward the grade-point average). Student in the master's paper option must select 6 of the additional credits from 400- and 500-level course work in Meteorology, together with 6 additional credits from 400- and 500-level course work in Meteorology or related disciplines if not used as electives above. METEO 600 credits cannot be used to fulfill any portion of these additional credits.

Finally, all M.S. students defend their thesis or paper in a public presentation that is evaluated by, and must be approved by, the students' committee. A minimum of three signatures is required for a master's thesis, including the thesis adviser and the department head or program chair.

For a minor in Meteorology, an M.S. student must select 6 credits of 500-level Meteorology courses in a course plan approved by the department.

Doctoral Degree Requirements

Studies for the Ph.D. degree are designed to accommodate the interests and capabilities of the candidate, and they are overseen by a doctoral committee, which also administers comprehensive and final oral examinations. Before being admitted to Ph.D. candidacy, a student must have the academic support of a faculty member and the student must pass each part of the two-part Ph.D. candidacy examination that is typically offered twice each year. In order to assess the student's progress in assimilating the required material, both sections of the exam must be taken within one year of being admitted to the program and the student must pass the entire exam within two years of admission. Once a student passes a section of the candidacy exam, the student does not take that section again. Before being admitted to the comprehensive exam, a student must have passed the department's competency exam in written and spoken technical English. Before being admitted to the final oral exam, a student must have completed 4 required credits: METEO 580 (1 credit) and 3 credits from at least two different graduate seminar courses. In addition, 6 credits per academic year from 400- and 500-level course work in Meteorology or related disciplines must be taken until the comprehensive examination is passed (METEO 580 and the elective courses apply to this requirement). One credit of METEO 590 is required each semester until the comprehensive exam is passed. There are no minimal credit requirements for quality-graded METEO 600 (research credits whose grades count toward the grade-point average). Students may earn up to 12 quality-graded credits, including those earned during the pursuit of an M.S. degree in Meteorology from Penn State. The student is expected to master the material in the M.S. core courses (METEO 520, 521, 533, and 535), but need not take those courses for credit.

Students interested in the emerging field of Astrobiology may wish to obtain a dual-title degree in Astrobiology and Meteorology. The pursuit of this dual title entails additional course work beyond the degree requirements set forth here (see the *Graduate Bulletin* graduate_degree_programs.cfm?letter=D&program=grad_abiol.htm for further details concerning these course and other program requirements), as well as the participation of at least one Astrobiology program faculty member on the dissertation committee. The Astrobiology representative, who assists with the selection of courses, may be the adviser and have an appointment in Meteorology. In addition to passing the departmental Ph.D. Candidacy exam that all Meteorology doctoral students must take, all dual-title students must pass a second Candidacy Examination that assesses their potential in the field of astrobiology. The structure and timing of the second candidacy examination will determined jointly by the dual-title and major program. The field of Astrobiology should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of Astrobiology is required. A public oral presentation of the dissertation is required.

For a minor in Meteorology, Ph.D. students should select 15 credits of 500-level Meteorology courses in a course plan approved by the department.

Other Relevant Information

The program differentiates between instruction and research topics appropriate for M.S. students seeking positions of advanced responsibility in government or industry, those appropriate for M.S. students anticipating further study, and those appropriate for Ph.D. candidates who will work in advanced research laboratories or academic institutions.

Student Aid

Graduate assistantships available through this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. Most graduate students are supported with teaching or research assistantships.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

METEOROLOGY (METEO) course list

NOTE: Courses in the use of X-ray diffraction, electron microscopy, and spectroscopy in meteorological studies are listed under MATERIALS SCIENCE.

Integrated B.S./M.S. Program in Meteorology

The Department of Meteorology offers an integrated B.S./M.S. Program that is designed to allow academically superior students to obtain both the B.S. and the M.S. degree in Meteorology in five years of study. In order to complete the program in five years, students interested in the Integrated B.S./M.S. Program in Meteorology must apply for admission to the Graduate School and the Integrated B.S./M.S. program by the end of their junior year.

During the first three years, the student will follow the course scheduling of one of the options in the B.S. degree, normally the Atmospheric Sciences or the General Option (see the *Undergraduate Bulletin*). Students who intend to enter the Integrated B.S./M.S. Program are encouraged to take upper level classes during their first three years whenever appropriate. By the end of the junior year, students normally apply for admission to both the IUG Program and to the Graduate School. Acceptance decisions will be made prior to the beginning of the senior year and M.S. advising committees appointed for successful applicants. During the senior year, IUG students follow the scheduling of the selected B.S. Meteorology Option, with an emphasis on completing 500-level course work as appropriate. During the senior year, IUG students will start work on their theses or papers that are designed to meet the requirements of the M.S. degree in Meteorology. During the fifth year, IUG students take courses fulfilling the departmental M.S. degree requirements and complete their M.S. theses or papers. Typical scheduling plans for students pursuing the General or Atmospheric Sciences Options are given on the departmental Web site http://www.met.psu.edu. If a plan similar to one of these plans is followed, then the student will have completed all requirements for the B.S. in Meteorology by the end of the fourth year. If, for some reason, a student cannot continue in the integrated program, then this student will be able to receive the undergraduate degree upon completion of all of the B.S. requirements. Undergraduate tuition rates will apply as long as the student is an undergraduate, unless the student receives financial support, for example, via an assistantship requiring the payment of graduate tuition.

Admission Requirements

Students who wish to complete the Integrated B.S./M.S. Program in Meteorology should apply for admission to both the Graduate School and the Integrated B.S./M.S. Program by no later than the end of their junior year. In this case, successful students will be admitted formally into the graduate program in Meteorology just prior to their senior year, if their progress has been satisfactory. Admission prior to the senior year is also possible in some unusual circumstances. In all cases, admission to the program will be at the discretion of the Graduate Admissions Officer for the Department of Meteorology, who will determine the necessary criteria for all applicants. These criteria include the setting of the minimum required scores on the GRE and minimum cumulative GPA for consideration, the receipt of recommendation letters from three faculty and a letter of support from the department head, and the identification of an adviser who is willing to oversee the student's research project; normally, evidence of significant research potential must be provided in the application as well.

Degree Requirements

The total degree requirements are as follows: The new program will fulfill the present rigorous requirements of the existing M.S. Program. In particular, all IUG students must defend their theses or papers, as do all M.S. students, in a public presentation toward the end of their graduate program.

B.S. Degree Portion:

TOTAL B.S. REQUIREMENTS: 121 credits (12 double-counted with the M.S. Requirements)

General Education: 45 credits, 24 of which are included in the REQUIREMENTS FOR THE MAJOR

Requirements for the Major (All Options): 75 credits

Prescribed Courses: 56 credits
Additional Courses: 19 credits

Requirements for the General Option: 18-19 credits

M.S. Degree Portion:

TOTAL M.S. REQUIREMENTS: 30 credits (12 double-counted with the B.S. Requirements)

Prescribed Courses: METEO 520, 521, 533, 535 (12 credits)

Additional Courses: 18 credits

6 credits of 500-level course work
6 credits of 400- or 500-level course work
6 credits of METEO 600 (thesis option)
or 6 credits of 400- or 500-level course work

Last Revised by the Department: Spring Semester 2007

Blue Sheet Item #: 35-02-120

Review Date: 10/10/06

Last updated by Publications: 01/21/10 (link check)

Microbiology and Immunology (MICRO)

Program Home Page (Opens New Window)

RICHARD J. COURTNEY, *Chair of the Department*
College of Medicine, Penn State Milton S. Hershey Medical Center
Hershey, PA 17033
717-531-6521
micro-grad-hmc@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Robert H. Bonneau, Ph.D. (Penn State) Professor of Microbiology and Immunology
- Hua Cheng, M.D., Ph.D. (NYU) Assistant Professor of Medicine, and Microbiology and Immunology
- Michael J. Chorney, Ph.D. (Cornell) Professor of Microbiology and Immunology, and Pediatrics
- Neil D. Christensen, Ph.D. (Auckland, New Zealand) Professor of Pathology, and Microbiology and Immunology
- Richard J. Courtney, Ph.D. (Syracuse) Professor of Microbiology and Immunology
- Rebecca C. Craven, Ph.D. (Tennessee) Associate Professor of Microbiology and Immunology
- John N. Goldman, M.D. (Cincinnati) Professor of Medicine, and Microbiology and Immunology
- Harriet C. Isom, Ph.D. (Illinois) Distinguished Professor of Microbiology and Immunology; Professor of Pathology
- Michael Katzman, M.D. (Columbia) Professor of Medicine, and Microbiology and Immunology
- Kenneth Lucas, M.D. (SUNY, Syracuse) Associate Professor of Pediatrics, and Microbiology and Immunology
- Craig Meyers, Ph.D. (California, Los Angeles) Professor of Microbiology and Immunology
- Christopher C. Norbury, Ph.D. (Dundee, Scotland) Associate Professor of Microbiology and Immunology
- Leslie J. Parent, M.D. (Duke) Professor of Medicine, and Microbiology and Immunology
- Clare Sample, Ph.D. (South Florida) Professor of Microbiology and Immunology
- Jeffery T. Sample, Ph.D. (South Florida) Professor of Microbiology and Immunology
- Todd D. Schell, Ph.D. (West Virginia) Associate Professor of Microbiology and Immunology
- Jianxun (Jim) Song, Ph.D. (Third Military Medical U) Assistant Professor of Microbiology and Immunology
- David J. Spector, Ph.D. (Pennsylvania) Professor of Microbiology and Immunology
- Kevin Staveley-O'Carroll, M.D., Ph.D. (Johns Hopkins) Assistant Professor of Surgery, and Microbiology and Immunology
- Jose A. Stoute, M.D. (U of Miami) Associate Professor of Medicine, and Microbiology and Immunology
- Richard B. Tenser, M.D. (SUNY, Upstate) Professor of Medicine, and Microbiology and Immunology
- M. Judith Tevethia, Ph.D. (Michigan State) Professor Emeritus of Microbiology and Immunology
- Satvir S. Tevethia, B.V.Sc. (Agra, India); Ph.D. (Michigan State) Distinguished Professor Emeritus of Microbiology and Immunology
- Mary Ellen Truckenmiller, Ph.D. (California) Assistant Professor of Microbiology and Immunology
- Michael F. Verderame, Ph.D. (Columbia) Professor of Medicine, and Microbiology and Immunology
- Hanspeter Waldner, Ph.D. (U of Basil) Assistant Professor of Microbiology and Immunology
- John W. Wills, Ph.D. (Tennessee) Distinguished Professor of Microbiology and Immunology

The graduate program in Microbiology and Immunology emphasizes basic research consisting of the application of molecular, genetic, and biochemical approaches to problems of fundamental biological interest. The research activities of the department are focused on the study of the interactions of viruses with their host cells and organisms with emphasis on adenoviruses, hepatitis virus, herpesviruses, papillomaviruses, papovaviruses, and retroviruses. Individual research programs center on virus replication and cellular immune response in these processes. Viral systems are also utilized as models for the study of eukaryotic gene regulation, protein transport and processing, transmembrane and intracellular signal transduction, and the human immune response. In addition, active research programs are maintained in the areas of eukaryotic cellular differentiation and growth control, tumor cell biology and immunology, and the mapping of human immune response genes and genes associated with other human diseases.

A laboratory rotation program during the first academic year serves as an introduction to the different subdisciplines and investigators. This experience acquaints each student with four research groups leading to the choice of a permanent research adviser. A broad-based curriculum and stimulating series of seminars and literature reports complement the research training.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by the Graduate Program Committee and authorized by the dean of the Graduate School, are required for admission. Requirements listed here are in addition to general Graduate School admission requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Qualified students with undergraduate preparation in biological, biochemical, or physical sciences may apply. An adequate background in biology, general and organic chemistry, and mathematics and an overall grade-point average of 3.00 or better are required.

The best-qualified applicants will be accepted on a space-available basis. Formal applications should contain three letters of recommendation and a brief personal essay summarizing the background and professional goals of the applicant.

Doctoral Degree Requirements

During the first year of study, Ph.D. candidates take The College of Medicine Core Curriculum (BMS 501 Regulation of Cellular and Systemic Energy Metabolism, BMS 502 Cell and Systems Biology, and BMS 503 Flow of Cellular Information) in the Fall semester to provide a strong foundation. Additional Required courses are GENET 581, IBIOS 580, IBIOS 591, MICRO 550, MICRO 551, MICRO 553, MICRO 560, MICRO 572, MICRO 581, MICRO 582, MICRO 583, MICRO 590, and MICRO 602. To augment the core sequence of courses, students and their thesis committees will formulate an individualized advanced curriculum including departmental courses, as well as graduate courses offered by other departments.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of

the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

MICROBIOLOGY (MICRO) course list

BIOLOGICAL CHEMISTRY (BCHEM) course list

CELL AND MOLECULAR BIOLOGY (CMBIO) course list

Last Revised by the Department: Spring Semester 2008

Blue Sheet Item #: 36-03-085

Review Date: 11/27/07

DATE LAST REVIEWED BY GRADUATE SCHOOL: 6/1/04

Last reviewed by Publications: 5/27/09

Mineral Processing (MN PR)

Program Home Page (Opens New Window)

YAW D. YEBOAH, *Head of the Department of Energy and Geo-Environmental Engineering*
MARK S. KLIMA, *Associate Department Head*

Department Office
110 Hosler Building
814-865-3437

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Frank Aplan, Sc.D. (MIT) *Distinguished Professor Emeritus of Metallurgy and Mineral Processing*
- Leonard G. Austin, Ph.D. (Penn State) *Professor Emeritus of Fuels and Mineral Engineering*
- Richard Hogg, Ph.D. (California, Berkeley) *Professor Emeritus of Mineral Processing and Geo-Environmental Engineering*
- M. Thaddeus Ityokumbul, Ph.D. (U of Western Ontario) *Associate Professor of Mineral Processing and Geo-Environmental Engineering*
- Mark S. Klima, Ph.D. (Penn State) *Associate Professor of Mineral Processing and Geo-Environmental Engineering*
- Harold Lovell, Ph.D. (Penn State) *Professor Emeritus of Mineral Engineering*
- Peter T. Luckie, Ph.D. (Penn State) *Professor Emeritus of Mineral Engineering*
- Kwadwo A. Osseo-Asare, Ph.D. (California, Berkeley) *Professor of Metallurgy*

The Department of Energy and Geo-Environmental Engineering provides a vertically integrated approach to research and education in all aspects of the energy and mineral industries, including scientific and engineering issues, health and safety and maintenance of high environmental standards. The department's mission is to forge an intellectual and scientific cohesiveness in energy and mineral resource technology. This objective is achieved by exploiting the natural synergy between the exploration, extraction, processing and utilization of energy and mineral resources so as to cater to the emerging needs of society.

The Department of Energy and Geo-Environmental Engineering offers advanced degrees in six programmatic areas (Energy and Geo-Environmental Engineering, Industrial Health and Safety, Mineral Processing, Mining Engineering, Oil and Gas Engineering Management, and Petroleum and Natural Gas Engineering). Each academic degree program has specific faculty associated with it and a professor who serves as the graduate program chair. The Department of Energy and Geo-Environmental Engineering has overall requirements for the M.S., M.Eng., and Ph.D. degrees with specific requirements associated with each program.

Mineral Processing Program

Mineral Processing is concerned with the extraction and purification of valuable commodities from the earth. The raw materials produced by mining are highly impure and must be upgraded before they are of use to society. For example, the cleaning of coal to minimize pollution is an area of national and international concern. Energy, raw materials, and the environment are some of the most serious problem areas facing the world today. Mineral processing engineers play a key role in solving these problems.

The refining of mineral commodities involves a broad variety of problems, mostly associated with the production, handling, and separation of solid particles. Particle systems are also critical to many of the processes and products of modern industry: materials, chemicals, and electronics as well as minerals. Mineral processing engineers are at the forefront of the science and technology of particle systems, and many of the techniques and procedures used in mineral processing find direct application in other areas. Training of a mineral processing engineer involves interdisciplinary study of chemistry, physics, the geological sciences, and engineering with special emphasis on concentration by physical methods; surface chemistry of particles; particle processing; chemical and thermal extraction processes, etc.

Pollution control and the preservation of environmental quality are of major concern to the mineral processing profession. The mining and processing industries produce large quantities of solid waste which must be disposed of properly. Process water must be treated for reuse or disposal and processing systems must be designed and operated to minimize air pollution. Many air and water pollution control methods use equipment and processes originally developed for the mineral industries. Mineral processing methods are also involved in the recovery, recycling, and reuse of metals and other materials.

Admission Requirements

Scores for the Graduate Record Examinations (GRE) are required for admission, though this may be waived at the discretion of the academic programs. The best-qualified applicants will be accepted up to the number of spaces available for new students. Students will be accepted by the academic programs and at the discretion of a graduate program, a student may be granted provisional admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*

Admission to the academic programs in the Department of Energy and Geo-Environmental Engineering is competitive. Entering students must hold a bachelor's degree in engineering or physical sciences. Students with 3.00 or better (out of 4.00) junior/senior cumulative grade-point averages and appropriate course backgrounds will be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Entering graduate students in Energy and Geo-Environmental Engineering for whom English is not the first language are required to have a score of at least 550 on the Test of English as a Foreign Language (TOEFL) examination. Letters of recommendation and a statement of purpose written by the applicant are also required.

Masters Degree Requirements

The M.S. degree programs in the Department of Energy and Geo-Environmental Engineering are designed for students to gain advanced knowledge for research, analysis, and design in Energy and Geo-Environmental Engineering, Industrial Health and Safety, Mineral Processing, Mining Engineering, and Petroleum and Natural Gas Engineering. Students pursuing an M.S. degree will be required to

complete 24 course credits and submit a thesis (6 credits) to the Graduate School. Graduate committees in each academic program play an important role in formulating individual course and research schedules.

The Mining Engineering and Oil and Gas Engineering Management programs also offer an M.Eng. degree. Students pursuing an M.Eng degree are required to present a scholarly written report on a suitable project, the topic of which may be suggested by the industry. The report must be a scholarly achievement, relating a developmental study that involves an appropriate, significant subject in the discipline. The report must be approved by a committee of the faculty comprised of report adviser, report reader, and chair of the program.

The specific credit requirements and other specifics of the master's programs in Energy and Geo-Environmental Engineering are available upon request.

Doctoral Degree Requirements

The Ph.D. programs in the Department of Energy and Geo-Environmental Engineering emphasize scholarly research and help students prepare for research and related careers in industry, government and academe. Acceptance into the Ph.D. degree programs in the Department of Energy and Geo-Environmental Engineering are based on the student's performance on the Ph.D. candidacy examination administered by the faculty of a specific academic program. A comprehensive examination is required of all Ph.D. candidates and should be taken after substantial completion of course work. The comprehensive examination is the responsibility of the candidate's doctoral committee and administered according to the rules specified by the Graduate School. The Ph.D. programs in Energy and Geo-Environmental Engineering are quite flexible with minimum formal requirements. The communication and foreign language requirements for the Ph.D. degree may be satisfied by intermediate knowledge of one foreign language. The general requirements for graduation are outlined in the GENERAL INFORMATION section of the *Graduate Bulletin*. The specific credit requirements of the Ph.D. programs in Energy and Geo-Environmental Engineering are available upon request.

Other Relevant Information

All graduate students are expected to attend general department seminars and seminars in their programmatic areas. Graduate students may be asked to contribute to the instructional programs of the department by assisting with laboratory and lecture courses.

Students in Mining Engineering and Petroleum and Natural Gas Engineering may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (*See also* Operations Research.)

Student Aid

Graduate students are supported by a variety of government and industry fellowships, and research and teaching assistantships. Stipends vary depending on the source. Please see the STUDENT AID section of the *Graduate Bulletin* to learn other forms of the student aid.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ENERGY AND GEO-ENVIRONMENTAL ENGINEERING (EGEE) course list

MINERAL PROCESSING (MN PR) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/17/04

Last updated by Publications: 1/21/10 (link check; department head check)

Mining Engineering (MNGE)

Program Home Page (Opens New Window)

YAW D. YEBOAH, *Head of the Department of Energy and Mineral Engineering*
MARK S. KLIMA, *Associate Department Head*

Department Office
110 Hosler Building
814-865-3437

Degrees Conferred:

Ph.D., M.S., M.Eng.

The Graduate Faculty

- Z. T. Bieniawski, D.Sc. (Eng) (U Pretoria) *Professor Emeritus of Mineral Engineering*
- Christopher J. Bise, Ph.D. (Penn State) *Professor of Mining Engineering, and Industrial Health and Safety; George H., Jr., and Anne B. Deike Chair in Mining Engineering*
- Robert L. Frantz, M.S. (Penn State) *Professor Emeritus of Mining Engineering*
- Maochen Ge, Ph.D. (Penn State) *Associate Professor of Mining Engineering*
- H. Reginald Hardy, Ph.D. (Virginia Tech) *Professor Emeritus of Mining Engineering*
- M. Thaddeus Ityokumbul, Ph.D. (Univ. of Western Ontario) *Associate Professor of Mineral Processing and Geo-Environmental Engineering*
- Vladislav Kecojevic, Ph.D. (U Belgrade) *Assistant Professor of Mining Engineering*
- Mark S. Klima, Ph.D. (Penn State) *Associate Professor of Mineral Processing and Geo-Environmental Engineering*
- Jan M. Mutmansky, Ph.D. (Penn State) *Professor Emeritus of Mining Engineering*
- Barry L. Phelps, Ph.D. (Penn State) *Associate Professor Emeritus of Mining Engineering*
- Raja V. Ramani, Ph.D. (Penn State) *Professor Emeritus of Mining and Geo-Environmental Engineering*
- Andrew P. Schissler, Ph.D. (Colorado School of Mines) *Assistant Professor of Mining Engineering*

The Department of Energy and Geo-Environmental Engineering provides a vertically integrated approach to research and education in all aspects of the energy and mineral industries, including scientific and engineering issues, health and safety and maintenance of high environmental standards. The department's mission is to forge an intellectual and scientific cohesiveness in energy and mineral resource technology. This objective is achieved by exploiting the natural synergy between the exploration, extraction, processing and utilization of energy and mineral resources so as to cater to the emerging needs of society.

The Department of Energy and Geo-Environmental Engineering offers advanced degrees in six programmatic areas (Energy and Geo-Environmental Engineering, Industrial Health and Safety, Mineral Processing, Mining Engineering, Oil and Gas Engineering Management, and Petroleum and Natural Gas Engineering). Each academic degree program has specific faculty associated with it and a professor who serves as the graduate program chair. The Department of Energy and Geo-Environmental Engineering has overall requirements for the M.S., M.Eng., and Ph.D. degrees with specific requirements associated with each program.

Mining Engineering: The objectives of the Mining Engineering program are to train students in the methodology of research and expand the student's knowledge in selected subjects related to research as well as to the entire field of mining engineering.

Areas of specialization in research and course work include computer applications, environmental control, geomechanics and rock mechanics, health and safety, innovative mining systems, materials handling, mine electrical systems, mine maintenance, mine management, mine planning and reclamation, monitoring and control, operations research, surface mining, underground mining, and ventilation. Interests cover coal, metal, and nonmetal mining.

The program has outstanding facilities for mining engineering research. Among these are the Mining Computer Laboratory, Rock Mechanics Laboratory, and Ventilation Laboratory.

Admission Requirements

Scores for the Graduate Record Examinations (GRE) are required for admission, though this may be waived at the discretion of the academic programs. The best-qualified applicants will be accepted up to the number of spaces available for new students. Students will be accepted by the academic programs and at the discretion of a graduate program, a student may be granted provisional admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*

Admission to the academic programs in the Department of Energy and Geo-Environmental Engineering is competitive. Entering students must hold a bachelor's degree in engineering or physical sciences. Students with 3.00 or better (out of 4.00) junior/senior cumulative grade-point averages and appropriate course backgrounds will be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Entering graduate students in Energy and Geo-Environmental Engineering for whom English is not the first language are required to have a score of at least 550 on the Test of English as a Foreign Language (TOEFL) examination. Letters of recommendation and a statement of purpose written by the applicant are also required.

Master's Degree Requirements

The M.S. degree programs in the Department of Energy and Geo-Environmental Engineering are designed for students to gain advanced knowledge for research, analysis, and design in Energy and Geo-Environmental Engineering, Industrial Health and Safety, Mineral Processing, Mining Engineering, and Petroleum and Natural Gas Engineering. Students pursuing an M.S. degree will be required to complete 24 course credits and submit a thesis (6 credits) to the Graduate School. Graduate committees in each academic program play an important role in formulating individual course and research schedules.

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report must be a scholarly achievement, relating a developmental study that involves an appropriate, significant subject in the discipline. The report must be approved by a committee of the faculty comprised of report adviser, report reader, and chair of the program.

The specific credit requirements and other specifics of the master's programs in Energy and Geo-Environmental Engineering are available upon request.

Doctoral Degree Requirements

The Ph.D. programs in the Department of Energy and Geo-Environmental Engineering emphasize scholarly research and help students prepare for research and related careers in industry, government and academe. Acceptance into the Ph.D. degree programs in the Department of Energy and Geo-Environmental Engineering are based on the student's performance on the Ph.D. candidacy examination administered by the faculty of a specific academic program. A comprehensive examination is required of all Ph.D. candidates and should be taken after substantial completion of course work. The comprehensive examination is the responsibility of the candidate's doctoral committee and administered according to the rules specified by the Graduate School. The Ph.D. programs in Energy and Geo-Environmental Engineering are quite flexible with minimum formal requirements. The communication and foreign language requirements for the Ph.D. degree may be satisfied by intermediate knowledge of one foreign language. The general requirements for graduation are outlined in the GENERAL INFORMATION section of the *Graduate Bulletin*. The specific credit requirements of the Ph.D. programs in Energy and Geo-Environmental Engineering are available upon request.

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Students in Mining Engineering and Petroleum and Natural Gas Engineering may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (*See also* Operations Research.)

Student Aid

Graduate students are supported by a variety of government and industry fellowships, and research and teaching assistantships. Stipends vary depending on the source. Please see the STUDENT AID section of the *Graduate Bulletin* to learn other forms of the student aid.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ENERGY AND GEO-ENVIRONMENTAL ENGINEERING (EGEE) course list

MINING (MNG) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/17/04

Last updated by Publications: 1/22/10 (link check; department head check)

Molecular Medicine (M M)

Program Home Page

Current Co-Chairs

AVERY AUGUST, Department of Veterinary and Biomedical Sciences, University Park
CHARLES H. LANG, Department of Cellular and Molecular Physiology, College of Medicine, Penn State Hershey Medical Center

Degrees Conferred:

Ph. D., M.S.

The Graduate Faculty

- Avery August , Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- David Antonetti, Ph.D. (Cellular and Molecular Physiology, College of Medicine)
- Rebecca Bascom, M.D. (Medicine, College of Medicine)
- Sarah Bronson, Ph.D. (Cellular and Molecular Physiology, College of Medicine)
- Craig E. Cameron, Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Margherita Cantorna , Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Douglas R. Cavener, Ph.D. (Biology, ECoS)
- Gary Clawson, M.D., Ph.D. (Pathology, Molecular Biology and Biochemistry, and Gittlen Cancer Center, College of Medicine)
- James Connor, Ph.D. (Neural and Behavioral Sciences, College of Medicine)
- Pamela Correll, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Richard Courtney, Ph.D. (Microbiology and Immunology, College of Medicine)
- Kristen Eckert, Ph.D. (Pathology, Molecular Biology and Biochemistry, and Gittlen Cancer Center, College of Medicine)
- Nina Federoff, Ph.D. (Biology, ECoS)
- Richard Frisque, Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Robert Gabbay, M.D., Ph.D. (Medicine, College of Medicine)
- Thomas Gardner, M.D. (Molecular Biology and Physiology, College of Medicine)
- Adam Glick, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Channe Gowda, Ph.D. (Molecular Biology and Biochemistry, College of Medicine)
- Eric Harvill, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Biao He, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Andrew Henderson, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Jianming Hu, Ph.D. (Microbiology and Immunology, College of Medicine)
- Harriet Isom, Ph.D. (Microbiology and Immunology, College of Medicine)
- Leonard Jefferson, Ph.D. (Cellular and Molecular Physiology , College of Medicine)
- Michael Katzman, M.D. (Medicine, College of Medicine)
- Ralph Keil, Ph.D. (Molecular Biology and Biochemistry, College of Medicine)
- Mark Kester, Ph.D. (Pharmacology, College of Medicine)
- Kouacou Konan , Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Zhi-Chun Lai, Ph.D. (Biology and Biochemistry & Molecular Biology, ECoS)
- Charles H. Lang, Ph.D. (Cellular and Molecular Biology, College of Medicine)
- Kathryn LaNoue, Ph.D. (Cellular and Molecular Physiology, College of Medicine)
- Philip Lazarus, Ph.D. (Pharmacology, College of Medicine)
- Robert Levenson, Ph.D. (Pharmacology, College of Medicine)
- Thomas Loughran, M.D. (Penn State Cancer Institute, College of Medicine)
- Bernhard Luscher, Ph.D. (Biology and Biochemistry &Molecular Biology, ECoS)
- Christopher Lynch, Ph.D. (Cellular and Molecular Physiology, College of Medicine)
- Andrea M. Mastro, Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Patricia McLaughlin, Ph.D. (Neural and Behavioral Sciences, College of Medicine)
- Jan McAllister, Ph.D. (Cellular and Molecular Physiology, College of Medicine)
- Craig Meyers, Ph.D. (Microbiology and Immunology, College of Medicine)
- David Mu, Ph.D., (Pathology, and Biochemistry and Molecular Biology, College of Medicine)
- Kathleen Mulder, Ph.D. (Pharmacology, College of Medicine)
- Christopher Norbury, Ph.D. (Microbiology and Immunology, College of Medicine)
- Curt Omiecinski, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Leslie Parent, M.D. (Medicine, College of Medicine)
- Robert Paulson, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Gary Perdew, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Jeffrey M. Peters, Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)
- Joseph Reese, Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Ira Ropson, Ph.D. (Molecular Biology and Biochemistry, College of Medicine)
- Carl Barth Roundtree, Ph.D. (Pediatrics and Pharmacology, College of Medicine)
- Jeffery Sample, Ph.D. (Micrbiology and Immunology, College of Medicine)
- Robert A. Schlegel, Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Cara-Lynn Schengrund, Ph.D. (Molecular Biology and Biochemistry, College of Medicine)
- Ian Simpson, Ph.D. (Neural and Behavioral Sciences, College of Medicine)
- Jill Smith, M.D. (Medicine, College of Medicine)
- Michael Smith, Ph.D. (Radiology, College of Medicine)
- Shao-Cong Sun, Ph.D. (Microbiology and Immunology, College of Medicine)
- Song Tan, Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Michael Teng, Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Diane Thiboutot, M.D. (Medicine, College of Medicine)
- Thomas Vary, Ph.D. (Cellular and Molecular Physiology, College of Medicine)
- Kent Vrana, Ph.D. (Pharmacology, College of Medicine)
- Yanming Wang, Ph.D. (Biochemistry and Molecular Biology, ECoS)
- Na Xiong , Ph.D. (Veterinary and Biomedical Sciences, College of AgSci)

- Ian Zagon, Ph.D. (Neural and Behavioral Sciences, College of Medicine)
- Jiyue Zhu, Ph.D. (Cellular and Molecular Physiology, College of Medicine)

The Intercollege Graduate Program in Molecular Medicine (IGDP in MM) prepares graduates for diverse opportunities in academic institutions, pharmaceutical companies, private research foundations, governmental research and regulatory programs. The program includes faculty from 14 academic units in the College of Agricultural Sciences and Eberly College of Science at the University Park campus and the College of Medicine at the Penn State Milton S. Hershey Medical Center. The IGDP in MM is also supported by the Huck Institutes of Life Sciences which provides modern telecommunications facilities and sophisticated equipment for state-of-the-art research applications. Doctoral students not only explore new conceptual connections, but also engage in active group learning experiences and explore a variety of potential career opportunities before graduation. Two unique aspects are (1) optional dual mentors will expose students to complementary viewpoints and encourage students to pursue problems at the interface between traditional disciplines, and (2) an optional internship will provide a mechanism for students to obtain practical experience in future professional settings.

General Admission Requirements

Ph.D. degrees

Application deadline is December 1 for priority consideration.

1. Completed official Penn State Graduate School application for the IGDP in Molecular Medicine
2. Paid nonrefundable application fee
3. Two official transcripts from each institution attended
4. Application for a U.S. visa (International applicants only)
5. Graduate Record Examinations (GRE) general test
6. Three letters of recommendation
7. Statement of goals that pertains to the life sciences
8. All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) examination. A minimum TOEFL score of 550 on the paper test, a score of 213 on the computer-based test, or a score of 80 on the internet-based test is required.
9. Students must have completed a bachelor's degree at an accredited college or university and have a minimum of a 3.0/4.0 junior/senior undergraduate grade-point average.

Program Requirements

Ph.D. degrees

1. Foundation of basic knowledge in cancer biology, toxicology, immunology, infectious diseases, molecular biology, cell biology, biochemistry. The IGDP in MM requires at least 9 credits in one or more of these disciplines. Students may request a waiver of a required if they have taken the specific course as an undergraduate or a similar course at another institution. The request will be made in writing to the campus curriculum committee after consultation with the co-chair. The following courses are to fulfill this requirement.

University Park

BIOCHEMISTRY AND MOLECULAR BIOLOGY (B M B)
464. Molecular Medicine (3 credits)

BIOCHEMISTRY, MICROBIOLOGY & MOLECULAR BIOLOGY (BMMB)
501. Biochemistry & Molecular Biology (5 credits)

INTEGRATIVE BIOSCIENCES (IBIOS)
VBS/IBIOS 511. Molecular Immunology (2 credits)
590. Colloquium(1 credit)
591. Ethics in Life Sciences (1 credit)
596. Independent Studies: 3 Laboratory Rotations (1 credit)

Penn State Hershey

College of Medicine Core Curriculum

BIOMEDICAL SCIENCE (BMS)
501. Regulation of Cellular and Systemic Energy Metabolism (3 credits)
502. Cell and Systems Biology (3 credits)
503. Flow of Cellular Information (3 credits)

Molecular Medicine Core Curriculum

INTEGRATIVE BIOSCIENCES (IBIOS)
590. Colloquium (1 credit)
591. Ethics in Life Sciences (1 credit)
596 Independent Studies: 3 Laboratory Rotations (1 credit)

Electives

Five additional credits from the College of Medicine Selective Courses

To augment the core sequences of courses, students and their research committees will formulate an individualized advanced curriculum. Additionally, opportunities to participate in an internship (IBIOS 595) or supervised college teaching experiences (IBIOS 602/VBS 602) are available. Interested graduate students are to discuss the opportunity with a MM IGDP Co-Chair and/or their faculty advisor.

IBIOS 595. INTERNSHIP (1 credit). For students interested in exploring academic, government, medical, law, or business corporate approaches to research. This is an external work assignment relevant to individual research or career goals. Interested graduate students are to discuss the opportunity with the IGDP in MM co-chair and/or their faculty advisor.

IBIOS 602/VBS 602. SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1 credit). All students are strongly encouraged to enroll for 1 credit

(or the equivalent) of Supervised Experience in College Teaching before the beginning of their third year. International fellows from non-English speaking countries must pass an English proficiency exam before any teaching duties are assigned.

M.S. Degree Requirements

Although the graduate program in Molecular Medicine generally gives admission to students who seek the Ph.D. degree, on occasion, the program may allow candidates to pursue the Master of Science (M.S.) degree. This degree can also serve as an alternative for students who do not proceed to the Ph.D. for any number of reasons. It should be noted that an M.S. degree is not required for entry into the Ph.D. program of the Molecular Medicine IGDP. Masters students must have a minimum of 30 credits and a 3.0 overall GPA. IBIOS 595 (Internship), 596 (Rotations), and 602 (Teaching) credits all count toward the 30 credits. 18 credits need to be in the major at the 500-600 level.

Student Aid

Graduate assistantships available in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. Under normal circumstances, all students admitted and continuing in good standing are provided with graduate assistantship support from University sources, research grants, or fellowships. Financial support is usually not provided for work toward a M.S. degree.

Courses

Graduate courses carry numbers from 500-599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

For course descriptions see the corresponding URLs.

INTEGRATED BIOSCIENCES (IBIOS) course list

BIOCHEMISTRY, MICROBIOLOGY & MOLECULAR BIOLOGY (BMMB) course list

VETERINARY AND BIOMEDICAL SCIENCES (VBS) course list

BIOCHEMISTRY AND MOLECULAR BIOLOGY (BCHEM) course list

MICROBIOLOGY AND IMMUNOLOGY (MICRO) course list

CELL AND MOLECULAR BIOLOGY (CMBIO) course list

BIOLOGY (BIOL) course list

MICROBIOLOGY (MICRB) course list

STATISTICS (STAT) course list

HEALTH EVALUATION SCIENCES (HES) course list

PHYSIOLOGY (PSIO) course list

PHARMACOLOGY (PHARM) course list

PATHOLOGY (PATH) course list

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-443

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Last updated by Publications: 8/19/09

Molecular Toxicology

Program Home Page (Opens New Window)

JEFFREY M. PETERS, *Co-Chair*
Intercollege Graduate Degree Program in Molecular Toxicology
312 Life Sciences Building
University Park, PA 16802
814-863-1387

JONG YUN, *Co-Chair*
Intercollege Graduate Degree Program in Molecular Toxicology
College of Medicine, Penn State Milton S. Hershey Medical Center
500 University Drive
Hershey, PA 17033

Degrees Conferred:

Ph. D., M.S.

The Graduate Faculty

- Shantu Amin, Ph.D. (Stevens Institute of Technology) Professor of Pharmacology and Biochemistry and Molecular Biology
- Anne Andrews, Ph.D. (American University) Assistant Professor of Veterinary and Biomedical Sciences
- Keith Cheng, M.D.; Ph.D. (NYU; U Washington) Associate Professor of Pathology; Adjunct Professor of Biochemistry and Molecular Biology
- Gary Clawson, Ph.D.; M.D., (Michigan State; Miami) Professor of Pathology, and Biochemistry and Molecular Biology
- Kristin Eckert, Ph.D. (Wisconsin, Madison) Associate Professor of Pathology, and Biochemistry and Molecular Biology
- Karam El-Bayoumy, Ph.D. (New York University) Professor of Pharmacology and Biochemistry and Molecular Biology
- Adam Glick, Ph.D. (Yale) Associate Professor of Veterinary and Biomedical Sciences
- Christopher Herzog, Ph.D. (Medical College of Ohio) Assistant Professor of Pharmacology
- Harriet Isom, Ph.D. (Illinois) Assistant Dean and Director of the M.D./Ph.D. Program; Distinguished Professor of Microbiology and Immunology and Professor of Pathology
- Mark Kester, Ph.D. (SUNY, Buffalo) Professor of Pharmacology
- Philip Lazarus, Ph.D. (McGill) Associate Director Penn State Cancer Institute
- Robert Levenson, Ph.D. (SUNY, Stony Brook) Professor of Pharmacology
- Keith Martin, Ph.D. (North Carolina, Greensboro) Assistant Professor of Nutrition
- Andrea M. Mastro, Ph.D. (Penn State) Professor of Microbiology and Cell Biology
- Kathleen Mulder, Ph.D. (SUNY, Buffalo) Professor of Pharmacology
- Chris Mullin, Ph.D. (Cornell) Professor of Insect Toxicology
- Curtis J. Omiecinski, Ph.D. (U of Washington) Professor of Veterinary and Biomedical Sciences
- Gary Perdew, Ph.D. (Oregon State) Distinguished Professor of Molecular Toxicology
- Jeffrey M. Peters, Ph.D. (California, Davis) Associate Professor of Molecular Toxicology
- C. Channa Reddy, Ph.D. (Indian Inst of Science) Distinguished Professor and Head of Veterinary and Biomedical Sciences
- John Richie, Ph.D. (Louisville) Professor of Health Evaluation Sciences
- Gavin Robertson, Ph.D. (California, Riverside) Assistant Professor of Pharmacology
- Thomas Spratt, Ph.D. (Chicago) Associate Professor of Biochemistry and Molecular Biology
- Chen-Pei David Tu, Ph.D. (Cornell) Professor of Biochemistry and Molecular Biology
- John Vanden Heuvel, Ph.D. (Wisconsin) Associate Professor of Molecular Toxicology
- Kent Vrana, Ph.D. (Louisiana State) Professor and Chair of Pharmacology
- Jong Yun, Ph.D. (Case Western Reserve) Assistant Professor of Pharmacology
- Jiyue Zhu, Ph.D. (Dartmouth Medical School) Assistant Professor of Cellular and Molecular Physiology

The Intercollege Graduate Program in Molecular Toxicology (IGDP in MT) prepares graduates for diverse opportunities in academic institutions, pharmaceutical companies, private research foundations, governmental research, and regulatory programs. The program includes faculty from eight departments in the College of Agricultural Sciences, Health and Human Development and Eberly College of Science at the University Park campus and the College of Medicine at the Penn State Milton S. Hershey Medical Center. The IGDP in MT is also supported by the Huck Institutes of Life Sciences, which provides modern telecommunications facilities and sophisticated equipment for state-of-the-art research applications. Doctoral students not only explore new conceptual connections, but also engage in active group-learning experiences and explore a variety of potential career opportunities before graduation. Two unique aspects are (1) optional dual mentors will expose students to complementary viewpoints and encourage students to pursue problems at the interface between traditional disciplines, and (2) an optional internship will provide a mechanism for students to obtain "real world" experience in future professional settings.

General Admission Requirements

M.S. or Ph.D. degrees

Application deadline is January 10 for priority consideration.

1. Completed official Penn State Graduate School application
2. Paid nonrefundable application fee
3. Two official transcripts from each institution attended
4. Completed Integrative Biosciences Graduate Degree Program application
5. Application for a U.S. visa (International applicants only)
6. Graduate Record Examinations (GRE) general test
7. Three letters of recommendation
8. Statement of goals that pertains to the life sciences
9. International applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English, must take the TOEFL (Test of English as a Second Language) and submit

the results of that test with the application for admission. A TOEFL score of 550 on the paper test, a score of 213 on the computer-based test, or 80 points on the internet-based test with a minimum of 23 points on the speaking portion is required for admission.

10. Students must have completed a bachelor's degree at an accredited college or university and have a minimum of a 3.0/4.0 junior/senior undergraduate grade-point average.

Additional English Requirement for International Students (both M.S. and Ph.D.)

International applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English, whether or not they hold a teaching assistantship, will be required to take the AEOCPT (American English Oral Communicative Proficiency Test) prior to entering the classroom. The AEOCPT is given at the beginning of fall and spring semesters. All international students are required to preregister for this test. This test is administered at the University Park campus, thus students from the Hershey campus are required to take the test at the University Park campus. Below is the course of action for the score ranges:

- Greater than 250 approved for teaching and the ESL (English as a Second Language) requirement will be satisfied.
- 230-249 required to schedule and pass ESL 118G.
- 200-229 required to pass ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.
- Less than 200 required to schedule and pass with the grade of A ESL 115G, before ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

* At the end of this course, students are re-tested. Based upon these test results, students are either approved for teaching, placed in a subsequent ESL course, or asked to retake the course. Students who are required to enroll in ESL courses must complete the ESL requirement by the end of the second semester of residency. As noted above, the ESL courses are taught at the University Park campus, thus students from the Hershey campus must attend these courses at the University Park campus, or receive suitable course work at Hershey, if available. Students who fail to satisfy this requirement may be terminated from the IGDP in MT program, at the discretion of the co-chairs.

Program Requirements

M.S. or Ph.D. degrees

1. Foundation of basic knowledge in molecular biology, cell biology, biochemistry, and molecular toxicology. The IGDP in MT requires at least 9 credits in one or more of these disciplines, taken either as an undergraduate or as a part of the graduate curriculum. The following courses are requirements for respective campuses.

University Park students

BIOCHEMISTRY AND MOLECULAR BIOLOGY (B M B)
400. MOLECULAR BIOLOGY OF THE GENE (3 credits)

VETERINARY AND BIOMEDICAL SCIENCES (VB SC)
433. MOLECULAR AND CELLULAR TOXICOLOGY (3 credits)

VETERINARY SCIENCE (V SC)
V SC/IBIOS 530. REGULATION OF GENE EXPRESSION (3 credits)

Hershey Medical Center Students

CELL AND MOLECULAR BIOLOGY (CMBIO)
502. CORE BIOCHEMISTRY (3 credits)
503. MOLECULAR BIOLOGY (3 credits)

PHARMACOLOGY (PHARM)
520. PRINCIPLES OF DRUG ACTION (2 credits)

In addition to these required courses, electives must also be taken to fulfill the required number of academic credits for either an M.S. or Ph.D. degrees.

1. **IBIOS 570 MOLECULAR TOXICOLOGY SEMINAR (2 credits, 1 per semester during any of the first four semesters in residence)**, a monthly colloquium that will present molecular toxicology topics of general interest to all faculty and graduate students in the IGDP in MT.
2. **IBIOS 590 COLLOQUIUM (2 credits)** All students are required to enroll for 4 credits of Colloquium. Students typically take this course in the fall and spring semesters of their first year. In Colloquium, students are introduced to a wide variety of topics of contemporary and future importance in the life sciences. A particular focus is placed on topics where science is likely to impact on society (and society on science). Topics are drawn from the area introduced by the speaker and can span the entire spectrum from basic research to the social, legal, moral and ethical implications of the science. A significant challenge in Colloquium is to organize and coordinate a presentation using contemporary presentation software, such as PowerPoint, in an environment in which part of the audience is present at a remote site. Students are required to attend the lectures and the dinners following the lectures. Students also participate in the group presentations during discussion sessions and submit written reports. Reports may be submitted to the co-chairs of the IGDP who may add them to the student's permanent record. Students receive A-F quality grades.
3. **IBIOS 591. ETHICS IN THE LIFE SCIENCES (1 credit)** Usually taken the fall semester of their second year, students exam integrity and misconduct in life sciences research, including issues of data collection, publication, authorship, and peer review. Students receive A-F quality grades.
4. **IBIOS 595. INTERNSHIP (1 credit, optional)** For students interested in exploring academic, government, medical, law, or business corporate approaches to research. This is an external work assignment relevant to individual research or career goals. Students receive an R (satisfactory/passing) or U (unsatisfactory/failing). Only R credits are counted for credit totals. Students typically participate in an internship the summer of their first or second year. Contacts, positions, applications, course registration, course requirements, and grading are processed through the Eberly College of Science Cooperative Education Program (814-865-5000). Additional credits of IBIOS 595 are at the expense of the student. Interested graduate students are to discuss the opportunity with the IGDP in MT chair and/or their faculty adviser.
5. **IBIOS 596. INDEPENDENT STUDIES: LABORATORY ROTATIONS (1-3 credits per semester)** For students exploring potential Ph.D. projects and faculty advisers. Students receive a R (satisfactory/passing) or F (unsatisfactory/failing). Only R credits are counted for credit totals.

6. **IBIOS 597(optional, variable credits)** SPECIAL TOPICS
7. **IBIOS 600. THESIS RESEARCH (1-9 per semester)** For students who have been matched with a faculty adviser AND have not taken/passed their comprehensive exams. Students may receive A-F grades or R/F grades at any time. By the time a student passes his/her comprehensive exam, up to 12 credits worth of IBIOS 600 may have the A-F quality grade.
8. **IBIOS 601. THESIS PREPARATION (0 per semester)** For those students who passed their comprehensive exams. This course appears on the transcript but does not have any grade or credit associated with it.
9. **VB SC 602/IBIOS 602. SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1 credit, optional)** All students are strongly encouraged to enroll for 1 credit (or the equivalent) of Supervised Experience in College Teaching before the beginning of their third year. Students typically take this course during the fall semester of their second year. To encourage teaching experience in toxicological sciences, students will be encouraged to enroll in VSC 602 for supervised experience in college teaching for a toxicology-related courses (VSC 433, VSC 430, ERM 431). As an alternative, after consulting with their respective adviser, students may elect to enroll in IBIOS 602. Teaching at Hershey is arranged by the co-chairs of the IGDP and co-director of graduate education for the IBIOS program. Students receive A-F grades on their transcripts but these grades are not computed in with the overall GPA. International fellows must pass an English proficiency exam before any teaching duties are assigned.
10. The Graduate School requires all graduate students to maintain a 3.0 grade-point average.

M.S. Degree Requirements

Masters students must have a minimum of 30 credits and a 3.0 overall grade-point average. For a master's thesis option, up to 6 IBIOS 600 credits may be A-F graded. Eighteen (18) credits must be at the 500 to 600 level, and a minimum of 12 credits need to be in the major at the 400 to 600 level (excluding IBIOS 600). The student selects a thesis committee (upon consultation with faculty adviser), writes a thesis, and defends his/her work. If pursuing a master's nonthesis option, the student must have a first-authored manuscript (based on his/her research) that has been either accepted and/or published in a peer reviewed journal. Additionally, for a master's nonthesis option, 18 credits need to be in the major at the 500 level. The manuscript is given to at least the faculty adviser and the IGDP Chair for evaluation. IBIOS 595 (Internship) and 596 (Rotations) credits count toward the 30 credits. However, the 602 (Teaching) optional credits do not count toward the 30 credits. All IGDP in Molecular Toxicology graduate students must successfully take the following list of required courses and/or electives during the first two years of their graduate education. If all course credits and requirements are met, students do not have to be registered for classes while writing and/or defending his/her work.

Year 1-Fall Semester			
University Park		*Hershey*	
Course	Credits	Course	Credits
B M B 400 Molecular Biology of the Gene	2-3	CMBIO 502 Core Biochemistry	3
IBIOS 570 Molecular Toxicology Seminar	2	PHARM 590 Pharmacology Colloquium	1
IBIOS 590 Colloquium	2	IBIOS 590 Colloquium	2
IBIOS 596 Independent Studies, Laboratory Rotations	1-2	IBIOS 596 Independent Studies, Laboratory Rotations	1-2
VB SC 430 Principles of Toxicology	3	PHARM 520 Principles of Drug Action	2
Graduate Elective	2-4	Graduate Elective	2-4
Year 1-Spring Semester			
University Park		***Hershey***	
Course	**Credits**	**Course**	**Credits**
V SC/IBIOS 530 Regulation of Gene Expression	3	CMBIO 503 Molecular Biology	3
IBIOS 570 Molecular Toxicology Seminar	2	PHARM 590 Pharmacology Colloquium	1
IBIOS 590 Colloquium	2	IBIOS 590 Colloquium	2
IBIOS 600 Thesis Research	1-2	IBIOS 600 Thesis Research	1-2
VB SC 433 Molecular and Cellular Toxicology	3	Graduate Elective	3-6
Graduate Elective	3-6		

Year 2-Fall Semester			
University Park		***Hershey***	
Course	**Credits**	**Course**	**Credits**
IBIOS 570 Molecular Toxicology Seminar	2	PHARM 590 Pharmacology Colloquium	1
IBIOS 591 Ethics in Life Sciences	1	IBIOS 591 Ethics in Life Sciences	1
IBIOS 600 Thesis Research	3-6	IBIOS 600 Thesis Research	3-6
IBIOS/VB SC 602* Supervised Teaching	1	IBIOS 602* Supervised Teaching	1
Graduate Electives	3-6	Graduate Electives	3-6
Year 2-Spring Semester			
University Park		***Hershey***	
Course	**Credits**	**Course**	**Credits**
IBIOS 570 Molecular Toxicology Seminar	2	PHARM 590 Pharmacology Colloquium	1
IBIOS 600 Thesis Research	3-6	IBIOS 600 Thesis Research	3-6
Graduate Electives	3-6	Graduate Electives	3-6

*Optional

Students must present their thesis in accordance with the Penn State guidelines as described in the THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses. Current copies may be obtained from the Thesis Information Web site. For more informatin, contact the Thesis Office, 115 Kern Building, University Park, PA 16802; 814-865-5448.

Ph.D. Degree Requirements

Ph.D. students must have a minimum of 30 credits and a 3.0 overall grade-point average. For a master's thesis option, up to 6 IBIOS 600 credits may be A-F graded and 12 credits need to be in the major at the 400 to 600 level (excluding IBIOS 600). The course requirements are essentially the same as that required for the M.S. degree listed above, with some discretion left to the student and adviser.

Grade-Point Average/Unsatisfactory Scholarship

Students are required to maintain an overall 3.0 GPA throughout the program, and, in particular, must have a 3.0 to take the doctoral candidacy, the comprehensive examination, and the final oral examination. One or more failing grades or a cumulative grade-point average below 3.0 may be considered evidence of unsatisfactory scholarship and may be grounds for dismissal from the IGDP in MT.

English competence

A candidate for the degree of Doctor of Philosophy for the IGDP in MT is required to demonstrate a high-level competence in the use of the English language, including reading, writing, and speaking, as part of the language and communication requirements for the Ph.D. Programs are expected to establish mechanisms for assessing and improving competence of both domestic and international students. Toward this goal, all students must participate in the IBIOS 590 colloquium, which includes assessment of reading, original writing and speaking skills. International students must also demonstrate proficiency of the English language as part of the Additional English Requirement for teaching described above. During the course work prior to the candidacy examination, candidates will be assessed for communicative competence in reading, writing, and speaking English. Should a higher level of competence be required, the candidate will be directed to the appropriate resources. International students are advised that the passage of the minimum TOEFL requirements does not demonstrate the level of competence required for completion of the Ph.D. program. English competence must be demonstrated before the doctoral comprehensive examination is scheduled. Besides course work, research, and teaching, IGDP Molecular Toxicology doctoral students participate in the following:

Candidacy Exam

The Candidacy Exam is uniquely designed for each student. The exam should be taken by the end or during the student's third semester in the Integrative Biosciences graduate program. The student will be assigned a scientific paper from the biochemical literature to read and analyze; the paper will be selected based upon the student's background and course work. The analysis should involve exploring the relevant literature as well as the fundamental issues in toxicology, biochemistry, and biology. The student will be given ten days to write a three-page single-spaced review. At the same time the paper is assigned a meeting of the committee should be arranged for a sixty- to ninety-minute oral exam by the committee to review the written assignment and discuss other issues. The committee meeting shall be within twenty-one days of the original assignment of the paper. The student is not require to make a formal oral presentation, but should have overheads of the data for discussion purposes. The student should be able to integrate knowledge about chemical and biological

aspects of the paper and understand and evaluate the experimental design, rationale, results, and the authors' interpretation of their work. In the event that the student does not pass this exam, the student's committee will make a recommendation as to whether to offer another opportunity or to terminate the student's enrollment in the program.

Comprehensive Examination

Evaluation via the Doctoral Committee to determine the feasibility of proposed research and the preparedness of the student. Students must be registered for classes (typically IBIOS 600) the semester they take this exam.

Doctoral Committee

Upon successful completion of the Candidacy Examination, the student in consultation with the advisor will, as soon as possible, select a doctoral committee. The committee will consist of the advisor, two members of the IGDP in MT and up to two faculty members who are not a member of the IGDP in MT. If the student has selected the option of having dual advisors, then both of the advisors will be on the doctoral committee, along with two members of the IGDP in MT and one faculty member who is not a member of the IGDP in MT. If the faculty members from the IGDP in MT on the committee are also members of the same department, the one faculty member who is not a member of the IGDP in MT must be from a different department. This committee is responsible for supervising the academic program and monitoring the progress of the student towards his/her degree. Doctoral thesis committee composition is based on the Graduate Degree Programs Bulletin prepared by the Graduate School regarding Doctoral Committees and requires:

- Four-person minimum of approved Penn State Graduate Faculty.
- Two members must be inside the major and one member must be outside the major. Note: The outside member must be member of the approved Penn State Graduate Faculty. The outside member for intercollege graduate programs may be inside the major but committee membership must have representation from more than one department.
- A person not affiliated with Penn State may be added as a special member (beyond the four members of the approved Penn State Graduate Faculty) upon recommendation of the head of the program and approval of the graduate dean.
- Have committee chair or one of the co-chairs be a member of the approved Penn State Graduate Faculty. Typically it's the faculty adviser.
- The doctoral candidate and three committee members must be physically present for the comprehensive exam and defense. No more than one person may be present via telephone. Telephone or video conference arrangements must be approved by the Dean of the Graduate School.
- Need approval of two-thirds of the committee members for passing comprehensive exam and defense dissertation.

Ph.D. Defense

Evaluation via the Doctoral Committee of the thesis research. Students must present their thesis in accordance with the Penn State guidelines as described in the THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses. Current copies may be obtained from the Thesis Information Web site. For more informatin, contact the Thesis Office, 115 Kern Building, University Park, PA 16802; 814-865-5448.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BIOCHEMISTRY AND MOLECULAR BIOLOGY (B M B) course list

CELL AND MOLECULAR BIOLOGY (CMBIO) course list

INTEGRATED BIOSCIENCES (IBIOS) course list

PHARMACOLOGY (PHARM) course list

VETERINARY AND BIOMEDICAL SCIENCES (VB SC) course list

VETERINARY SCIENCE (V SC) course list

Last Revised by the Department: Spring Semester 2007

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Music (MUSIC and MU ED)

Program Home Page (Opens New Window)

SUE HAUG, *Director, School of Music*
233 Music Building
814-865-0431

Degrees Conferred:

- M.A., M.Mus., M.M.E.
- Ph.D.
- D.M.A.
- Music: Integrated Undergraduate-Graduate Degrees

The Graduate Faculty

- Sue Haug, D.M.A. (Iowa) Professor of Music
- Dan C. Armstrong, M.Mus. (Michigan) Professor of Music
- Eleanor Duncan Armstrong, D.Mus.A. (Michigan) Professor of Music
- Mark Ballora, Ph.D. (McGill) Associate Professor of Music
- Paul Barsom, Ph.D. (Eastman) Associate Professor of Music
- Vincent Benitez, Ph.D. (Indiana) Assistant Professor of Music
- Lisa J. Bontrager, M.Mus. (Michigan) Professor of Music
- Velvet Brown, M.Mus. (Boston) Professor of Music
- O. Richard Bundy, D.Ed. (Penn State) Professor of Music Education
- Maureen A. Carr, Ph.D. (University of Wisconsin) Distinguished Professor of Music
- Ann Clements, Ph.D. (Washington, Seattle) Assistant Professor of Music Education
- Kim Cook, M.Mus. (Yale) Professor of Music
- Timothy Deighton, D.Mus.A. (Kansas) Associate Professor of Music
- Lynn Drafall, D.Ed. (Illinois) Associate Professor of Music
- Daryl Durran, M.Mus. (Wisconsin, Milwaukee) Associate Professor of Music
- Gerardo Edelstein, M.Mus. (Rice) Associate Professor of Music
- Langston Fitzgerald III, D.Mus.A. (Catholic) Professor of Music
- Robert Gardner, Ph.D. (Eastman) Assistant Professor of Music Education
- Dennis Glocke, M.Mus. (Northwestern) Associate Professor of Music
- Taylor Greer, Ph.D. (Yale) Associate Professor of Music
- Stephen Hopkins, Ph.D. (Florida State) Assistant Professor of Music
- Timothy Hurtz, B.Mus. (Southern California) Associate Professor of Music
- Lisa Jenkins, Ph.D. (Michigan) Instructor in Music
- Richard Kennedy, M.Mus. (Indiana) Professor of Music
- Christopher Kiver, D.Mus.A. (Michigan) Assistant Professor of Music
- Anthony Leach, Ph.D. (Penn State) Associate Professor of Music
- Mark Lusk, M.Mus. (Eastman) Professor of Music
- James Lyon, M.Mus. (West Texas) Professor of Music
- Eric J. McKee, Ph.D. (Michigan) Associate Professor of Music
- Robert Nairn, Dipl.Mus. (Berlin Musikhochschule) Associate Professor of Music
- Joanne Rutkowski, Ph.D. (SUNY, Buffalo). Professor of Music Education
- Mary Saunders, M.A. (Middlebury College/Sorbonne, Paris) Associate Professor of Music
- Timothy Shafer, D.Mus. (Indiana) Professor of Music
- Steven H. Smith, D.Mus.A. (Eastman) Professor of Music
- Norman Spivey, D.Mus.A. (Michigan) Associate Professor of Music
- David Stambler, D.Mus.A. (Maryland) Associate Professor of Music
- Marica Tacconi, Ph.D. (Yale) Associate Professor of Music
- Linda Thornton, Ph.D. (Missouri) Assistant Professor of Music Education
- Jennifer Trost, M.Mus. (Michigan State) Assistant Professor of Music
- M. Daniel Yoder, M.Mus. (Idaho) Professor of Music
- Charles Youmans, Ph.D. (Duke) Associate Professor of Music
- Max Zorin, M.Mus. (Yale) Assistant Professor of Music

Admission Requirements

In addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin, the School of Music requires the completion of a recognized baccalaureate degree in music or music education, with a junior/senior grade-point average of 2.80 or higher (on a 4.00 scale), but admission to the Doctor of Musical Arts (D.M.A.) requires a grade point average of 3.00. Admission to the M.Mus. program requires an audition or the submission of compositions, or a list of works studied in preparation for conducting (depending on the specific degree); admission to the M.M.E. program requires the completion of 12-15 credits in music education methods at the undergraduate level and successful teaching or student teaching experience; admission to the Ph.D. requires an interview, submission of videotapes of teaching or conducting, scores from the Miller Analogies Test, and a portfolio of requested documents; admission to the M.A. program requires scores from the Graduate Record Examinations (GRE General Test), and evidence of scholarly writing on a musical topic. Information on additional requirements for entrance to the various degree programs can be obtained from the School of Music office. Admission to the D.M.A. (major in piano performance) requires an audition in person or by video recording of an extensive memorized program; students admitted to this program must perform musically at least at the level required to complete the degree Master of Music at Penn State, and must show potential ability to perform professionally. Additional requirements include an interview in person or by interactive video to assess language skills in addition to the University's requirement of specific performance on the TOEFL (550 on the paper test, 213 on the computer-based test, or 80 points on the new Internet test with a minimum of 20 on the new speaking portion) or alternatively, the International English Language Testing System (IELTS) with a minimum of 6.5.

Master's Degree Requirements

Three programs leading to the master of arts degree are offered. All three degrees require a research component. The M.A. in Music Theory and History (34 credits) provides an interdisciplinary approach to the field of music scholarship, whereas the M.A. in Musicology (32 credits) and the M.A. in Music Theory (32 credits) are more specialized in preparing students for doctoral study. All three programs require a thesis. A reading knowledge of German or another appropriate language must be demonstrated before thesis credit may be scheduled.

The master of music education degree provides opportunity for advanced study in the art of music, pedagogy, and systematic problem solving. Fulfillment of degree requirements includes successful completion of 30 credits of course work, a comprehensive examination, and a master's paper. (Twenty credits must be earned at the University Park campus.)

The master of music degree (36 credits) provides five majors: Performance, Composition/Theory, Conducting, Piano Pedagogy and Performance, and Voice Performance and Pedagogy. The M.Mus. in Performance offers three separate curricula with areas of emphasis in Voice, Keyboard, or Orchestral Instruments. Depending on the area of emphasis, a recital, a composition project, or a conducting project is required. For the M.Mus. in Performance with emphasis in voice or keyboard, a master's recital is required, in addition to either a master's paper or lecture-recital. For the M.Mus. in Performance (orchestral instruments), a master's recital is required. For the M.Mus. in Composition/Theory, a composition project and a master's paper are required. The M.Mus. in Conducting offers three areas of emphasis: Orchestral, Choral, or Band/Wind Ensemble. A performance project and a master's paper are required.

In all master's programs, at least one-half the required credits must be at the 500 level, and a comprehensive examination is required.

Doctoral Degree Requirements: Ph.D. in Music Education

The Ph.D. in Music Education is designed to provide opportunities for the highest level of scholarly study in the processes of teaching and learning music. Candidates are expected to develop and test new knowledge in the field of music education while preparing themselves for positions in higher education or other leadership roles within the profession. A candidacy exam, a doctoral thesis, and comprehensive written and oral examinations are required.

Doctoral Degree Requirements: D.M.A. major in Piano Performance

The Doctor of Musical Arts is offered with a major in Piano Performance. Four semesters in residence are required. The degree is designed to provide students with a thorough background of preparation and experience in professional-level performance and in the literature of the instrument, while becoming sufficiently knowledgeable about the discipline of music as a whole, in order to teach at the collegiate or university level. This background knowledge would include, but not be limited to, music theory, analysis, and history. Sixty credits are required beyond the Master of Music; if an exceptional student is admitted before completion of a prior Master of Music degree, the student will complete a total of 30 credits in categories equivalent to those required for the M.Mus., in addition to the 60 required for the D.M.A. A candidacy examination will follow upon two semesters completed in residence. Minimum course requirements (post-Master's degree) include sixteen credits (four semesters at 4 credits/semester) of Keyboard 580J applied music instruction; four credits of advanced ensembles; 10 credits of literature and pedagogy in the major area; and 18 credits in the broader discipline of music. the comprehensive examination will occur upon the completion of course work, before the final recital. The culminating experience of the D.M.A. degree is public performance: three memorized solo recitals are required (the final recital is prepared independently), and two recitals of chamber music. Although no written thesis is required, a lecture-recital is required, with a pre-approved monograph text.

Other Relevant Information

The School of Music sponsors many musical ensembles, and candidates for performance degrees are required to participate in positions of responsibility. All candidates for degrees are expected to be in residence for a minimum of two semesters, except that D.M.A. candidates must be in residence for at least four semesters.

The School of Music is a regionally accredited institutional member of the National Association of Schools of Music.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Music: Integrated Undergraduate-Graduate Degrees

The School of Music offers six Integrated Undergraduate-Graduate degree programs--three that combine the B.A. in Music with the M.A. in Musicology, Music Theory, and Music Theory and History, and three that combine the B.M. in Performance with the M.A. in Musicology, Music Theory, and Music Theory and History. This enables a select number of students to further their research interests at the undergraduate and graduate levels. By the end of the five-year program students receive two degrees, a B.A. in Music and an M.A. in Musicology, Music Theory, or Music Theory and History, or a B.M. in Performance and an M.A. in Musicology, Music Theory, or Music Theory and History.

Candidates for these Integrated Undergraduate-Graduate degrees must demonstrate a high level of aptitude and achievement in academic core courses and be highly motivated to pursue research projects with faculty.

Modeled after a similar program in the Schreyer Honors College, this IUG program enables gifted music students to double count credits in two degree programs. As a result they will have developed a research focus during their fourth and fifth years, which will help them prepare for entry into doctoral programs at other institutions.
For further information about the six Integrated Undergraduate-Graduate degree programs, including application procedures and degree requirements, see the School of Music Web site (Opens New Window) and click on the "Prospective Students" link.

MUSIC COURSES
Individualized instruction is offered in six categories covering eighteen instruments:

Brass (BRASS)	Trumpet, french horn, trombone, euphonium, tuba
Keyboard (KEYBD)	Piano, organ
Strings (STRNG)	Violin, viola, violoncello, double bass

Woodwinds (WWNDS)	Flute, oboe, clarinet, bassoon, saxophone
Percussion (PERCN)	
Voice (VOICE)	

Instruction is offered for each instrument in three different modes: Secondary for 1 credit, Secondary for 2 credits, and Performance for 4 credits.

The Performance mode is available only to M.Mus. (Performance) students in their major areas. All other students take Secondary for 1 or 2 credits.

Applied music fees are required for individual instruction: $175 per instrument for a 1-credit course, $250 per instrument for a 2-, 3-, or 4-credit course. A complete list can be obtained from the School of Music office.

MUSIC (MUSIC)
*503. CONCERT CHOIR (1 per semester, maximum of 4)
*504. CHAMBER SINGERS (1 per semester, maximum of 4)
*505. SYMPHONIC WIND ENSEMBLE (1 per semester, maximum of 4)
*506. SYMPHONIC BAND (1 per semester, maximum of 4)
*507. PHILHARMONIC ORCHESTRA (1 per semester, maximum of 4)
*508. CHAMBER ORCHESTRA (1 per semester, maximum of 4)
*509. CENTRE DIMENSIONS (1 per semester, maximum of 4)
*510. BRASS CHOIR (1 per semester, maximum of 4)
*511. PERCUSSION ENSEMBLE (1 per semester, maximum of 4)
*520. CHAMBER MUSIC FOR STRINGS (1-4)
*521. CHAMBER MUSIC FOR WOODWINDS (1-4)
*522. CHAMBER MUSIC FOR BRASS (1-4)
*523. SONATA DUOS (1)
560. CHORAL CONDUCTING (2-4 per semester, maximum of 16)
561. ORCHESTRAL CONDUCTING (2-4 per semester, maximum of 8)
562. BAND/WIND ENSEMBLE CONDUCTING (2-4 per semester, maximum of 16)
**565. STUDIO AND RECITAL ACCOMPANIMENT (1)

*Admission by audition.
**Course may be scheduled only after consultation with the director of the School of Music.

Course Descriptions

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

MUSIC (MUSIC) course list

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-06-191

Review Date: 4/15/08

Last updated by Publications: 3/27/09

Neuroscience (NEURO)

Program Home Page

ROBERT L. SAINBURG, *Co-Director of Neuroscience Program*
29 Recreation Building
University Park, PA 16802
814-865-7938

ROBERT J. MILNER, *Co-Director of Neuroscience Program*
College of Medicine, University Hospital
Penn State Milton S. Hershey Medical Center
Hershey, PA 17033
717-531-1045
Neuro-grad-hmc@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Kevin D. Alloway, Ph.D. (Indiana) Professor of Neural and Behavioral Sciences
- Anne Andrews, Ph.D. (American U) Associate Professor of Molecular Toxicology
- Alistair J. Barber, Ph.D. (Open University, Milton Keynes, UK) Assistant Professor of Ophthalmology, and Cellular and Molecular Physiology
- Colin Barnstable, Ph.D. (Wolfson College, Oxford, UK) Professor and Chair, Neural and Behavioral Sciences
- Paul Bartell, Ph.D. (Virginia) Assistant Professor of Avian Biology
- Sheri Berenbaum, Ph.D. (California, Berkeley) Professor of Psychology
- Melvin L. Billingsley, Ph.D. (George Washington) Professor of Pharmacology
- Edward O. Bixler, Ph.D. (New Mexico) Professor of Psychiatry; Vice Chair of Research
- Robert H. Bonneau, Ph.D. (Penn State) Professor of Microbiology and Immunology
- Douglas Cavener, Ph.D. (Georgia) Professor and Head of Biology
- Sonia Cavigelli, Ph.D. (Duke) Assistant Professor of Biobehavioral Health
- John Collins, Ph.D. (Cambridge) Professor of Physics
- James R. Connor, Ph.D. (California, Berkeley) Distinguished Professor and Vice Chair of Neurosurgery
- Rebecca Corwin, Ph.D. (Chicago) Associate Professor of Psychology
- Mihai Covasa, Ph.D. Associate Professor of Nutrition
- Nancy Dennis, Ph.D. (Catholic U of America) Assistant Professor of Psychology
- Min Ding, Ph.D. (Pennsylvania); Ph.D. (Ohio State) Associate Professor of Marketing
- Barry R. Dworkin, Ph.D. (Rockefeller) Professor of Neural and Behavioral Sciences
- John Ellis, Ph.D. (Rochester) Professor of Psychiatry and Pharmacology; Director, Molecular Neuropharmacology Laboratory
- Paul J. Eslinger, Ph.D. (Texas Christian) Professor of Neurology
- Andrew G. Ewing, Ph.D. (Indiana) Professor of Chemistry, and Neural and Behavioral Sciences; J. Lloyd Huck Chair in Natural Sciences
- Jidong Fang, M.D./Ph.D. (CUNY) Associate Professor of Psychiatry
- Thomas W. Gardner, M.D. (Thomas Jefferson) Professor of Opthalmology, and Cellular and Molecular Physiology
- Rick Gilmore, Ph.D. (Carnegie Mellon) Associate Professor of Psychology
- Bruce Gluckman, Ph.D. (Pennsylvania) Associate Professor of Engineering Science and Mechanics, and Neurosurgery; Associate Director, Penn State Center for Neural Engineering
- Jinger Gottschall, Ph.D. (Colorado) Assistant Professor of Kinesiology
- Patricia S. Grigson, Ph.D. (Rutgers) Associate Professor of Neural and Behavioral Sciences
- Andras Hajnal, M.D., Ph.D. (Pécs U Medical School, Hungary) Assistant Professor of Neural and Behavioral Sciences
- Kyung-An Han, Ph.D. Associate Professor of Biology
- Frank Hillary, Ph.D. (Drexel) Assistant Professor Psychology
- Dezhe Jin, Ph.D. Assistant Professor of Physics
- Byron C. Jones, Ph.D. (Arizona) Professor of Biobehavioral Health and Pharmacology
- Uhnoh Kim, Ph.D. (Duke) Associate Professor of Neurosurgery
- Laura Klein, Ph.D. (Uniformed Services U of Health Sci) Associate Professor of Biobehavioral Health
- Lisa Kopp, Ph.D. (USC) Assistant Professor of Human Development
- Alexay Kozhevnikov, Ph.D., Assistant Professor of Physics
- J. Kyle Krady, Ph.D. Assistant Professor of Neural and Behavioral Sciences
- Zhi-Chun Lai, Ph.D. (Albert Einstein College of Med) Professor of Biology, Biochemistry and Molecular Biology
- Kathryn F. LaNoue, Ph.D. (Yale) Professor of Cellular and Molecular Physiology
- Alphonse E. Leure-duPree, Ph.D. (U of London, England) Professor of Neural and Behavioral Sciences
- Robert Levenson, Ph.D. (SUNY, Stony Brook) Professor of Pharmacology
- Aimin Liu, Ph.D. (NYU Medical Center) Assistant Professor of Biology
- David X. Liu, Ph.D. (CUNY) Assistant Professor of Neural and Behavioral Sciences
- Lyle N. Long, D.Sc. (George Washington) Distinguished Professor of Aerospace Engineering and Mathematics
- Patricia J. McLaughlin, D.Ed. (Penn State, Harrisburg) Professor of Neural and Behavioral Sciences
- Robert J. Milner, Ph.D. (Rockefeller) Professor of Neural and Behavioral Sciences; Co-Director, Graduate Program in Neuroscience
- Gregory Moore, M.D. (Wayne State School of Med), Ph.D. (MIT) Professor of Psychiatry, and Neural and Behavioral Sciences; Director, Behavioral Neuroimaging Research Division
- Ralph Norgren, Ph.D. (Michigan) Professor of Neural and Behavioral Sciences
- Richard W. Ordway, Ph.D. (UMass Medical School) Professor of Biology; Chair, Intercollege Graduate Degree Program in Genetics
- Ann Ouyang, M.B., B.S. (London) Professor of Medicine
- Charles Palmer, M.D. (U of Cape Town, South Africa) Professor of Pediatrics
- Randen Patterson, Ph.D. (Maryland) Assistant Professor of Biology
- Blaise Peterson, PhD. (U of Washington) Associate Professor of Cellular and Molecular Physiology
- Thomas G. Pritchard, Ph.D. (Delaware) Associate Professor of Neural and Behavioral Sciences
- Chester A. Ray, Ph.D. (Georgia) Professor of Medicine and Cellular and Molecular Physiology

- William Ray, Ph.D. (Vanderbilt) Professor of Psychology
- Frank Ritter, Ph.D. (Carnegie Mellon) Associate Professor of Information Sciences and Technology
- Victor J. Ruiz-Velasco, Ph.D. (Tulane) Assistant Professor of Anesthesiology
- Robert L. Sainburg, Ph.D. (Rutgers) Associate Professor of Kinesiology and Neurology; Co-Director, Graduate Program in Neuroscience
- Russell C. Scaduto, Jr., Ph.D. (Indiana) Associate Professor of Cellular and Molecular Physiology
- Cara-Lynne Schengrund, Ph.D. (Seton Hall) Professor of Biochemistry and Molecular Biology
- Steven Schiff, M.D., Ph.D. (Duke) Brush Chair Professor of Engineering; Professor of Neurosurgery, and Engineering Science and Mechanics; Director, Penn State Center for Neural Engineering,
- Zachery Simmons, M.D. (Florida) Professor of Neurology
- Ian A. Simpson, Ph.D. (U of London, England) Professor of Neural and Behavioral Sciences
- Semyon Slobounov, Ph.D. (Illinois); Ph.D. (U of Leningrad) Associate Professor of Kinesiology
- Thyagarajan Subramanian, Professor of Neuorology and Neural and Behavioral Sciences; Director, Movement Disorders Program
- Joan Y. Summy-Long, Ph.D. (Penn State) Professor of Pharmacology
- Xiaorui Tang, Ph.D., Assistant Professor of Neural and Behavioral Sciences
- Richard B. Tenser, M.D. (SUNY, Syracuse) Professor of Neurology, and Microbiology and Immunology
- Joyce Tombran-Tink, Ph.D. Professor of Neural and Behavioral Science
- David Vandenbergh, Ph.D. (Penn State) Associate Professor of Biobehavioral Health
- Kent Vrana, Ph.D. (Louisiana State) Elliot S. Vesell Professor and Chair of Pharmacology
- Andrew Webb, Ph.D. (Cambridge) Professor of Bioengineering and Director, Magnetic Resonance Center
- Paul Weiss, Ph.D. (California, Berkeley) Distinguished Professor of Chemistry and Physics
- Judith Weisz, M.B., B.Chir. (Cambridge, England) Professor of Obstetrics and Gynecology
- Michael Wenger, Ph.D. (SUNY, Binghamton) Associate Professor of Psychology; Director, Human Electrophysiology Facility
- Matthew Whim, Ph.D. (Cambridge) Assistant Professor of Biology
- Qing Yang, Ph.D. (Georgia Inst of Tech) Associate Professor of Radiology
- Ian S. Zagon, Ph.D. (Colorado) Distinguished Professor of Neural and Behavioral Sciences; Director, Program on Education in Human Structure
- Samuel (Sam) Shao-Min Zhang, M.D. (Henan Med College, China), Ph.D. (U of Tokyo) Assistant Professor of Neural and Behavioral Sciences

The Neuroscience graduate program is an interdepartmental program within the College of Medicine. The goal of the program is to provide academic and research training leading to the Ph.D. or M.S. degree in Neuroscience. Graduates are prepared for future careers in academic research, teaching, industry or government service. Doctoral students are expected to graduate with the following competencies: (1) the conceptual and technical skills necessary to conduct a research project in an area of neuroscience; (2) a broad general knowledge of neuroscience and detailed knowledge of one or more specialized areas; (3) the ability to appraise scientific evidence; (4) effective oral and written communication skills; (5) a commitment to professional responsibilities and adherence to ethical principles; and (6) an understanding of the external structures that govern biomedical research and the career pathways available to graduates. These competencies are delivered and/or assessed through formal course work (required and elective courses), candidacy and comprehensive examinations, mentored laboratory research, public presentations, publication of research papers, and defense of a written dissertation.

Although the program focuses on doctoral education; the M.S. degree in Neuroscience can be granted to students who request it. Master's students are expected to complete the same course requirements as doctoral students and to write a research thesis.

Admission Requirements

Prospective applicants should have a bachelor's degree in a biological, physical, or behavioral science and are expected to have taken courses in biology, chemistry, physics, and mathematics. Candidates are expected to have a 3.0 (B) grade-point average or better. Neuroscience courses are desirable but not essential and research experience is an advantage. The General Test of the Graduate Record Examinations (GRE), or a comparable substitute examination accepted by a graduate program and authorized by the dean of the graduate school, is required for all applicants. Foreign applicants whose native language is not English must provide evidence of proficiency in English with a minimum Test of English as a Foreign Language (TOEFL) score of 550 on the paper test or 213 on the computer-based test.

A complete application should include: completed application form with personal statement of purpose; GRE scores; undergraduate transcripts; three letters of recommendation; and TOEFL scores (if applicable).

The application deadline is February 1 for admission in the following fall.

Qualified applicants generally will be requested to visit Hershey for an interview. Admission is based on evaluation of the undergraduate transcript, GRE scores, personal statement of purpose, letters of recommendation and performance on interview.

Graduate Degree Requirements

Ph.D. degree in Neuroscience

During the first year of study, Ph.D. candidates in neurosciences receive a broad education in the breadth of neuroscience through three core neuroscience courses covering cellular and molecular neuroscience (which includes developmental neuroscience and neuropharmacology), systems neuroscience, and neuroanatomy. Students must also demonstrate competency in biostatistics. This requirement is satisfied by passing the course HES 515 or another similar course with the approval of the program director. This requirement may be waived with the approval of the program director for students who can demonstrate prior course work in biostatistics. In addition, 3 credits of elective courses offered at Penn State; course selection for this elective is with the approval of the program director.

The Language and Communication Requirement is satisfied by a grade of at least 3.0 in NEURO 530.
A research thesis and thesis defense are required.

M.S. Degree in Neuroscience

Core or Required Courses: NEURO 511, 520, 521, 522, 523, 530, 597; CMBIO 540; IBIOS 591.
Language and Communication Requirement: Satisfied by a grade of at least 3.0 in NEURO 530
Thesis or Paper Requirement and Course(s)/Credits Required: A research thesis is required.

Student Aid

Graduate research assistantships are provided for qualified doctoral students; full tuition is also provided. All support is continuous for the first year from the Neuroscience program. Support in years two and above, when the student is conducting thesis research, must be acquired from either the basic science department in which the candidate elects to pursue his/her minor or from funds available from the thesis adviser. These funds must be secured by the student in conjunction with his/her adviser.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

NEUROSCIENCE (NEURO) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 6/1/04

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-446

Review Date: 6/12/07

Last reviewed by Publications: 8/25/09

Nuclear Engineering (NUC E)

Program Home Page (Opens New Window)

JACK S. BRENIZER, Jr., *Chair of Nuclear Engineering*
138 Reber Building
814-863-6384

Degrees Conferred:

Ph.D., M.S., M.Eng.

The Graduate Faculty

- Maria Avramova, Ph.D. (Penn State) Assistant Professor of Nuclear Engineering
- Yousry Y. Azmy, Ph.D. (Illinois, Urbana-Champaign) Adjunct Professor of Nuclear Engineering
- Anthony J. Baratta, Ph.D. (Brown) Professor Emeritus of Nuclear Engineering
- Jack S. Brenizer, Jr., Ph.D. (Penn State) Professor of Mechanical and Nuclear Engineering
- Gary L. Catchen, Ph.D. (Columbia) Professor of Nuclear Engineering
- Fan-Bill Cheung, Ph.D. (Notre Dame) Professor of Mechanical and Nuclear Engineering
- Ward S. Diethorn, Ph.D. (Carnegie Tech) Professor Emeritus of Nuclear Engineering
- Robert M. Edwards, Ph.D. (Penn State) Professor of Nuclear Engineering
- Kostadin N. Ivanov, Ph.D. (Bulgarian Academy of Sciences) Professor of Nuclear Engineering
- Edward S. Kenney, Ph.D. (Penn State) Professor Emeritus of Nuclear Engineering
- Seungjin Kim, Ph.D. (Purdue) Assistant Professor of Mechanical and Nuclear Engineering
- Edward H. Klevans, Ph.D. (Michigan) Professor Emeritus of Nuclear Engineering
- Samuel H. Levine, Ph.D. (Pittsburgh) Professor Emeritus of Nuclear Engineering
- Thomas F. Lin, Senior Research Associate
- Arthur M. Motta, Ph.D. (California, Berkeley) Professor of Nuclear Engineering
- Gordon E. Robinson, Ph.D. (Penn State) Professor Emeritus of Nuclear Engineering
- Barry E. Scheetz, Ph.D. (Penn State) Professor of Materials; Senior Scientist, Materials Research Laboratory; Professor of Civil Engineering and Nuclear Engineering
- Kenan Ünlü, Ph.D. (Michigan) Professor of Nuclear Engineering; Director, Radiation Science and Engineering Center

Graduate programs and research facilities are available in thermal-hydraulics, neutronics, computational methods, advanced controls with applications of artificial intelligence, materials, radiation monitoring and effects, fuel management, and radioactive waste management. Application areas include advanced reactor design, safety analysis, radiation instrumentation development, neutron imaging, and plant life extension.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Students with a 3.00 junior/senior grade-point average and with appropriate course backgrounds will be considered for admission. General aptitude GRE test results are required. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

To qualify for admission, an international student must achieve a minimum score on the Test of English as a Foreign Lanaguage (TOEFL) of 550 on the paper-based test, 213 on the computer-based test, and 80 on the Internet-based test with a 19 in the speaking section. This requirement is waived if the student's native language is English or if the student received a bacclauareate or master's degree from an institution in which the language of instruction was English. Letters of recommendation and a statement of purpose written by the applicant are also required to complete the application package.

Degree Requirements

The M.Eng. degree is a nonthesis professional master's degree. In the M.Eng. degree program, 30 course credits are required. Twelve of those credits must be in Nuclear Engineering with at least 18 credits at the 500 level. No thesis is required for the M.Eng. degree. Instead, the student must take 3 credits of NUC E 597C Professional Topics in Nuclear Engineering, which represents formal recognition of the student's effort spent on writing a paper about an engineering subject. It must be approved by the adviser, a faculty reader, and the program chair.

The M.S. degree program is designed for students to gain advanced knowledge for research, analysis, and design in nuclear engineering. Student pursuing an M.S. degree must complete 24 course credits and submit an acceptable thesis (6 research credits) to the Graduate School.

Continuous registration is required of all Ph.D. students until the thesis is approved.

The Ph.D. program emphasizes scholarly research and helps students prepare for research and related careers in industry, government, and academe. Students are admitted to candidacy after passing written and oral examinations. The Ph.D. program is quite flexible, with minimal formal requirements. The Ph.D.. degree is awarded upon completion of a program of advanced study that includes a minimum period of residence, a satisfactory thesis, and the passing of comprehensive and final oral examinations as determined by the student's doctoral committee.

Generally, a Ph.D. student must have 30 credits above a master's degree before taking a comprehensive examination.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin,* the following awards typically have been available to graduate students in this program:

NATIONAL ACADEMY FOR NUCLEAR TRAINING FELLOWSHIPS-Available to graduate students in nuclear engineering; stipend plus tuition.

U.S. DEPARTMENT OF ENERGY-NUCLEAR SCIENCE AND ENGINEERING FELLOWSHIPS-Available to graduate students interested in engineering and engineering support related to nuclear technology; stipend plus tuition.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level will not count. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

NUCLEAR ENGINEERING (NUC E) course list

Last reviewed by Graduate School: 5/6/04

Last updated by Publications: 5/12/10

Nursing (NURS)

Program Home Page (Opens New Window)

PAULA MILONE-NUZZO, *Dean, School of Nursing*

JUDITH E. HUPCEY, *Professor-In-Charge of Graduate Program in Nursing*

201 Health and Human Development East Building
814-863-0245

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Kesha Baptiste-Roberts, Ph.D. (Johns Hopkins) *Assistant Professor of Nursing*
- Raymonde A. Brown, Ph.D. (Maryland) *Assistant Professor of Nursing; Associate Dean for Undergraduate Programs and Outreach in Nursing*
- Mary Beth Clark, Ed.D. (Temple) *Assistant Professor of Nursing*
- Mona M. Counts, Ph.D. (Texas, Austin) *Associate Professor of Nursing; Elouise Ross Eberly Professor of The School of Nursing*
- Margaret (Peg) Cushman, Ph.D. (UMass, Boston) *Professor of Nursing*
- Kathryn Dansky, Ph.D. (Ohio State) *Associate Professor of Health Policy and Administration, and Nursing*
- Sharon Falkenstern, Ph.D. (Penn State) *Assistant Professor in Nursing; Coordinator, Family Nurse Practitioner Option*
- Donna Fick, Ph.D. (California) *Associate Professor of Nursing*
- Christine Frazer, Ph.D. (Widener) *Instructor in Nursing*
- Kim Kopenhaver Haidet, Ph.D. (Penn State) *Assistant Professor of Nursing*
- Marianne Hillemeier, Ph.D. (Michigan) *Assistant Professor of Health Policy and Administration, and Nursing Health Policy*
- Judith E. Hupcey, Ed.D. (Columbia) *Associate Professor of Nursing; Coordinator, Clinical Nurse Specialist Option*
- Rita Jablonski, Ph.D. (Virginia) *Assistant Professor of Nursing*
- Ann M. Kolanowski, Ph.D. (New York) *Professor of Nursing; Elouise Ross Eberly Professor of The School of Nursing*
- Susan Loeb, Ph.D. (Penn State) *Assistant Professor of Nursing*
- Kathleen G. Mastrian, Ph.D. (Kent State) *Assistant Professor of Nursing*
- Dee M. McGonigle, Ph.D. (Pittsburgh) *Associate Professor of Nursing*
- Paula Milone-Nuzzo, Ph.D. (Connecticut) *Professor and Dean, School of Nursing*
- Janice L. Penrod, Ph.D. (Penn State) *Associate Professor of Nursing*
- Deborah B. Preston, Ph.D. (Penn State) *Professor Emerita of Nursing*
- Carol A. Smith, D.S.N. (Alabama) *Associate Professor of Nursing*
- Elizabeth J. Susman, Ph.D. (Penn State) *Jean Phillips Shibley Professor of Biobehavioral Health; Professor of Nursing*

The graduate programs emphasize productive scholarship and research in the development of nursing knowledge and the translation of knowledge into practice. Advanced study is in human health and development throughout the life span, and in nursing's role in providing health services to individuals, families, and communities.

The Ph.D. program prepares nurse scientists and clinical scholars to provide leadership in nursing education, practice and research. Individualized curricula prepare nursing graduates to assume positions as faculty, advanced clinicians, clinical researchers and leadership positions in community, governmental, or institutional settings.

The M.S. degree in Nursing prepares advanced practice nurses. Two options are offered within the major of Nursing: Clinical Nurse Specialist with an intensive role specialty concentration (at least 8 credits of course work related to the area of specialization) or a graduate minor in another program and Nurse Practitioner with specializations in Family or Adult populations. The master's degree program in Nursing is accredited by the National League for Nursing Accrediting Commission and the Commission on Collegiate Nursing Education.

The Nurse Practitioner option is designed to help prepare the professional nurse to function in an expanded nursing role providing direct care to specific groups of clients in a variety of health care settings. Since that practice is inherently interdisciplinary in nature, advanced knowledge and research from nursing is combined with knowledge from science, medicine, and related disciplines. The Nurse Practitioner may also function in supervisory, consultative, education, and research roles.

The Clinical Nurse Specialist option prepares advanced practice nurses in a specialty field to plan, implement, and evaluate care in a variety of settings. They function in direct care, supervisory, consultative, education, and research roles serving individuals, families, and communities.

Admission Requirements for M.S. and Ph.D. Programs

1. A baccalaureate degree in Nursing from a regionally accredited program is required for all applicants. Students entering the doctoral program via the traditional post-master's route must have earned a master's degree with a major in nursing from a program accredited by a national accrediting agency for nursing. Well-qualified doctoral applicants with a baccalaureate degree in nursing and master's degree in a related discipline (e.g., public health) will be evaluated individually to assess the need for prerequisite master's-level course work in nursing for doctoral program admission.
2. Strong letters of evaluation and a well-crafted statement of purpose.
3. Applicants must submit transcripts of all previous course work from institutions of higher learning. For M.S. applicants, a cumulative grade-point average of 3.0 (on a 4.0 scale) for junior/senior baccalaureate degree is expected. For doctoral applicants, a cumulative grade-point average 3.5 (on a 4.0 scale) for master's and subsequent course work is expected.
4. Two letters of evaluation are required for the master's program and three letters of reference are required for the doctoral program. the letters should be solicited from professional colleagues who can attest to the applicant's ability.
5. All applicants must submit a statement of purpose. In addition, doctoral applicants must also submit a published or unpublished scientific paper, thesis, or other scholarly writing sample and a complete curriculum vitae.
6. International students for whom English is not the primary language must demonstrate competence in English, as reflected in a Test of English as a Foreign Language (TOEFL). Minimum score requirements are: 550 or above on a paper-based test or 213 or above on a computer-based test. The International English Language Testing System (IELTS) has been approved by the Graduate

Council as an alternative exam to the TOEFL for international students applying to Penn State. A minimum composite score of 6.5 on the IELTS test or 80 points on the Internet-based test with a minimum of 19 points on the speaking portion is required for admission.

7. Applicants to the master's program must hold a current Pennsylvania license to practice professional nursing. Applicants to the doctoral program must be licensed to practice professional nursing in at least one state or in a foreign country.
8. Applicants to the master's program are encouraged to discuss program options with the faculty; however, an interview is not required. Doctoral applicants will be contacted by the School of Nursing to schedule a required interview (either in person or via telephone).

M.S. Degree Requirements

A core of courses including nursing issues, theory, and research is required of all students. Candidates in the Clinical Nurse Specialist option must earn a minimum of 37-43 credits (including an intensive concentration in a specialty area). In the Nurse Practitioner option, the requirement is a minimum of 47 to 50 credits. Students in all options may choose to do either a thesis for 6 credits or a scholarly paper for 3 credits. The scholarly paper option is designed to be as academically rigorous as the thesis option. A scholarly paper demonstrates the application of theory and research to a clinical problem based on review of literature and research utilization for that problem.

Ph.D. Degree Requirements

Candidacy Examination: All students must satisfactorily complete the candidacy examination, which is designed to confirm the student's mastery of basic nursing theory and research methods. For students entering the doctoral program with a master's degree, the candidacy examination must be taken at the end of the first year of full-time study or the equivalent. Students who fail the examination on the first attempt may repeat it once. Students who fail the examination the second time are terminated from the program.

Comprehensive Examination: The comprehensive examination is designed to test the student's mastery of and ability to synthesize and integrate the theoretical basis for nursing science, advanced research methods and the chosen specialty area. This examination is taken upon completion of all course work. Students who fail the examination on the first attempt may repeat it once. Students who fail the examination the second time are terminated from the program.

English Competency: All students will be assessed for deficiencies in reading, writing and speaking of English during the core nursing courses prior to the candidacy examination; should remedial work be necessary, the student will be directed to the appropriate sources. International students will be advised that the passage of the minimal TOEFL or IELTS requirement does not demonstrate the level of competence expected of a Ph.D. in nursing.

Communication and Language Requirement: A foreign language will not be required. However, all students are required to be computer literate in word processing and use of statistical packages, as determined by their dissertation committee, and will be assessed for communication skills during core nursing courses.

Dissertation: Each student is required to conduct an original and independent research project which adds to nursing's body of knowledge, and to communicate the research report in a written dissertation. A written dissertation proposal is required and must be approved at a proposal hearing by a majority vote of the student's dissertation committee. A majority vote is also required for approval of the completed written dissertation at the final oral defense.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

U.S. PUBLIC HEALTH SERVICE TRAINEESHIPS IN NURSING
Open to selected registered nurse, full-time students in nursing; stipend may be available plus tuition. Apply to Professor-in-Charge, Graduate Programs, School of Nursing.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

NURSING (NURS) course list

Last Revised by the Department: Spring Semester 2009

Blue Sheet Item #: 37-03-044

Review Date: 11/18/08

Last updated by Publications: 1/8/10

Nutrition (NUTR)

Program Home Page (Opens New Window)

GORDON JENSEN, *Head of the Department of Nutritional Sciences*
SHELLY NICKOLS-RICHARDSON, *Professor-in-Charge of Graduate Program in Nutrition*
323 Chandlee Laboratory
814-863-2920

Degrees Conferred:

Ph.D., M.S., M.Ed. in Human Nutrition

The Graduate Faculty

- Craig R. Baumrucker, Ph.D. (Purdue) Professor of Animal Nutrition and Physiology
- Cheston M. Berlin, Jr., M.D. (Harvard) University Professor of Pediatrics and Pharmacology
- Leann Lipps Birch, Ph.D. (Michigan) Professor, Department of Human Development and Family Studies
- Dorothy A. Blair, Ph.D. (Cornell) Assistant Professor of Nutrition
- J. Lynne Brown, Ph.D. (MIT) Associate Professor of Food Science
- Margherita Cantorna, Ph.D. (Wisconsin, Madison) Associate Professor of Nutrition
- Katherine Cason, Ph.D. (Virginia Tech) Associate Professor of Food Science
- James R. Connor, Ph.D. (California, Berkeley) Professor of Neuroscience and Anatomy
- Rebecca L. Corwin, Ph.D. (Chicago) Associate Professor of Nutrition
- Gary J. Fosmire, Ph.D. (California, Berkeley) Associate Professor of Nutrition
- Michael H. Green, Ph.D. (California, Berkeley) Professor of Nutrition Science and Physiology; Head, Department of Nutrition
- Andras Hajnal, M.D., Ph.D. (Univ Medical School Pecs, Hungary) Associate Professor of Neural/Behavioral Sciences
- Terry Hartman, Ph.D. (Minnesota) Assistant Professor of Nutrition
- Leonard S. Jefferson, Jr., Ph.D. (Vanderbilt) Professor and Head, Department of Cellular and Molecular Physiology; Associate Dean for Research and Graduate Studies
- Shannon L. Kelleher, Ph.D. (California, Davis) Assistant Professor of Nutrition
- Katarzyna (Kasia) Kordas, Ph.D. (Johns Hopkins) Assistant Professor of Nutrition
- Penny M. Kris-Etherton, Ph.D. (Minnesota) Distinguished Professor of Nutrition
- Barbara Lohse, Ph.D. (Wisconsin-Madison), R.D., Associate Professor and Director, Pennsylvania Nutrition Education Program and Pennsylvania Nutrition
- Audrey N. Maretzki, Ph.D. (Pittsburgh) Professor of Food Science and Nutrition
- Andrea M. Mastro, Ph.D. (Penn State) Professor of Microbiology and Cell Biology
- Edward W. Mills, Ph.D. (Purdue) Associate Professor of Dairy and Animal Science
- Shelly Nickols-Richardson, Ph.D. (Georgia) Associate Professor of Nutrition
- Han Okhee, Ph.D. (North Carolina) Assistant Professor of Nutrition
- Jill Patterson, Ph.D. (Wisconsin-Madison) Assistant Professor of Nutrition
- Jeffrey Peters, Ph.D. (California, Davis) Associate Professor of Veterinary Science
- Claudia K. Probart, Ph.D. (Oregon) Associate Professor of Nutrition
- Barbara J. Rolls, Ph.D. (Cambridge) Helen A. Guthrie Chair and Professor of Nutrition
- A. Catharine Ross, Ph.D. (Cornell) Dorothy Foehr Huck Chair and Professor of Nutrition
- Ian Simpson, Ph.D. (University College, London) Professor of Neuroscience and Anatomy
- Helen Smiciklas-Wright, Ph.D. (Penn State) Professor of Nutrition
- Donald B. Thompson, Ph.D. (Illinois) Professor of Food Science
- Jack Vanden Heuvel, Ph.D. (Wisconsin) Associate Professor of Veterinary Science
- Regina Vasilatos-Younken, Ph.D. (Penn State) Professor of Poultry Science
- Nancy I. Williams, Sc.D. (Boston) Associate Professor of Kinesiology

Graduates are prepared for careers in basic and applied research in nutrition and in college teaching. The course of study is planned to meet the professional objectives of the individual student. Students may emphasize nutrition science, applied human nutrition, applied animal nutrition, nutrition education, and nutrition in public health. Supporting courses are available in biochemistry, physiology, genetics, microbiology, biophysics, food science, education, health policy and administration, human development and family studies, anthropology, sociology, and psychology.

Current research emphasizes trace elements, vitamin A, lipid metabolism, nutrition and behavior, nutrition education strategies, and evaluation of dietary intake and nutritional status and nutrition policy.

Facilities include well-equipped nutrition science laboratories with animal facilities supervised by a University laboratory animal resource staff. The Nutrition Center and the program in nutrition education serve as a laboratory for students in community nutrition and nutrition education, and the Nutrition Clinic serves this function for those in clinical nutrition.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from the Medical College Admission Test (MCAT), are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Gene General Bulletin*

College graduates with an undergraduate degree in nutrition, animal sciences, food science, dietetics, or a related biological or social science will be considered for admission. Applicants should have a minimum grade-point average of 3.00 (on a 4.00 scale), an acceptable score on the GRE (an average quantitative and verbal score above the fiftieth percentile), and three supporting recommendations. Exceptions may be made for students with special backgrounds, abilities, and interests. When openings are limited, the best-qualified candidates are given priority.

The basic expectations for admission from undergraduate studies include 6 credits in chemistry (organic and inorganic); 3 credits each in physiology, biochemistry, and nutrition; and physics, calculus, and analytical chemistry for some research areas in nutrition science and social science for public health and community nutrition. Students with more than 9 credits of deficiency and a superior record may be admitted as provisional students until they qualify for consideration for regular degree status. Deficiencies are expected to be made up

with a 3.00 grade-point average or better within the first two semesters.

Master's Degree Requirements

The graduate program in Nutrition offers the M.S. degree with an emphasis in nutrition science, applied human nutrition, nutrition education, or nutrition in public health.

The M.S. degree requires 30 credits of course work, including 6 credits in research (NUTRN 600). The M.Ed. degree requires 45 credits of course work, including 6 credits in a field of professional education. The M.S. and M.Ed. degrees with an emphasis on nutrition in public health include a 4-credit field experience (NUTR 555).

Doctoral Degree Requirements

Students are admitted on a provisional basis pending satisfactory completion of the candidacy examination designed to assess the student's potential and academic preparation for doctoral study. Candidacy examinations must be scheduled by students with a master's degree after they have completed 10 credits in doctoral work but before the end of the second semester following admission to the graduate program. The candidacy examination is administered and evaluated by the Graduate Candidacy Committee.

Communication and Language Requirement: Doctoral students must demonstrate competency in spoken English as judged by the program faculty and in technical writing by completion of ENGL 418 with a grade of B or better. Students also must complete satisfactorily 2 to 3 credits at the 400 or 500 level from any one of the following areas: (1) college teaching; (2) logic or philosophy of science; (3) foreign language; or (4) computer science. There are no specific course requirements; however, the academic program is developed by the student in consultation with his or her adviser to develop doctoral-level competence in nutrition and one or more supporting areas. Students are expected to participate in a colloquium each semester and enroll in a seminar on a regular basis.

Nutrition Sciences Option within the IBIOS program: This option in Nutrition Sciences is proposed to promote excellence in graduate education in nutrition by capitalizing on the expertise existing within the biological, biomedical, behavioral, and social sciences at Penn State. Students can choose an area of focus within this option that emphasizes biomolecular nutrition, human nutrient requirements, or ingestive behavior and nutrition intervention. The educational goal of this option is to create a stimulating and diverse environment in which students will develop the critical thinking skills needed to tackle complex issues in nutrition. Students will be expected to develop a foundation of basic knowledge in molecular biology, cell biology, biochemistry and computational methodology. In addition, students are required to complete 2 credits of IBIOS 590. Students are required to complete a course in professional developmental ethics. All students are required to assist in teaching/resident instruction for at least two semesters during their degree program.

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

FOOD SCIENCE (FD SC) course list

NUTRITION (NUTR) course list

NUTRITION (NUTRN) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/21/04

Last updated by Publications: 10/28/09

Oil and Gas Engineering Management (OGEM)

Program Home Page (Opens New Window)

YAW D. YEBOAH, *Head of the Department of Energy and Mineral Engineering*
MARK S. KLIMA, *Associate Department Head*

Department Office
110 Hosler Building
814-865-3437

Degrees Conferred:

M.Eng. (Master of Engineering)

The Graduate Faculty

- Michael A. Adewumi, Ph.D. (IIT) *Professor of Petroleum and Natural Gas Engineering*
- Luis F. Ayala, Ph.D. (Penn State) *Assistant Professor of Petroleum and Natural Gas Engineering*
- Timothy J. Considine, Ph.D. (Cornell) *Professor of Natural Resource Economics*
- Turgay Ertekin, Ph.D. (Penn State) *Professor of Petroleum and Natural Gas Engineering*
- Semih Eser, Ph.D. (Penn State) *Associate Professor of Energy and Geo-Environmental Engineering*
- Abraham S. Grader, Ph.D. (Stanford) *Professor of Petroleum and Natural Gas Engineering*
- Phillip M. Halleck, Ph.D. (Chicago) *Associate Professor of Petroleum and Natural Gas Engineering*
- M. Thaddeus Ityokumbul, Ph.D. (Western Ontario) *Associate Professor of Energy and Geo-Environmental Engineering*
- Zuleima Karypyn, Ph.D. (Penn State) *Assistant Professor of Petroleum and Natural Gas Engineering*
- Jonathan P. Mathews, Ph.D. (Penn State) *Assistant Professor of Energy and Geo-Environmental Engineering*
- Alan W. Scaroni, Ph.D. (Penn State) *Professor of Energy and Geo-Environmental Engineering*
- Andrew P. Schissler, Ph.D. (Colorado School of Mines) *Assistant Professor of Mining Engineering*
- Robert W. Watson, Ph.D. (Penn State) *Associate Professor of Petroleum and Natural Gas Engineering, and Geo-Environmental Engineering*
- Yaw D. Yeboah, Sc.D. (MIT) *Professor of Energy and Geo-Environmental Engineering*

Course offerings are available in four thematic areas: reservoir engineering, transmission and processing, porous media flow dynamics, and production engineering.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. At the discretion of the program, a student may be offered provisional admission without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Prospective candidates should hold a bachelor's degree in a physical science or an engineering discipline with a minimum of 3.00 junior/senior grade point average on a scale of 4.00 (or equivalent).

Exceptions can be made, at the discretion of the program, for students with special backgrounds, experiences, abilities and interests. Working experience in the petroleum and/or natural gas industry will be considered a plus in the admission consideration.

Master of Engineering Degree Requirements

A total of 33 credit hours will be required to complete the degree program of M. Eng. in Oil and Gas Engineering Management. Twenty-four credits will be taken from the focused areas (reservoir engineering, transmission and processing, porous media flow dynamics, production engineering). Additional 6 credits will be taken for the common courses (PNG 550 Advanced Engineering Evaluation in Oil and Gas Management; PNG 551 Advanced Risk Analysis in Oil and Gas Management). The final 3 credits are assigned to a comprehensive engineering project report (PNG 594 Research Topics) to be taken under the supervision of a faculty adviser.

Other Relevant Information

Of the 24 credits required in the focused areas, at least 9 credits will be earned from structured graduate courses. The remaining 15 credits will be designed around the interest and experience of each candidate. This strategy is aimed at broadening the technical horizon of the candidate in anticipation for a career in management. These customized course contents will be administered under the umbrella of PNG 595 and/or PNG 596; in so doing the candidate will work with a Committee of faculty members who will design their appropriate internship program and administer a comprehensive examination at its conclusion.

Last updated by Publications: 1/22/10 (link check; department head check)

Operations Research (O R)

Program Home Page

SUSAN H. XU, *Chair of the Committee on Operations Research*
335 Beam Building
814-863-0531

Degrees Conferred:

Students electing this option through participating programs earn a degree with a dual title at both the Ph.D. and the M.S., M.A., or M.Eng. levels, i.e., Ph.D. in (graduate program name) and Operations Research, or M.S., M.A., or M.Eng. in (graduate program name) and Operations Research.

The following graduate programs offer dual degrees in Operations Research: Agricultural, Environmental and Regional Economics; Agricultural and Biological Engineering; Animal Science; Business Administration; Civil Engineering; Chemical Engineering; Computer Science and Engineering; Electrical Engineering; Economics; Educational Leadership; Energy and Mineral Engineering; Entomology; Forest Resources; Geography; Geosciences; Hotel, Restaurant and Institutional Management; Industrial Engineering; Mathematics; Mechanical Engineering; Statistics; and Workforce Education and Development.

The Graduate Faculty

- William P. Andrew, Ph.D. (Penn State) Associate Professor of Hotel, Restaurant, and Institutional Management
- Charles E. Antle, Ph.D. (Oklahoma State) Professor Emeritus of Statistics
- Steven E. Arnold, Ph.D. (Stanford) Professor of Statistics
- Russell R. Barton, Ph.D. (Cornell) Professor of Industrial Engineering
- Tom M. Cavalier, Ph.D. (Virginia Tech) Professor of Industrial Engineering
- M. Jeya Chandra, Ph.D. (Syracuse) Professor of Industrial Engineering
- Kalyan Chatterjee, Ph.D. (Harvard) Distinguished Professor of Management Science and Information Systems
- David P. Christy, Ph.D. (Georgia) Associate Professor of Management Science and Information Systems
- N. Edward Coulson, Ph.D. (California, San Diego) Associate Professor of Economics
- Lily (Ageliki) Elefteriadou, Ph.D. (Polytechnic U, Brooklyn) Associate Professor of Civil Engineering
- E. Emory Enscore, Jr., Ph.D. (Penn State) Professor Emeritus of Industrial Engineering
- Turgay Ertekin, Ph.D. (Penn State) Professor of Petroleum and Natural Gas Engineering
- Jill L. Findeis, Ph.D. (Washington State) Professor of Agricultural Economics
- Duncan K. H. Fong, Ph.D. (Purdue) Professor of Management Science and Information Systems
- Natarajan Gautam (North Carolina) Associate Professor of Industrial Engineering
- Richard L. Gordon, Ph.D. (MIT) Professor Emeritus of Mineral Economics
- Milton C. Hallberg, Ph.D. (Iowa State) Professor Emeritus of Agricultural Economics
- Catherine Harmonosky, Ph.D. (Purdue) Associate Professor of Industrial Engineering
- Terry P. Harrison, Ph.D. (Tennessee) Professor of Supply Chain and Information Systems
- Jack C. Hayya, Ph.D. (UCLA) Professor Emeritus of Management Science and Information Systems
- Paul H. Heinemann, Ph.D. (Florida) Associate Professor of Agricultural Engineering
- George B. Kleindorfer, Ph.D. (Carnegie Mellon) Professor of Management Science and Information Systems
- Joseph M. Lambert, Ph.D. (Purdue) Associate Professor of Computer Science
- Holly S. Lewis, Ph.D. (South Carolina) Associate Professor of Management Science and Information Systems
- Gary L. Lilien, D.E.S. (Columbia) Distinguished Research Professor of Management Science
- Costas Maranas (Princeton) Associate Professor of Chemical Engineering
- John I. McCool, Ph.D. (Temple) Associate Professor of Industrial Engineering
- Elise D. Miller-Hooks, Ph.D. (Texas, Austin) Assistant Professor of Civil Engineering
- Jan M. Mutmansky, Ph.D. (Penn State) Professor of Mineral Engineering
- David Passmore, Ph.D. (Minnesota) Professor of Education
- Raja V. Ramani, Ph.D. (Penn State) P.E. Professor of Mining Engineering
- A. Ravindran (Berkeley) Professor of Industrial Engineering
- William J. Rothwell, Ph.D. (Illinois) Professor of Education
- Michael Saunders, Ph.D. (Georgia) Associate Professor of Entomology
- James S. Shortle, Ph.D. (Iowa State) Associate Professor of Agricultural Economics
- Timothy W. Simpson, Ph.D. (Georgia Tech) Associate Professor of Mechanical Engineering and Industrial Engineering
- Spiro Stefanou, Ph.D. (California State) Professor of Agricultural Economics
- Joseph V. Terza, Ph.D. (U of Pittsburg) Associate Professor of Economics
- Leonid N. Vaserstein, Ph.D. (Moscow State) Professor of Mathematics
- Jose A. Ventura, Ph.D. (Florida) Professor of Industrial Engineering
- Paul N. Walker, Ph.D. (Massachusetts) P.E. Professor of Agricultural Engineering
- Robert D. Weaver, Ph.D. (Wisconsin) Professor of Agricultural Economics
- Anthony V. Williams, Ph.D. (Michigan State) Associate Professor of Geography
- Susan H. Xu, Ph.D. (Rensselaer) Associate Professor of Management Science and Information Systems

The Operations Research dual-title degree program option is administered by an Operations Research committee, which is responsible for management of the program. The committee maintains program definition, identifies faculty and courses appropriate to the option, and recommends policy and procedures for its operation to the dean of the Graduate School. This dual-title degree program is offered as an option through graduate major programs in eight colleges. The option enables students from diverse graduate programs to attain and be identified with the tools, techniques, and methodology of operations research, while maintaining a close association with areas of application. Operations research is the analysis--usually involving mathematical treatment--of a process, problem, or operation to determine its purpose and effectiveness and to gain maximum efficiency. To pursue a dual-title degree under this program option the student must apply to the Graduate School and register through one of the approved graduate programs.

Admission Requirements

Scores from the Graduate Record Examination (GRE), or from a comparable substitute examination accepted by a graduate program and

authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements listed in the GENERAL INFORMATION section of the *Graduate Bulletin*.

For the M.S., M.A., M.Eng. dual-title degree in Operations Research, in addition to those prescribed by the graduate major program, prerequisites for acceptance to the program without deficiency include the following or their equivalent: MATH 140, MATH 141, MATH 220; CMPSC 101; and 3 credits of probability and statistics.

For the Ph.D. dual-title degree in Operations Research, in addition to those prescribed by the graduate major program, prerequisites for acceptance to the program without deficiency include the following or their equivalent: MATH 401, MATH 436; CMPSC 101; and 3 credits of probability and statistics.

Degree Requirements

To qualify for a dual-title degree, students must satisfy the requirements of the graduate major programs in which they are enrolled, in addition to the minimum requirements, or their equivalent, in the Operations Research program. Students must enroll in O R 590 Colloquium for at least 1 credit in each year enrolled in the program and in residence.

For the M.S. or M.A. dual-title degree in Operations Research, the minimum requirements are: 6 credits in stochastic/statistical methods, including a minimum of 3 credits in each of the areas of statistical methods and stochastic processes; 6 credits in optimization, including a minimum of 3 credits in linear programming; 3 credits in computational methods; and 3 credits in applications/specialization. (Application courses are those that involve problem solving through the use of decision methods.) A minimum of 9 credits must be in the 500 series. Particular courses may satisfy both the graduate major program requirements and those in the Operations Research program.

A thesis may be required, the supervisor of which must be a member of the graduate faculty recommended by the chair of the program granting the degree and approved by the Operations Research committee as qualified to supervise thesis work in operations research. A paper or report may be written in lieu of the M.S. or M.A. thesis upon approval of the student's graduate major program. An M.Eng. student or a student selecting the paper or report must take an additional 6 credits in the Operations Research program. It is the prerogative of the graduate major program to assign these credits to one or more of the following categories: stochastic/statistical methods, optimization, computational methods, or applications.

The minimum requirements for the Ph.D. dual-title degree in Operations Research are: 9 credits in stochastic/statistical methods, including a minimum of 3 credits in each of the areas of statistical methods and stochastic processes; 9 credits in optimization, including a minimum of 3 credits in linear programming; 6 credits in computational methods, including a minimum of 3 credits in simulation; and 12 credits in applications/specialization. A minimum of 18 credits must be in the 500 series, and particular courses may satisfy both the graduate major program requirements and those in the Operations Research program.

A Ph.D. minor program in Operations Research is available for doctoral students who find it advantageous to include advanced quantitative methods of systems analysis in their programs of study and have been approved to do so by their doctoral committees. To qualify for a minor in Operations Research, students must satisfy the requirements of their graduate major programs, meet the same prerequisites as the M.S. dual-title degree, and meet the following minimum requirements: 6 credits in stochastic/statistical methods, including a minimum of 3 credits in each of the areas of statistical methods and stochastic processes; 6 credits in optimization; and 3 credits in computational methods. A minimum of 6 credits must be taken at the 500 level.

The doctoral committee for a Ph.D. dual-title degree student is recommended by the graduate major program granting the degree. The chair and at least two members of a doctoral committee must be members of the graduate faculty and approved by the Operations Research committee as qualified to supervise doctoral theses in operations research. The Operations Research committee is responsible for administering an examination in operations research that constitutes a portion of the comprehensive examination administered to the doctoral students in the program option, as well as to the candidate who chooses operations research as a minor field.

STOCHASTIC/STATISTICAL METHODS

Statistical Methods
MATH/STAT 414, MATH/STAT 415, MATH/STAT 418
I E 511
MS&IS 501, MS&IS 533
STAT 460, STAT 501, STAT 502, STAT 503
ECON 501
AG EC/ECON 510, AG EC/ECON 511
Stochastic Processes
I E /SC&IS 516
I E 517
MATH/STAT 416, MATH/STAT 516, MATH/STAT 519
STAT 515

OPTIMIZATION

Linear Programming
I E 405 or MS&IS 451 or MATH 484
I E 505
Nonlinear Programming
MS&IS 452
I E 521
Integer Programming
I E 510
Dynamic Programming
I E/SC&IS 519
Mathematical Programming
I E 512, I E 520
CMPSC/MATH 555
SC&IS 525, MS&IS 550

COMPUTATIONAL METHODS

Numerical Methods
CMPSC/MATH 451, CMPSC/MATH 455, CMPSC/MATH 456, CMPSC/MATH 550
Simulation Methods
I E 453 or MS&IS 432

I E 522
MSIS 532

APPLICATION/SPECIALIZATION
Includes courses in the above areas as well as courses in quality control, scheduling, inventory, queuing, decision analysis, game theory, logistics, expert systems, econometrics, forecasting, and others.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

OPERATIONS RESEARCH (O R) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/24/04

Last reviewed by Publications: 3/2/10

Pathobiology (PATHB)

Program Home Page (Opens New Window)

ROBERT PAULSON, *Director of the Graduate Program in Pathobiology*
104 Henning Building

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Anne Andrews, Ph.D. (American U) Assistant Professor of Molecular Toxicology
- Avery August, Ph.D. (Cornell) Associate Professor of Immunology
- Margherita Cantorna, Ph.D. (Wisconsin, Madison) Associate Professor of Nutrition and Immunology
- Pamela H. Correll, Ph.D. (George Washington) Associate Professor of Veterinary Science and Biomedical Sciences
- Richard Frisque, Ph.D. (Wisconsin) Professor of Molecular Virology
- Lester C. Griel, Jr., M.S., V.M.D. (Pennsylvania) Professor of Veterinary Science and Biomedical Sciences
- Eric Harvill, Ph.D. (California, Los Angeles) Associate Professor of Immunology
- Arthur L. Hattel, D.V.M. (Colorado) Senior Research Associate in Veterinary Science and Biomedical Sciences
- Biao He, Ph.D. (New York, Brooklyn) Assistant Professor of Veterinary Science and Biomedical Sciences
- Andrew J. Henderson, Ph.D. (California, Riverside) Associate Professor of Veterinary Science and Biomedical Sciences
- Bhushan Jayarao, Ph.D. (Univ of Vet Sci, Budapest) Associate Professor of Veterinary Science and Biomedical Sciences
- Mary Kennett, D.V.M., Ph.D. (Missouri, Columbia) Associate Professor of Veterinary Science and Biomedical Sciences
- Brenda Love, D.V.M., Ph.D. (California, Davis) Research Associate in Veterinary Science and Biomedical Sciences
- Andrea M. Mastro, Ph.D. (Penn State) Professor of Microbiology and Cell Biology
- Curtis Omiecinski, Ph.D. (Washington) Professor of Veterinary Science and Biomedical Sciences
- Robert Paulson, Ph.D. (California, San Francisco) Associate Professor of Veterinary Science and Biomedical Sciences
- Gary H. Perdew, Ph.D. (Oregon) Professor of Veterinary Science and Biomedical Sciences
- Jeffrey Peters, Ph.D. (California, Davis) Associate Professor of Environmental Toxicology
- Sandeep K. Prabhu, Ph.D. (Mysore, India) Research Associate in Veterinary Science and Biomedical Sciences
- Ramesh Ramachandran, D.V.M., Ph.D. (Maryland) Assistant Professor of Poultry Science
- Robert Van Saun, D.V.M., Ph.D. (Cornell) Professor of Veterinary Science and Biomedical Sciences
- Anthony Schmitt, Ph.d. (UCLA) Assistant Professor of Molecular Immunology and Infectious Disease
- Michael Teng, Ph.D. (Chicago) Assistant Professor of Biochemistry and Molecular Biology
- Jack Vanden Heuvel, Ph.D. (Wisconsin) Professor of Veterinary Science and Biomedical Sciences
- Na Xiong, Ph.D. (Case Western Reserve) Assistant Professor of Veterinary Science and Biomedical Sciences

The graduate program in Pathobiology is designed to provide flexibility in graduate work while providing opportunities to study immunology, microbiology, nutrition, biochemistry, virology, veterinary pathology, physiology, or toxicology, usually as related to problems seen in domestic animals and humans.

Graduate instruction is directed by graduate faculty members from the Department of Veterinary Science and related units including dairy and animal science, biochemistry, biology, biophysics, immunology, nutrition, physiology, zoology, and others. The Ph.D. program is designed for completion in three to four academic years. Doctoral candidates usually complete certain required courses and obtain laboratory experience before selecting an area of specialization and completing an original research problem, including the defense of the Ph.D. dissertation.

Facilities for departmental research include laboratories in the Agricultural Sciences and Industries Building, Henning Building, Poultry Disease Laboratory, Animal Diagnostic Laboratory, Centralized Biological Laboratory, and Environmental Resources Research Institute. Opportunities to utilize specialized research equipment exist in other related facilities. The University has an extensive, modern library. A large University computer center and consultation service are available.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Applicants with a 3.00 or better grade-point average (on a 4.00 scale) in undergraduate science courses and appropriate course backgrounds will be considered for admission. Applicants should have a baccalaureate degree in biological science or a degree as a graduate veterinarian or equivalent. Undergraduate preparation should include biology, chemistry, physics, mathematics through calculus, and preferably biostatistics and biochemistry.

Master's Degree Requirements

A minimum of 30 graduate credits is required for the M.S. degree, of which 18 credits must be taken in 500- and 600-level courses.

Satisfactory completion of the following courses or their equivalent is required of all degree candidates: statistics, 3 credits; biochemistry or molecular and cell biology (usually chosen from B M B 400, B M B 401, B M B 402, B M B 437, and BMMB 514), 6 credits; and pathobiology (V SC 520), 3 credits.

All graduate students are required to complete one semester of VB SC 590 Colloquium each year as well as 8 credits from a list of courses.

Pathobiology requires no program-specific qualifying examinations, and there is no communication/language requirement for the M.S.

A thesis is required of all candidates for the M.S. degree.

Doctoral Degree Requirements

The doctor of philosophy degree places a strong emphasis on research. It is conferred in recognition of the capacity to carry out independent research and the attainment of a high level of scholarship. General requirements for the doctorate specify a minimum period of residence, the passing of candidacy, comprehensive and final oral examinations, and the writing of a satisfactory thesis. The particular combination of courses, seminars, individual study, and research that constitutes an individual student's program is arranged by the doctoral committee and should include the courses that have been designated in the Pathobiology graduate curriculum, subject to the general policies of the Graduate School.

The Graduate School requires no specified number of courses for the attainment of the doctorate. However, the Pathobiology graduate program requires that all graduate students complete the course requirements outlined. A total of 21 graduate credits is required for the Ph.D. degree. A minimum grade-point average of 3.00 for work done at the University is required.

There are formal communications requirements for the Ph.D. degree in Pathobiology which are required by the Graduate School. The doctoral committee will assess the technical writing and oral communication skills of the candidate and may require that formal course work or other means to improve these skills be undertaken.

The graduate program requires that each graduate student have 3 credits in statistics. However, Ph.D. candidates are expected to have statistical skills equivalent to those learned in STAT 501 and STAT 502. The candidacy examination committee and the doctoral committee will assess the student's competence in statistics and may require that additional course work be taken.

A candidacy examination is given to students entering the Ph.D. program and after they complete at least twelve hours of postbaccalaureate course work.

After being admitted to candidacy, each doctoral candidate is guided by a doctoral committee consisting of four or more members of the graduate faculty. At least one member and preferably two are from other departments. These committees are appointed through the Office of Graduate Student Programs, upon recommendation of the department head, after the student is admitted to candidacy.

Other Relevant Information

After a student has been admitted to graduate study in the department, an adviser will be appointed by the program director. This person may be a member of the eventual M.S. committee or someone else assigned the responsibility for directing the student's scheduling of course work. In the case of a doctoral candidate, the person may be a member of the eventual doctoral committee or someone else designated the responsibility for directing the student's scheduling of course work. The adviser is also responsible for initiating the scheduling of the candidacy examination.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

VETERINARY SCIENCE (V SC) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/30/04

DATE LAST REVIEWED BY PUBLICATIONS: 11/16/06

Petroleum and Mineral Engineering (PME)

Program Home Page (Opens New Window)

YAW D. YEBOAH, *Head of the Department of Energy and Mineral Engineering*
MARK S. KLIMA, *Associate Department Head*

Department Office
110 Hosler Building
814-865-3437

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Michael A. Adewumi, Ph.D. (IIT) *Professor of Petroleum and Natural Gas Engineering*
- Luis Ayala, Ph.D. (Penn State) *Assistant Professor of Petroleum and Natural Gas Engineering*
- Christopher J. Bise, Ph.D. (Penn State) *Professor of Mining Engineering and Industrial Health and Safety*
- Timothy J. Considine, Ph.D. (Cornell) *Professor of Natural Resource Economics*
- Turgay Ertekin, Ph.D. (Penn State) *Professor of Petroleum and Natural Gas Engineering*
- Maochen Ge, Ph.D. (Penn State) *Associate Professor of Mining Engineering*
- Abraham S. Grader, Ph.D. (Stanford) *Professor of Petroleum and Natural Gas Engineering*
- William A. Groves, Ph.D. (Michigan) *Assistant Professor of Industrial Health and Safety*
- Joel M. Haight, Ph.D. (Auburn) *Assistant Professor of Industrial Health and Safety*
- Phillip M. Halleck, Ph.D. (Chicago) *Associate Professor of Energy and Geo-Environmental Engineering*
- Richard Hogg, Ph.D. (California, Berkeley) *Professor Emeritus of Mineral Processing and Geo-Environmental Engineering*
- M. Thaddeus Ityokumbul, Ph.D. (University of Western Ontario) *Associate Professor of Mineral Processing and Geo-Environmental Engineering*
- Zuleima Karpyn, Ph.D. (Penn State) *Assistant Professor of Petroleum and Natural Gas Engineering*
- Vladislav Kecojevic, Ph.D. (U Belgrade) *Assistant Professor of Mining Engineering*
- Mark S. Klima, Ph.D. (Penn State) *Associate Professor of Mineral Processing and Geo-Environmental Engineering*
- Peter T. Luckie, Ph.D. (Penn State) *Professor Emeritus of Mineral Processing*
- K.Osseo-Asare, Ph.D. (California, Berkeley) *Professor of Metallurgy and Energy, and Geo-Environmental Engineering*
- Raja V. Ramani, Ph.D. (Penn State) *Professor Emeritus of Mining and Geo-Environmental Engineering*
- Andrew Schissler, Ph.D. (Colorado School of Mines) *Assistant Professor of Mining Engineering*
- Robert W. Watson, Ph.D. (Penn State) *Associate Professor of Petroleum and Natural Gas Engineering, and Geo-Environmental Engineering*
- Yaw D. Yeboah, Sc.D. (MIT) *Professor and Head of Energy and Geo-Environmental Engineering*

The Department of Energy and Mineral Engineering provides a vertically integrated approach to research and education in all aspects of the energy and mineral industries, including scientific and engineering issues, health and safety, and maintenance of high environmental standards. The department's mission is to forge an intellectual and scientific cohesiveness in energy and mineral resource technology. This objective is achieved by exploiting the natural synergy between the exploration, extraction, processing, and utilization of energy and mineral resources so as to cater to the emerging needs of society.

The Department of Energy and Mineral Engineering offers advanced degrees in three programmatic areas (Energy and Geo-Environmental Engineering, Oil and Gas Engineering Management, and Petroleum and Mineral Engineering). Each academic degree program has specific faculty associated with it and a professor who serves as the graduate program chair. The Department of Energy and Mineral Engineering has overall requirements for the M.S., M.Eng., and Ph.D. degrees with specific requirements associated with each program.

Petroleum and Mineral Engineering

The Petroleum and Mineral Engineering (PME) program is a single graduate program with a focus on the production of energy and minerals in an economic, safe, and efficient manner. The program provides flexible education of students in energy and mineral sciences and engineering, and industrial health and safety, with particular focus on non-renewable resource and energy industries. The program is designed to resolve the sometimes competing goals of flexible education of requisite breadth while still providing in-depth study; students are required to follow a focused core curriculum that combines the requisite rigor with flexibility in a rapidly changing field of endeavor. Participating students take common core courses in engineering project investment evaluation, occupational health and safety, and engineering multiphase systems analysis with subsequent specialization in one of three specialty option areas: petroleum and natural gas engineering, mining and mineral process engineering, and industrial health and safety.

Admission Requirements

Scores for the Graduate Record Examinations (GRE) are required for admission, though this may be waived at the discretion of the Petroleum and Mineral Engineering graduate program. The best-qualified applicants will be accepted up to the number of spaces available for new students. Students will be accepted by the Petroleum and Mineral Engineering graduate program, and at the discretion of the Petroleum and Mineral Engineering graduate program, a student may be granted provisional admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Admission to the Petroleum and Mineral Engineering graduate program in the Department of Energy and Mineral Engineering is competitive. Entering students must hold a bachelor's degree in a science or engineering discipline. Students with 3.00 or better (out of 4.00) junior/senior cumulative grade-point average and appropriate course backgrounds will be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Entering graduate students in Energy and Mineral Engineering for whom English is not the first language are required to have a score of at least 550 on the Test of English as a Foreign Language (TOEFL) examination. Letters of recommendation and a statement of purpose written by the applicant are also required.

Master's Degree Requirements

The M.S. degree program in Petroleum and Mineral Engineering is designed for students to gain advanced knowledge for research, analysis, and design in Industrial Health and Safety, Mining and Mineral Process Engineering, and Petroleum and Natural Gas Engineering. Students pursuing an M.S. degree will be required to complete 24 course credits and submit a thesis (6 credits) to the Graduate School. Graduate committees in each academic program within the Department of Energy and Mineral Engineering play an important role in formulating individual course and research schedules. M.S. students in the Petroleum and Mineral Engineering graduate program after completing 10 credits of common core courses must select a specialty option from among three available options and take a minimum of 14 course credits from a list of specialty option courses for that particular option. At least 12 of the total course credits must be at the 500 level.

Doctoral Degree Requirements

The Ph.D. program in Petroleum and Mineral Engineering emphasizes scholarly research and helps students prepare for research and related careers in industry, government, and academe. Acceptance into the Ph.D. degree program in Petroleum and Mineral Engineering is based on the student's performance on the Ph.D. candidacy examination administered by the faculty of the PME graduate program. A comprehensive examination is required of all Ph.D. candidates and should be taken after substantial completion of course work. The comprehensive examination is the responsibility of the candidate's doctoral committee and administered according to the rules specified by the Graduate School. The Ph.D. program in Petroleum and Mineral Engineering is quite flexible with minimum formal requirements. The communication and foreign language requirements for the Ph.D. degree may be satisfied by intermediate knowledge of one foreign language. The general requirements for graduation are outlined in the GENERAL INFORMATION section of the *Graduate Bulletin*. The specific credit requirements of the Ph.D. programs in the Department of Energy and Mineral Engineering are available upon request.

Other Relevant Information

All graduate students are expected to attend general department seminars and seminars in their programmatic areas. Graduate students may be asked to contribute to the instructional programs of the department by assisting with laboratory and lecture courses.

Students in Petroleum and Mineral Engineering may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (*See also* Operations Research online at http://bulletins.psu.edu/bulletins/whitebook/graduate_degree_programs.cfm?letter=O&program=grad_o_r.htm)

Student Aid

Graduate students are supported by a variety of government and industry fellowships, and research and teaching assistantships. Stipends vary depending on the source. Please see the STUDENT AID section of the *Graduate Bulletin* to learn other forms of the student aid.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

PETROLEUM AND MINERAL ENGINEERING (PME) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/17/04

Last Revised by the Department: Summer Session 2006

Blue Sheet Item #: 34-04-077

Review Date: 1/17/06

Last updated by Publications: 1/22/10 (link and department head check)

Petroleum and Natural Gas Engineering (PNG E)

Program Home Page

YAW D. YEBOAH, *Head of the Department of Energy and Mineral Engineering*
MARK S. KLIMA, *Associate Department Head*

Department Office
110 Hosler Building
814-865-3437

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Michael A. Adewumi, Ph.D. (IIT) *Professor of Petroleum and Natural Gas Engineering*
- Luis F. Ayala, Ph.D. (Penn State) *Assistant Professor of Petroleum and Natural Gas Engineering*
- Turgay Ertekin, Ph.D. (Penn State) *Professor of Petroleum and Natural Gas Engineering*
- Abraham S. Grader Ph.D. (Stanford) *Professor of Petroleum and Natural Gas Engineering*
- Phillip M. Halleck, Ph.D. (Chicago) *Associate Professor of Petroleum and Natural Gas Engineering*
- Robert W. Watson, Ph.D. (Penn State) *Associate Professor of Petroleum and Natural Gas, and Geo-Environmental Engineering*

The Department of Energy and Mineral Engineering provides a vertically integrated approach to research and education in all aspects of the energy and mineral industries, including scientific and engineering issues, health and safety and maintenance of high environmental standards. The department's mission is to forge an intellectual and scientific cohesiveness in energy and mineral resource technology. This objective is achieved by exploiting the natural synergy between the exploration, extraction, processing and utilization of energy and mineral resources so as to cater to the emerging needs of society.

The Department of Energy and Mineral Engineering offers advanced degrees in six programmatic areas (Energy and Geo-Environmental Engineering, Industrial Health and Safety, Mineral Processing, Mining Engineering, Oil and Gas Engineering Management, and Petroleum and Natural Gas Engineering). Each academic degree program has specific faculty associated with it and a professor who serves as the graduate program chair. The Department of Energy and Mineral Engineering has overall requirements for the M.S., M.Eng., and Ph.D. degrees with specific requirements associated with each program.

Petroleum and Natural Gas Engineering Program
Areas of specialization include fluid dynamics in pipes, multiphase flow in porous media, reservoir engineering, pressure transient analysis, drilling, perforating and completion engineering, secondary migration, environmental issues, numerical reservoir simulation, artificial neural networks, rock mechanics, improved hydrocarbon recovery, unconventional gas reservoirs, natural gas processing and transmission, coalbed methane reservoirs.

Admission Requirements

Scores for the Graduate Record Examinations (GRE) are required for admission, though this may be waived at the discretion of the academic programs. The best-qualified applicants will be accepted up to the number of spaces available for new students. Students will be accepted by the academic programs and at the discretion of a graduate program, a student may be granted provisional admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Gradu*
Graduate Bulletin

Admission to the academic programs in the Department of Energy and Geo-Environmental Engineering is competitive. Entering students must hold a bachelor's degree in engineering or physical sciences. Students with 3.00 or better (out of 4.00) junior/senior cumulative grade-point averages and appropriate course backgrounds will be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Entering graduate students in Energy and Geo-Environmental Engineering for whom English is not the first language are required to have a score of at least 550 on the Test of English as a Foreign Language (TOEFL) examination. Letters of recommendation and a statement of purpose written by the applicant are also required.

Master's Degree Requirements

The M.S. degree programs in the Department of Energy and Geo-Environmental Engineering are designed for students to gain advanced knowledge for research, analysis, and design in Energy and Geo-Environmental Engineering, Industrial Health and Safety, Mineral Processing, Mining Engineering, and Petroleum and Natural Gas Engineering. Students pursuing an M.S. degree will be required to complete 24 course credits and submit a thesis (6 credits) to the Graduate School. Graduate committees in each academic program play an important role in formulating individual course and research schedules.

The Mining Engineering and Oil and Gas Engineering Management programs also offer an M.Eng. degree. Students pursuing an M.Eng degree are required to present a scholarly written report on a suitable project, the topic of which may be suggested by the industry. The report must be a scholarly achievement, relating a developmental study that involves an appropriate, significant subject in the discipline. The report must be approved by a committee of the faculty comprised of report adviser, report reader, and chair of the program.

The specific credit requirements and other specifics of the master's programs in Energy and Geo-Environmental Engineering are available upon request.

Doctoral Degree Requirements

The Ph.D. programs in the Department of Energy and Geo-Environmental Engineering emphasize scholarly research and help students prepare for research and related careers in industry, government and academe. Acceptance into the Ph.D. degree programs in the Department of Energy and Geo-Environmental Engineering are based on the student's performance on the Ph.D. candidacy examination administered by the faculty of a specific academic program. A comprehensive examination is required of all Ph.D. candidates and should be taken after substantial completion of course work. The comprehensive examination is the responsibility of the candidate's doctoral

committee and administered according to the rules specified by the Graduate School. The Ph.D. programs in Energy and Geo-Environmental Engineering are quite flexible with minimum formal requirements. The communication and foreign language requirements for the Ph.D. degree may be satisfied by intermediate knowledge of one foreign language. The general requirements for graduation are outlined in the GENERAL INFORMATION section of the *Graduate Bulletin*. The specific credit requirements of the Ph.D. programs in Energy and Geo-Environmental Engineering are available upon request.

Other Relevant Information

All graduate students are expected to attend general department seminars and seminars in their programmatic areas. Graduate students may be asked to contribute to the instructional programs of the department by assisting with laboratory and lecture courses.

Students in Mining Engineering and Petroleum and Natural Gas Engineering may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (*See also* Operations Research.)

Student Aid

Graduate students are supported by a variety of government and industry fellowships, and research and teaching assistantships. Stipends vary depending on the source. Please see the STUDENT AID section of the *Graduate Bulletin* to learn other forms of the student aid.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

ENERGY AND GEO-ENVIRONMENTAL ENGINEERING (EGEE) course list

PETROLEUM AND NATURAL GAS ENGINEERING (P N G) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/17/04

Last updated by Publications: 1/22/10 (link check; department head check)

Pharmacology (PHARM)

Program Home Page (Opens New Window)

KENT E. VRANA, *Chair of the Department*
The Milton S. Hershey Medical Center
Hershey, PA 17033
717-531-8285
Pharm-grad-hmc@psu.edu

Degrees Conferred:

Ph.D., M.S., M.D./Ph.D. M.B.A./Ph.D.

The Graduate Faculty

- Shantu G. Amin, Ph.D. (Stevens Institute of Technology) Professor of Pharmacology
- Cheston M. Berlin, Jr., M.D. (Harvard) University Professor of Pediatrics and Professor of Pharmacology
- Melvin L. Billingsley, Ph.D. (George Washington) Professor of Pharmacology, and Biotechnology and Entrepreneurship
- Victor A. Canfield, Ph.D. (California) Assistant Professor of Pharmacology
- Keith C. Cheng, M.D., Ph.D. (New York; Washington) Professor of Pathology, Biochemistry and Molecular Biology, and Pharmacology
- John D. Connor, Ph.D. (Phila. College of Pharmacy and Sci) Professor Emeritus of Pharmacology
- Dhimant Desai, Ph.D. (Bombay) Associate Professor of Pharmacology
- John Ellis, Ph.D. (Rochester) Associate Professor of Pharmacology and Psychiatry
- Keith Elmslie, Ph.D. (SUNY, Stony Brook) Associate Professor of Anesthesiology and Pharmacology
- Leo Fitzpatrick, Ph.D. (Texas) Associate Professor of Pharmacology
- Willard M. Freeman, Ph.D. (Wake Forest) Assistant Professor of Pharmacology
- Frank E. Greene, Ph.D. (Florida) Associate Professor Emeritus of Pharmacology
- Christopher R. Herzog, Ph.D. (Ohio) Assistant Professor of Pharmacology and Pathology
- Byron C. Jones, Ph.D. (Arizona) Associate Professor of Biobehavioral Health and Pharmacology
- Kelly Karpa, Ph.D. (Penn State) Associate Professor of Pharmacology
- Mark Kester, Ph.D. (SUNY, Buffalo) G. Thomas Passananti Professor of Pharmacology
- Philip Lazarus, Ph.D. (McGill) Professor of Pharmacology and Health Evaluation Sciences
- Robert G. Levenson, Ph.D. (SUNY, Stony Brook) Professor of Pharmacology
- Thomas A. Lloyd, Ph.D. (Harvard) Professor of Health Evaluation Sciences and Pharmacology; Professor of Obstetrics and Gynecology
- Richard B. Mailman, Ph.D. (North Carolina) Professor of Pharmacology; Distinguished Senior Scholar in Pharmacology and Neurology
- Kathleen M. Mulder, Ph.D. (SUNY, Buffalo) Professor of Biochemistry and Molecular Biology
- Anthony E. Pegg, Ph.D. (Cambridge) Evan Pugh Professor of Physiology and Professor of Pharmacology
- Bogdan Prokopczyk, Ph.D. (Warsaw) Associate Professor of Pharmacology
- ohn P. Richie (Louisville) Professor of Public Health Sciences, and Pharmacology
- Gavin P. Robertson, Ph.D. (California) Associate Professor of Pharmacology, Dermatology, Pathology, and Surgery
- Victor J. Ruiz-Velasco, Ph.D. (Tulane) Associate Professor of Anesthesiology, and Pharmacology
- Ugur Salli, Ph.D. (Oregon) Assistant Professor of Pharmacology
- Lakshman Sandirasegarane, Ph.D. (Saskatchewan) Assistant Professor of Pharmacology
- Walter B. Severs, Ph.D. (Pittsburgh) Professor Emeritus of Pharmacology
- Arun K. Sharma, Ph.D. (North Eastern) Associate Professor of Pharmacology
- Joan Y. Summy-Long, Ph.D. (Penn State) Professor of Neural and Behavioral Sciences
- Elliot S. Vesell, M.D. (Harvard) Evan Pugh Professor Emeritus of Pharmacology and Medicine
- Hong Gang Wang, Ph.D. (Japan) Lois High Berstler Professor of Pharmacology
- Jin-Ming Yang, M.D., Ph.D. (China) Professor of Pharmacology
- Jong K. Yun, Ph.D. (Case Western Reserve) Associate Professor of Pharmacology

The graduate studies program in Pharmacology is designed to give qualified students a combination of didactic instruction, informal direction, and laboratory experience that will enable them to obtain a firm foundation in the principles, methods, and contributions of pharmacology (defined broadly as the science of the multiple aspects of the interaction of chemical agents with biological systems). With this preparation, graduates of the program should be capable of designing and executing high-quality independent research, and of assuming positions of responsibility within the pharmacologic community.

The department offers studies in the general areas of drug metabolism, molecular pharmacology, endocrine pharmacology, neuropharmacology, cardiovascular-renal pharmacology, and clinical pharmacology. Primary emphasis is placed on the molecular mechanism by which drugs act in the body and by which the body transforms drugs. The department also offers a concurrent degree program resulting in a combined M.B.A./Ph.D. Consult department for details.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. At the discretion of the graduate program, a student may be admitted provisionally for graduate study without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

A bachelor's degree reflecting a reasonable background in zoology or biology, mathematics, and chemistry is required. Reading knowledge of one or two foreign languages is recommended. Students with a minimum junior/senior grade-point average of 3.00 and with appropriate course backgrounds will be considered for admission. Three letters of recommendation, a curriculum vitae, and a description of career goals are required. Students are not usually accepted into the graduate program unless they are preparing for the doctoral degree.

Master's Degree Requirements

A minimum of 30 credits as specified by the Graduate School are required. Candidates must submit a thesis based on original laboratory observations. A specified core curriculum includes the following courses: BMS 501, BMS 502, BMS 503, PHARM 520, PHARM 502, PHARM 503, PHARM 504 (or PHARM 550), PHARM 590; PHARM 597. Candidates must defend their theses to the satisfaction of the graduate

faculty (two-thirds favorable vote).

Doctoral Degree Requirements

During the first two years of study Ph.D. candidates take The College of Medicine Core Curriculum (BMS 501 Regulation of Cellular and Systemic Energy Metabolism, BMS 502 Cell and Systems Biology, and BMS 503 Flow of Cellular Information) in the Fall semester to provide a strong foundation. Additional courses in general pharmacology, molecular pharmacology and principles of drug action are required including PHARM 502, PHARM 503, PHARM 504 (or PHARM 550), PHARM 520, PHARM 582, PHARM 590, and PHARM 597. Students will demonstrate skills in one of the following areas of communications: computer language, biostatistics; the department also requires competency in written and oral English.

Candidates for the combined M.D./Ph.D. programs must apply to and be accepted by the medical school before they can be considered for the combined program.

Candidates for the M.B.A./Ph.D. program must first apply and be accepted by the doctoral program before being considered for the M.B.A.

Other Relevant Information

Each new graduate student is assigned an adviser pro team who will serve as a general counselor. Master's candidates have three months from initial registration to form an agreement with a member of the graduate faculty who will supervise their laboratory work. Doctoral candidates can take as much as a year to form this agreement.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

PHARMACOLOGY (PHARM) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 6/1/04

Date last updated by Publications: 7/27/09

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-07-447

Review Date: 6/12/07

Philosophy (PHIL)

Program Home Page (Opens New Window)

SHANNON W. SULLIVAN, *Head of the Department*
240 Sparks Building
814-865-6397
sws10@psu.edu

Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- Mitchell S. Aboulafia, Ph.D. (Boston College) Professor of Philosophy
- Douglas R. Anderson, Ph.D. (Penn State) Associate Professor of Philosophy
- John P. Christman, Ph.D. (Illinois, Chicago) Associate Professor of Philosophy and Women's Studies
- Vincent M. Colapietro, Ph.D. (Marquette) Professor of Philosophy
- Daniel W. Conway, Ph.D. (California, San Diego) Professor of Philosophy
- Véronique M. Fóti, Ph.D. (Boston College) Associate Professor of Philosophy
- Emily R. Grosholz, Ph.D. (Yale) Professor of Philosophy and African American Studies; Fellow of the Institute for the Arts and Humanities
- Irene E. Harvey, Ph.D. (York) Associate Professor of Philosophy and Women's Studies
- Dale Jacquette, Ph.D. (Brown) Professor of Philosophy
- Claire Katz, Ph.D. (Memphis) Associate Professor of Philosophy, Jewish Studies and Women's Studies
- Catherine E. Kemp, Ph.D. (SUNY, Stony Brook) Assistant Professor of Philosophy
- Christopher P. Long, Ph.D. (New School, New York) Associate Professor of Philosophy
- Evelyn B. Pluhar-Moravetz, Ph.D. (Michigan) Professor of Philosophy
- Dennis J. Schmidt, Ph.D. (Boston College) Professor of Philosophy, German, and Comparative Literature; Co-director, Institute for the Arts and Humanities
- Shannon W. Sullivan, Ph.D. (Vanderbilt) Head; Associate Professor of Philosophy and Women's Studies
- Nancy Tuana, Ph.D. (California, Santa Barbara) DuPont/Class of '49 Professor of Philosophy, Humanities, and Women's Studies; Director, Rock Ethics Institute

Graduate education in the Penn State Department of Philosophy is characterized by a focus on, and commitment to, the history of philosophy, conceived as a basis for study in diverse areas of special interest. In addition, the graduate program includes special emphases on both contemporary Continental philosophy (including phenomenology, existentialism, hermeneutics, social theory, and postmodernism) and Classical American philosophy (including transcendentalism, semiotics, pragmatism, and contemporary cultural issues). All students' programs are arranged to facilitate preparation in the systematic fields of their interests, such as aesthetics, ethics, political philosophy, metaphysics, philosophy of religion, epistemology, philosophy of science, and mathematical logic, and there is a provision for directed research, collaboration, and in-depth consultation by students with member of the faculty.

Interdisciplinary study is also possible across the humanities, the social sciences, the arts, the natural sciences, and interdisciplinary programs such as Women's Studies, Classics and Ancient Mediterranean Studies, and Science Technology, and Society. The Philosophy department offers students the opportunity to earn a dual-title doctoral degree in Philosophy and Women's Studies. Doctoral minors are available in social thought and in literary theory, criticism, and aesthetics. Study abroad is possible as well, through exchange programs or individual arrangements with leading departments of philosophy.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

Undergraduate preparation is advisable.

Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 GPA may be made for students with special backgrounds, abilities, and interests. Apply by January 15.

Degree Requirements

The department may waive the requirement of a thesis for an M.A. candidate. The foreign language requirement for the Ph.D. degree is satisfied by passing department translation examinations in two languages other than English, and by completing a course in philosophy in one of the these languages. The logic requirement for the Ph.D. degree is satisfied by passing a department logic examination.

Student Aid

Every student admitted to the department's Ph.D. program receives full assistantship or fellowship funding (stipend and tuition waiver) for five years (assuming reasonable progress). In addition to the many fellowships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the Graduate Bulletin, the department awards annually an Edwin Erle Sparks Fellowship in the Humanities. In the last several years, Philosophy graduate students have received numerous external national and international fellowships and awards (such as DADD, Fulbright, Javits, Mellon). Many Philosophy graduate students have received assistantship support for interdisciplinary teaching assignments in programs such as American Studies, Classics and Ancient Mediterranean Studies, Religious Studies, and Women's Studies.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not

to meet requirements for an advanced degree.

PHILOSOPHY (PHIL) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

DATE LAST REVIEWED BY PUBLICATIONS: 7/9/07 (link check)

Physics (PHYS)

Program Home Page (Opens New Window)

JAYANTH R. BANAVAR, *Head of the Department*
104 Davey Laboratory
814-865-7533

Degrees Conferred:

Ph.D., D.Ed., M.S., M.Ed.

The Graduate Faculty

- Reka Albert, Ph.D. (Notre Dame) Assistant Professor of Physics
- Abhay V. Ashtekar, Ph.D. (Chicago) Eberly Professor of Physics
- Jayanth R. Banavar, Ph.D. (Pittsburgh) Distinguished Professor of Physics
- Bernd Bruegmann, Ph.D. (Syracuse) Associate Professor of Physics
- Welford A. Castleman, Ph.D. (Polytechnic Inst of New York) Evan Pugh Professor of Chemistry and Physics
- Moses H. W. Chan, Ph.D., (Cornell) Evan Pugh Professor of Physics
- Milton W. Cole, Ph.D. (Chicago) Distinguished Professor of Physics
- John C. Collins, Ph.D. (Cambridge) Professor of Physics
- Stephane Coutu, Ph.D. (Cal Tech) Associate Professor of Physics
- Douglas Cowen, Ph.D. (Wisconsin, Madison) Associate Professor of Physics
- Vincent H. Crespi, Ph.D. (California, Berkeley) Professor of Physics
- James P. Crawford, Ph.D. (Colorado) Associate Professor of Physics
- Paul H. Cutler, Ph.D. (Penn State) Professor Emeritus of Physics
- Renee D. Diehl, Ph.D. (Washington) Professor of Physics
- Peter Eklund, Ph.D. (Purdue) Professor of Physics
- Kristen Fichthorn, Ph.D. (Michigan) Professor of Chemical Engineering and Physics
- Lee Samuel Finn, Ph.D. (Cal Tech) Professor of Physics
- Norman Freed, Ph.D. (Case Western Reserve) Professor of Physics
- Kurt Gibble, Ph.D. (Colorado) Associate Professor of Physics
- Gabriela I. Gonzalez, Ph.D. (Syracuse) Adjunct Assistant Professor of Physics
- Murat Günaydin, Ph.D. (Yale) Professor of Physics
- M. Abul Hasan, Ph.D. (Lehigh) Associate Professor of Physics
- Steven F. Heppelmann, Ph.D. (Minnesota) Professor of Physics
- Roger M. Herman, Ph.D. (Yale) Professor Emeritus of Physics
- Jainendra Jain, Ph.D. (SUNY, Stony Brook) Mueller Professor of Physics
- Dezhe Jin, Ph.D. (California, San Diego) Assistant Professor of Physics
- Pablo Laguna, Ph.D. (Texas, Austin) Professor of Astronomy and Astrophysics, and Physics
- Daniel J. Larson, Ph.D. (Harvard) Professor of Physics
- Qi Li, Ph.D. (Peking) Professor of Physics
- Ying Liu, Ph.D. (Minnesota) Associate Professor of Physics
- Gerald Mahan, Ph.D. (California, Berkeley) Distinguished Professor of Physics
- Julian D. Maynard, Ph.D. (Princeton) Distinguished Professor of Physics
- Peter Mészáros, Ph.D. (California, Berkeley) Distinguished Professor of Astronomy and Astrophysics, and Physics
- Nicholas M. Miskovsky, Ph.D. (Penn State) Professor of Physics
- Ari Mizel, Ph.D. (California, Berkeley) Assistant Professor of Physics
- Kenneth O'Hara, Ph.D. (Duke) Assistant Professor of Physics; Downsbrough Professor
- Benjamin Owen, Ph.D. (Cal Tech) Assistant Professor of Physics
- Lawrence J. Pilione, Ph.D. (Penn State) Professor of Physics
- Jorge A. Pullin, Ph.D. (Instituto Balserio) Adjunct Professor of Physics
- Richard W. Robinett, Ph.D. (Minnesota) Professor of Physics
- Nitin Samarth, Ph.D. (Purdue) Professor of Physics
- Peter E. Schiffer, Ph.D. (Stanford) Professor of Physics
- Deirdre Shoemaker, Ph.D. (Texas) Assistant Professor of Physics
- Gerald A. Smith, Ph.D. (Yale) Professor Emeritus of Physics
- Jorge Sofo, Ph.D. (Instituto Balseiro) Associate Professor of Physics
- Mark Strikman, Ph.D. (Leningrad) Professor of Physics
- Brian L. J. Weiner, Ph.D. (Leicester) Professor of Physics
- David Weiss, Ph.D. (Stanford) Associate Professor of Physics
- James J. Whitmore, Ph.D. (Illinois) Professor of Physics
- Roy F. Willis, Ph.D. (Cambridge) Professor of Physics
- Thomas Winter, Ph.D. (Wisconsin) Professor of Physics
- Xiaoxing Xi, Ph.D. (Peking) Professor of Physics; Associate Professor of Materials Science and Engineering
- Jinwu Ye, Ph.D. (Yale) Assistant Professor of Physics

Graduate instruction and research opportunities are available in atomic and molecular physics, laser physics, experimental and theoretical condensed matter and materials physics, surface physics, low-temperature physics, statistical physics, acoustics, nuclear physics, experimental and theoretical particle physics, quantum field theory, general relativity, cosmology and relativistic astrophysics and quantum gravity. Work in some areas is conducted in cooperation with the Materials Research Institute, the Applied Research Laboratory, and other interdisciplinary research facilities.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School Requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin.*

A bachelor's degree in physics or an allied field is required for admission to the M.S., D.Ed., and Ph.D. programs. Students with a 2.50 or higher junior/senior grade-point average (on a 4.00 scale) in physics and mathematics will be considered, and the best-qualified

applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 2.50 GPA may be made for students with special backgrounds, abilities, and interests. Exceptions may also be made for applicants for doctoral programs who have completed master's degrees at other institutions.

Admission and study programs for the M.Ed. degree are handled on an individual basis.

Master's Degree Requirements

M.S. program: Required courses include PHYS 530, PHYS 557, PHYS 559 (2 credits), PHYS 561, or PHYS 410. There are two options. Thesis option: The thesis must be based on at least 6 credits of PHYS 600 and must conform to Graduate School regulations. Nonthesis option: An additional 6 credits of 500-level physics courses beyond the required ones must be taken, and a short paper must be submitted to, and accepted by, the department. There is no degree examination for either option.

M.Ed. program: At least 18 credits in physics are required, of which up to 6 credits may be for research. Six additional nonresearch science credits (which may be in physics) and a 6-credit minor in a field of professional education also must be included. A thesis or term paper must be submitted and accepted by the department.

Doctoral Degree Requirements

Ph.D. program: Required courses include PHYS 517, PHYS 525, PHYS 530, PHYS 557, PHYS 559 (2 credits), PHYS 561, PHYS 562, and a first-year seminar series. Courses required beyond these depend on the Ph.D. option. Those who choose the standard option take at least five additional 3-credit, 500-level physics courses. Those who choose the applied physics option take at least four additional courses of an applied nature selected from a list which will be provided by the physics department on request.

A candidacy examination is given at the end of the first year, a comprehensive examination approximately two years after the candidacy examination, and a final thesis defense takes place after the completion of the thesis. There is no departmental foreign language requirement, although a reading knowledge of one foreign language may be needed in some areas of research.

D.Ed. program: The requirements and procedures are the same as those for the Ph.D. program except for the following changes. Only three 500-level physics courses are required after the first nine courses listed above. An educational minor of at least 15 credits is required. A total of 90 credits must be earned in graduate school, at least 30 in residence. The thesis must be based on a minimum of 15 research credits.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

HOMER F. BRADDOCK GRADUATE FELLOWSHIPS Available to exceptional Ph.D. candidates in several departments of the Eberly College of Science. They carry stipends of $3,500 to $7,500 per year for each of the first three years.

WHEELER P. DAVEY MEMORIAL FELLOWSHIPS Carry stipend of variable amount and are available to a limited number of qualified graduate students in the Eberly College of Science.

DAVID C. DUNCAN GRADUATE FELLOWSHIPS Available to first- and second-year graduate students in physics and carry a stipend of approximately $2,000 per year for each of the first two years.

FRYMOYER SCHOLARSHIP

W. DONALD MILLER GRADUATE FELLOWSHIP

DAVID H. RANK MEMORIAL PHYSICS AWARD

THE NELLIE AND OSCAR L. ROBERTS FELLOWSHIPS Available to graduate students majoring in the physical sciences and in biochemistry and molecular biology. Each award is for $4,000 per year for one or two years.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

PHYSICS (PHYS) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

Last reviewed by Publications: 12/04/09

Physiology (PHSIO)

Program Home Page (Opens New Window)

DONNA KORZICK, *Chair of Program*
Associate Professor of Kinesiology

Penn State University Park
814-865-5679
Fax: 814-865-4602

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Steven F. Abcouwer, Ph.D. (Houston) Associate Professor of Surgery and Cellular and Molecular Physiology
- David A. Antonetti, Ph.D. (Penn State) Associate Professor of Cellular and Molecular Physiology and Ophthalmology
- Craig R. Baumrucker, Ph.D. (Purdue) Professor of Animal Nutrition/Physiology
- Aziz Ben-Jebria, Ph.D. (Paris) Professor of Chemical Engineering
- Sarah K. Bronson, Ph.D. (Washington University) Associate Professor of Cellular and Molecular Physiology
- C. Randall Brown, Ph.D. (Texas) Associate Professor of Cellular and Molecular Physiology
- Douglas Cavener, Ph.D. (Georgia) Professor and Head, Biology
- Vincent Chau, Ph.D. (Virginia) Professor of Cellular and Molecular Physiology
- Hui-Ling Chiang, Ph.D. (Harvard) Professor of Cellular and Molecular Physiology
- Pamela H. Correll, Ph.D. (George Washington) Associate Professor of Veterinary Science
- Catherine Coleman, Ph.D. (Aberdeen) Assistant Professor of Cellular and Molecular Physiology
- Robert N. Cooney, MD. (Vermont) Professor and Chief of General Surgery and Professor of Cellular and Molecular Physiology
- Rebecca L. Corwin, Ph.D. (Chicago) Associate Professor of Nutrition
- Mihai Covasa, Ph.D. (Leeds) Associate Professor of Nutrition
- Henry J. Donahue, Ph.D. (California) Professor of Orthopaedics and Rehabilitation, and Cellular and Molecular Physiology; Director, Musculoskeletal Research
- Terry D. Etherton, Ph.D. (Minnesota) Professor of Animal Nutrition
- David J. Feith, Ph.D. (Penn State) Assistant Professor of Cellular and Molecular Physiology
- Robert A. Frost, Ph.D. (SUNY, Stony Brook) Associate Professor of Cellular and Molecular Physiology
- Thomas W. Gardner, M.D., Ph.D. (Jefferson/Penn State) Professor of Ophthalmology, and Cellular and Molecular Physiology
- Carol V. Gay, Ph.D. (Penn State) Professor of Molecular and Cell Biology
- Michael H. Green, Ph.D. (California, Berkeley) Professor of Nutrition Science and Physiology
- Daniel R. Hagen, Ph.D. (Illinois) Professor of Animal Science
- William O. Hancock, Ph.D. (Washington) Associate Professor of Bioengineering
- Leonard S. Jefferson, Jr., Ph.D. (Vanderbilt) Evan Pugh Professor of Physiology and Chair, Cellular and Molecular Physiology
- Sreenivas Kanugula, Ph.D. (Hyderabad) Assistant Professor of Cellular and Molecular Physiology
- Gordon L. Kauffman, M.D. (Michigan) Professor of Surgery and Cellular and Molecular Physiology
- W. Larry Kenney, Ph.D. (Penn State) Professor of Physiology and Kinesiology
- Ronald S. Kensinger, Ph.D. (Florida) Professor of Animal Nutrition/Physiology
- Gary J. Killian, Ph.D. (Penn State) Distinguished Professor of Reproductive Physiology
- Scot R. Kimball, Ph.D. (Vermont) Professor of Cellular and Molecular Physiology
- Donna H. Korzick, Ph.D. (Penn State) Associate Professor of Kinesiology and Physiology
- Charles H. Lang, Ph.D. (Hahnemann) Distinguished Professor and Vice Chair of Cellular and Molecular Physiology, and Surgery
- Kathryn F. LaNoue, Ph.D. (Yale) Distinguished Professor of Cellular and Molecular Physiology
- Roland M. Leach, Jr., Ph.D. (Cornell) Walther H. Ott Professor in Avian Biology
- Richard S. Legro, M.D. (Mount Sinai) Professor of Obstetrics and Gynecology
- Herbert Lipowsky, Ph.D. (California, San Diego) Professor and Head, Bioengineering
- Christopher J. Lynch, Ph.D. (Northeastern) Professor of Cellular and Molecular Physiology
- James H. Marden, Ph.D. (Vermont) Professor of Biology
- Magdi M. Mashaly, Ph.D. (Wisconsin) Associate Professor of Poultry Science
- Robert B. Mitchell, Ph.D. (Penn State) Professor of Biology
- Jon Oatley, Ph.D. Assistant Professor of Reproductive Physiology and Physiology
- James A. Pawelczyk, Ph.D. (North Texas) Associate Professor of Physiology and Kinesiology
- Anthony E. Pegg, Ph.D. (Cambridge) Evan Pugh Professor of Cellular and Molecular Physiology and Pharmacology; J. Lloyd Huck Professor of Cell and Molecular Biology
- Blaise Peterson, Ph.D. (Washington) Associate Professor of Cellualar and Molecular Physiology
- Lisa S. Poritz, MD. (Northwestern) Assistant Professor of Surgery and Cellular and Molecular Physiology
- David N. Proctor, Ph.D. (Kent State) Associate Professor of Kinesiology and Physiology
- Stephen R. Rannels, Ph.D. (Penn State) Associate Professor of Cellular and Molecular Physiology
- Chester A. Ray, Ph.D. (Georgia) Professor of Medicine, and Cellular and Molecular Physiology
- Gavin Robertson, Ph.D. (California) Associate Professor of Pharmacology, Pathology, and Dermatology
- Barbara J. Rolls, Ph.D. (Cambridge, England) Professor and Guthrie Chair in Nutrition
- Russell C. Scaduto, Jr., Ph.D. (Indiana) Associate Professor of Cellular and Molecular Physiology
- Lisa M. Shantz, Ph.D. (Johns Hopkins) Associate Professor of Cellular and Molecular Physiology
- Neil A. Sharkey, Ph.D. (California, Davis) Professor of Kinesiology, Orthopaedics, and Rehabilitation
- Cooduvalli S. Shahikant, Ph.D. (Hyderabad, India) Associate Professor of Molecular and Developmental Biology
- Jeffrey S. Shenberger, MD (Penn State Hershey) Associate Professor of Pediatrics and Cellular and Molecular Physiology
- Yuguang (Roger) Shi, Ph.D. (Australian National University & UC-Davis) Associate Professor of Cellular and Molecular Physiology
- Ian Simpson, Ph.D. (London) Professor of Neural and Behavioral Sciences and Cellular and Molecular Physiology
- Jill P. Smith, M.D. (Florida) Professor of Medicine, Division of Gastroenterology
- Diane M. Thiboutot, MD. (Penn State Hershey) Professor of Dermatology
- James Ultman, Ph.D. (Delaware, Newark) Distinguished Professor of Chemical Engineering and Bioengineering
- Thomas C. Vary, Ph.D. (Penn State) Distinguished Professor of Cellular and Molecular Physiology
- Regina Vasilatos-Younken, Ph.D. (Penn State) Professor of Endocrine Physiology and Nutrition

- Nancy I. Williams, Sc.D. (Boston) Associate Professor of Kinesiology
- Jiyue Zhu, Ph.D. (Dartmouth) Associate Professor of Cellular and Molecular Physiology

This is an intercollege program designed to enable students to obtain an integrated series of courses encompassing both the fundamentals of physiology and advanced training in a specialized area. Courses can be taken either at the College of Medicineor at University Park campus.

Graduate instruction in physiology is under the direction of the program committee, composed of graduate faculty from several departments at University Park–including the areas of animal science, biochemistry, bioengineering, biology, kinesiology, microbiology, and nutrition, as well as the Department of Cellular and Molecular Physiology at the College of Medicine. The master's program, including courses, laboratory experience, and original research, is designed for completion in approximately two years, while the doctoral degree requires approximately five years.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Degree Requirements

Deficiencies in chemistry, biological science, mathematics (through a second course in calculus), and physics must be made up early in the student's graduate program. All candidates must complete a general basic laboratory course in physiology (combined cellular, mammalian, and comparative) before choosing an area of specialization. Possible areas of specialization are cardiovascular and respiratory physiology; cellular and subcellular physiology; comparative physiology; environmental physiology; exercise physiology; physiology of nutrition and metabolism; neurophysiology; renal physiology; and reproductive physiology. The graduate committee shall be appropriately represented by members of the physiology program committee and those of the area of specialization who shall have the responsibility and jurisdiction for determining the course program and research acceptable in satisfying degree requirements. The nonthesis option is available for the M.S. degree on a limited basis.

The communication and foreign language requirement for the Ph.D. degree may be satisfied by one of several options including intermediate knowledge of one foreign language.

Other Relevant Information

The following courses, among others, are available for physiology majors, and their descriptions may be found under the offerings of several departments: AGRO 545; AN SC 420, AN SC 423, AN SC 431W, AN SC 502, AN SC 514, AN SC 515; B M B 400, B M B 401, B M B 402, B M B 437; BIOE 402, BIOE 501, BIOE 502, BIOE 503, BIOE 504, BIOE 505, BIOE 506, BIOE 507, BIOE 552, BIOE 553, BIOE 570; BIOL 409, BIOL 428, BIOL 429, BIOL 437, BIOL 446, BIOL 465, BIOL 466, BIOL 467, BIOL 472, BIOL 473, BIOL 477, BIOL 479, BIOL 538, BIOL 539, BIOL 544, BIOL 550; CMPSC 412; EDPSY 400, EDPSY 406, EDPSY 450, EDPSY 506, EDPSY 507; KINES 456, KINES 457, KINES 484, KINES 530, KINES 565, KINES 567, KINES 577, KINES 587; MICRB 400, MICRB 401, MICRB 410, MICRB 412; NUC E 405, NUC E 420; NURS 503; NUTR 452, NUTR 515, NUTR 581, NUTR 582; PHSIO 503, PHSIO 506, PHSIO 507; PHYS 400, PHYS 402, PHYS 420; PTYSC 424, PTYSC 455; PSYCH 453, PSYCH 404, PSYCH 462, PSY 527; STAT 460, STAT 462, STAT 464, STAT 500, STAT 501, STAT 502, STAT 503, STAT 505; V SC 405, V SC 420.

The following courses are offered at the College of Medicine: ANAT 503, ANAT 505, ANAT 510, ANAT 512, ANAT 515, ANAT 535, ANAT 542, ANAT 543, ANAT 544, ANAT 545, ANAT 550; BCHEM 502, BCHEM 503, BCHEM 505, BCHEM 513, BCHEM 523, BCHEM 528, BCHEM 551, BCHEM 553; L A M 501, L A M 503, L A M 507, L A M 510, L A M 515; MICRO 552, MICRO 554, MICRO 555, MICRO 559; NEURO 509, NEURO 510, NEURO 515, NEURO 526, NEURO 527, NEURO 528, NEURO 550; PHARM 502, PHARM 505, PHARM 511, PHARM 515, PHARM 520, PHARM 540, PHARM 550. Descriptions of these courses can be found under the designated program.

Physiology Minor

The objective of the doctoral minor in Physiology is to augment the training of doctoral students with a coordinated group of courses that provide an integrated perspective of physiology from the molecular to the organismal level. It is expected that most students pursuing the minor will be graduate degree candidates in basic biological sciences, health sciences, or bioengineering.

The graduate minor in Physiology requires the following. (1) BIOL 472. If the student took a one-semester, upper-level undergraduate mammalian physiology course as an undergraduate, then this requirement may be waived with approval by the chair of the Physiology program. (2) PHSIO 571 and PHSIO 572. If these courses are required for the major, then substitute an equal number of credits in 500-level Physiology elective courses. (3) A 3-credit, 500-level Physiology elective course. (4) Select additional credits from 500-level Physiology courses or a relevant 400- or 500-level course so that the total course credits for the minor is 15. These 15 credits cannot include course work that is used to fulfill requirements in the student's major. (5) Elective courses for the minor must be approved by the chair of the Physiology program. For a list of suggested courses, see “Other Relevant Information” in the Physiology section of this bulletin. (6) Students must earn a grade of C or better in each course in the minor and maintain an overall average of 3.00 in the minor. (7) One member of the doctoral committee must be a faculty member in the Intercollege Graduate Degree Program in Physiology.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

MRS. A. ROBERT NOLL GRADUATE FELLOWSHIP IN APPLIED PHYSIOLOGY
For graduate research in applied physiology, especially in environmental or exercise physiology; stipend variable.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

BIOLOGICAL CHEMISTRY (BCHEM) course list

CELL AND MOLECULAR BIOLOGY (CMBIO) course list

NEUROSCIENCE (NEURO) course list

PHYSIOLOGY (PSIO) course list

PHYSIOLOGY (PHSIO) course list -- University Park Campus

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/27/04

Last updated by Publications: 05/27/09

UCA Revision #1: 9/1/06

Plant Biology (PLBIO)

Program Home Page (Opens New Window)

TEH-HUI KAO, *Head of the Graduate Program in Plant Biology*
Plant Biology Program Office
101 Life Sciences Building
814-865-8165
plantbiology@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Richard N. Arteca, Ph.D. (Washington State) Professor of Horticultural Physiology
- Sarah M. Assmann, Ph.D. (Stanford) Waller Professor of Biology
- Michael Axtell, Ph.D. (California, Berkeley) Assistant Professor of Biology
- Robert D. Berghage. Ph.D. (Michigan State) Associate Professor of Horticulture
- Philip C. Bevilacqua, Ph.D. (Rochester) Associate Professor of Chemistry
- David M. Braun, Ph.D. (Missouri) Assistant Professor of Biology
- Kathleen M. Brown, Ph.D. (Florida) Professor of Postharvest Physiology
- Donald A. Bryant, Ph.D. (California, Los Angeles) Ernest C. Pollard Professor of Biotechnology and Professor of Biochemistry and Molecular Biology
- John E. Carlson, Ph.D. (Illinois) Associate Professor of Molecular Genetics (Forest Resources)
- Surinder Chopra, Ph.D. (Vrije U, Brussels) Associate Professor of Maize Genetics
- Daniel Cosgrove, Ph.D. (Stanford) Eberly Chair and Professor of Biology
- Wayne R. Curtis, Ph.D. (Purdue) Professor of Chemical Engineering and Biotechnology
- Richard J. Cyr, Ph.D. (California, Irvine) Professor of Biology
- Consuelo DeMoraes, Ph.D. (Georgia) Assistant Professor of Entomology
- Claude DePamphillis, Ph.D. (Georgia) Associate Professor of Biology
- David M. Eissenstat, Ph.D. (Utah State) Professor of Woody Plant Physiology
- Nina V. Fedoroff, Ph.D. (Rockefeller) Willaman Professor of Life Sciences and Evan Pugh Professor
- Majid Foolad, Ph.D. (California, Davis) Professor of Plant Genetics
- Simon Gilroy, Ph.D. (Edinburgh) Associate Professor of Biology
- John H. Golbeck, Ph.D. (Indiana) Professor of Biochemistry and Biophysics
- Mark J. Guiltinan, Ph.D. (California, Irvine) Professor of Plant Molecular Biology
- David Huff, Ph.D. (California, Davis) Associate Professor of Turfgrass Breeding and Genetics
- Seogchan Kang, Ph.D. (Wisconsin) Associate Professor of Plant Pathology
- Teh-hui Kao, Ph.D. (Yale) Professor of Biochemistry and Molecular Biology
- Roger Koide, Ph.D. (California, Berkeley) Professor of Horticultural Ecology
- Dawn S. Luthe, Ph.D. (Wisconsin--Madison) Professor of Plant Stress Biology
- Jonathan P. Lynch, Ph.D. (California, Davis) Professor of Plant Nutrition
- Hong Ma, Ph.D. (MIT) Professor of Biology
- Timothy McNellis, Ph.D. (Yale) Associate Professor of Plant Pathology
- Paula McSteen, Ph.D. (East Anglia, UK) Assistant Professor of Biology
- Christopher A. Mullin, Ph.D. (Cornell) Professor of Entomology
- B. Tracy Nixon, Ph.D. (MIT) Associate Professor of Biochemistry and Molecular Biology
- John C. Schultz, Ph.D. (Washington) Distinguished Professor of Entomology
- Andrew G. Stephenson, Ph.D. (Michigan) Professor of Biology
- Ming Tien, Ph.D. (Michigan) Professor of Biochemistry and Molecular Biology
- Yinong Yang, Ph.D. (U Florida) Associate Professor of Plant Pathology

The Intercollege Graduate Degree Program in Plant Biology includes faculty from nine departments in the College of Agricultural Sciences, College of Engineering, and Eberly College of Science. Each student becomes associated with the adviser's department, which may provide financial support, research facilities, and office space. Applicants are encouraged to explore opportunities by contacting faculty who may be prospective advisers.

The objective of this program is to educate and train plant biologists using the most modern techniques available today. Graduates from this program have gone on to a diverse range of careers, including positions in colleges and universities, research institutes, industry, and government. Research interests of the program faculty span the breadth of scientific areas ranging from molecular, cell, and evolutionary biology, biochemistry, biophysics, genetics, and functional genomics to whole-plant physiology and ecology. Student training includes a comprehensive set of team-taught courses that reflect this breadth of scientific approaches.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) Aptitude Test (verbal, quantitative, analytical) are required for admission. At the discretion of the graduate program officers, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course background will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces available for new students. Students entering this program should have had a strong foundation in the biological sciences, including biochemistry, general physics, and college mathematics through calculus. Students with limited deficiencies may be admitted but must make up their deficiencies concurrently with their graduate studies. B.S.-level applicants with good academic records who have had strong training in plant biology and related courses, including research experience, are generally admitted directly into the Ph.D. program and bypass the M.S. degree.

Master's Degree Requirements

Candidates for the M.S. must take a written diagnostic examination during the first academic year in the program. The functions of this test are to (1) determine the areas of expertise and deficiency in the student's academic preparation and (2) serve as an early screening system to eliminate students with too great an academic deficiency to continue in the program.

As part of the core courses for any degree in the Plant Biology program, all students must enroll in the two tutorial courses, PLBIO 512 and PLBIO 513, and an ethics course, IBIOS 591. Students are presented with advanced lectures in various areas of plant biology and must prepare approximately three written solutions to problems per semester. This dossier of papers constitutes the written diagnostic examination for the M.S. degree and is also used for evaluation of English writing competency. At the end of the respective semesters, the faculty coordinator will present a summary and evaluation of the student's progress to the Candidacy Examination Committee. The committee will then decide if the student has passed the written diagnostic examination and satisfied English writing competency.

All M.S. degree candidates will be required to complete 30 credits of course work. In addition to the courses mentioned previously, students must include two biochemistry courses, 1 credit of colloquium (PLBIO 590), and at least 6 credits of thesis research (PLBIO 600 or PLBIO 610) in their program and they must complete a thesis. Upon recommendation of the advisory committee, equivalent courses taken at another university may be substituted for the above requirements.

Doctoral Degree Requirements

Students in the Ph.D. program must successfully pass the candidacy, comprehensive, and final examinations required by the Graduate School. One of the main goals of the candidacy examination is to determine the potential of a student to successfully obtain a Ph.D. degree and is intended to be a vigorous test of a student's abilities, prior to the major investment in time and effort necessary to pass the comprehensive examination.

As in the M.S. program, students enrolled in the Ph.D. program must pass a written English competency evaluation based on the dossier of papers written for PLBIO 512 and PLBIO 513. This evaluation is done at the end of the student's first year. The oral candidacy examination is based on two of the papers, jointly chosen by the student and the Candidacy Examination Committee, and must be passed by the end of the student's third semester.

Ph.D. candidates must complete the core courses required for the M.S. plus three 2-credit courses dealing with theory and techniques of plant ecophysiology, plant cell biology, and plant molecular biology (PLBIO 514, PLBIO 515, PLBIO 516) and 2 credits of colloquium (PLBIO 590). Upon recommendation of the candidacy committee, equivalent courses taken at another university may be substituted for some of the above requirements. Based on the results of the candidacy examinations, the major professor and the student's advisory committee will determine other course requirements.

Other Relevant Information

The following courses are some of the courses available for Plant Biology majors, in addition to the required courses. Their descriptions may be found under the offerings of several departments: AGRO 517, AGRO 518; BIOL 407, BIOL 431, BIOL 441, BIOL 448, BIOL 510, BIOL 513; BMMB 514, BMMB 520, BMMB 525; HORT 402W, HORT 407, HORT 412W, HORT 420, HORT 440W, HORT 444, HORT 445, HORT 517, HORT 520; PPATH 405, PPATH 516, PPATH 543; any course offered by the Plant Biology program.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. In most participating departments, Plant Biology applicants are eligible for departmental teaching or research assistantships, and other assistantships supported by grant funds of individual faculty who make these award decisions.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

PLANT BIOLOGY (PLBIO) course list

PLANT PHYSIOLOGY (PLPHY) course list

Last Revised by the Department: Fall Semester 2006

Blue Sheet Item #: 34-07-476

Review Date: 6/13/06

Date last reviewed by Graduate School: 5/24/04

Last updated by Publications: 12/15/06

Plant Pathology (PPATH)

Program Home Page (Opens New Window)

212 Buckhout Laboratory
814-865-7448

Degrees Conferred:

Ph.D., M.S., M.Agr.

The Graduate Faculty

- Paul A. Backman, Ph.D. (California) Professor of Plant Pathology
- David M. Beyer, Ph.D. (Penn State) Professor of Plant Pathology
- Barbara J. Christ, Ph.D. (British Columbia) Senior Associate Dean; Professor of Plant Pathology
- Donald D. Davis, Ph.D. (Penn State) Professor of Plant Pathology
- David M. Geiser, Ph.D. (Georgia) Professor of Plant Pathology
- Frederick E. Gildow, Ph.D. (Cornell) Department Head; Professor of Plant Pathology
- Beth K. Gugino, Ph.D. (Penn State) Assistant Professor of Plant Pathology
- John M. Halbrendt, Ph.D. (Missouri) Associate Professor of Plant Pathology
- Scott A. Isard, Ph.D. (Indiana) Professor of Aerobiology
- Maria del Mar Jimenez Gasco, Ph.D. (Cordoba, Spain) Assistant Professor of Plant Pathology
- Seogchan Kang, Ph.D. (Wisconsin) Professor of Plant Pathology
- Gretchen A. Kuldau, Ph.D. (California) Associate Professor of Plant Pathology
- Timothy W. McNellis, Ph.D. (Yale) Associate Professor of Plant Pathology
- Gary W. Moorman, Ph.D. (North Carolina State) Professor of Plant Pathology
- Henry Ngugi, Ph.D. (Reading, UK) Assistant Professor of Plant Pathology
- C. Peter Romaine, Ph.D. (Cornell) Professor of Plant Pathology
- Daniel J. Royse, Ph.D. (Illinois) Professor of Plant Pathology
- Elwin L. Stewart, Ph.D. (Oregon State) Professor of Plant Pathology
- James W. Travis, Ph.D. (North Carolina State) Professor of Plant Pathology
- Wakar Uddin, Ph.D. (Georgia) Associate Professor of Plant Pathology
- Yinong Yang, Ph.D. (Florida) Associate Professor of Plant Pathology

Plant pathology is the study of disease in plants and concerns the dynamic interaction between the plant, the causal agent (bacteria, fungi, viruses, nematodes, etc.), and their environments. A student prepares for a professional career in research, teaching, extension, or industry through advanced studies of the principles of plant infection, the physiology of disease in plants, the ecology of root diseases, the nature and inheritance of disease resistance in plants, epidemiology, ecology and physiology of air pollution injury to plants, or plant disease control by biological or chemical means. A student also may specialize in the nature and control of the diseases of forest trees, agronomic or horticultural crops, and commercial mushrooms. Advanced studies in molecular systematics of fungi and applied mycology, related to the production of the commercial mushroom, also may be taken. Modern, well-equipped laboratories, controlled environment facilities and greenhouses, and well-developed field research areas are available for graduate study.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Students scoring in the fiftieth percentile or above on each section of the GRE will be given preference. The best-qualified applicants will be accepted up to the number of spaces and advisers that are available for new students. Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Students are expected to have a strong foundation in biological and physical sciences. Generally, students with B.S. degrees in biology, microbiology, plant science, molecular biology, or biochemistry are well prepared.

Degree Requirements

M.Agr. DEGREE

The Master of Agriculture degree is offered to provide professional training in plant pathology with more of a crop orientation than is available under the M.S. program. In addition to the courses required for an M.S. degree, the M.Agr. degree requires further study in the areas of entomology and crop sciences.
Required courses for the M.Agr. degree are: PPATH 405, 502, 590, and 596. Candidates are required to take three additional courses from a list provided by the department (a minimum of 7 credits total). Candidates for the M.Agr. degree in Plant Pathology must present a suitable paper. A research thesis is not required. A thesis substitute, such as an internship report, or an adaptive or demonstrative activity whereby known technology or procedures are applied, is acceptable. The nature and extent of this paper shall be decided by the candidate's advistory committee and may result from an internship experience or PPATH 596 (Special Problems).

M.S. DEGREE

The master of science degree program in Plant Pathology leads students either to the development of special proficiencies in Plant Pathology, which will allow the individual to directly enter a professional career, or to the development of a basic knowledge of the discipline, allowing for advancement to the Ph.D. degree. M.S. degree students will be introduced to the broad aspects of the field of plant pathology, including exposure to the various causal agents of plant disease and the diseases they incite; diseases of current and classical importance affecting a wide range of crop plants; a variety of techniques used to isolate, characterize, and identify causal agents of plant disease; and an appreciation for the relationship between plant pathology and other biological and physical sciences.

Required Courses for the M.S. Degree are: PPATH 405, 416, 417, 425, 502, and 590. Candidates are required to take a minimum of 6 additional credits of Plant Pathology courses from a list provided by the department.

Candidates for the M.S. degree in Plant Pathology must present a thesis to their graduate advisory committee.

Ph.D. DEGREE

Students earning a Ph.D. degree from Penn State should have a thorough understanding of the complex interaction between the pathogen and its host. They should know how representative pathogens are dispersed and enter hosts and how the environment mediates these processes. They should understand the role that the pathogen, host genes, and metabolic products play in pathogenesis. They must be aware of the mechanisms the host has to defend it and how these are breeched by a successful pathogen. They must know the parameters involved in disease development and with this knowledge be able to apply measures of control.

Candidates for the Ph.D. degree in Plant Pathology are required to have an M.S. in plant pathology or a closely related field, or equivalent educational background. In addition, all students must enroll in PPATH 505 and other courses tailored to the individual by the candidate's doctoral advisory committee. Ph.D. candidates must prepare a thesis and present seminars in the departmental colloquium (PPATH 590), through which English communication skills will be evaluated. During their studies, Ph.D. students will have an opportunity to assist in teaching a disciplinary subject.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

PLANT PATHOLOGY (PPATH) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/30/04

Last updated by Publications: 8/20/09

Political Science (PL SC)

Program Home Page (Opens New Window)

SCOTT BENNETT, *Head of the Department*
219 Pond Laboratory
814-865-7515; Graduate Program: 814-863-1595

Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- Donna Bahry, Ph.D. (Illinois) Professor of Political Science
- Lee Ann Banaszak, Ph.D. (Washington U) Associate Professor of Political Science
- D. Scott Bennett, Ph.D. (Michigan) Head; Professor of Political Science
- Michael E. Berkman, Ph.D. (Indiana, Bloomington) Professor of Political Science
- David B. Carter, Ph.D. (U of Rochester) Assistant Professor of Political Science
- Gretchen G. Casper, Ph.D. (Michigan) Associate Professor of Political Science
- John Christman, Ph.D. (Illinois, Chicago) Associate Professor of Philosophy, Political Science, and Women's Studies
- Stephen J. Cimbala, Ph.D. (Wisconsin) Professor of Political Science
- C. Michael Comiskey, Ph.D. (Princeton) Associate Professor of Political Science
- James Eisenstein, Ph.D. (Yale) Professor Emeritus of Political Science
- Errol Henderson, Ph.D. (Michigan) Associate Professor of Political Science
- Marie E. Hojnacki, Ph.D. (Ohio State) Associate Professor of Political Science
- Zaryab Iqbal, Ph.D. (Emory) Assistant Professor of Political Science
- Douglas Lemke, Ph.D. (Vanderbilt) Associate Professor of Political Science
- Suzanna Linn, Ph.D. (Iowa) Professor of Political Science
- Burt Monroe, Ph.D. (Oxford0 Associate Professor of Political Science
- Subhanan Mukherjee, Ph.D. (Columbia) Associate Professor of Political Science
- David J. Myers, Ph.D. (California, Los Angeles) Associate Professor of Political Science
- Glenn Palmer, Ph.D. (Michigan) Professor of Political Science
- Eric Plutzer, Ph.D. (Washington U) Professor of Political Science
- Susan Welch, Ph.D. (Illinois, Urbana-Champaign) Professor of Political Science
- Joseph G. Wright, Ph.D. (California, Los Angeles) Assistant Professor or Political Science
- Christopher Zorn, Ph.D. (Ohio State) Professor of Political Science

The purpose of the graduate program in Political Science is to train professional political scientists who intend to pursue careers in research, teaching, and public service. The department offers programs leading to the M.A. and Ph.D. degrees. The programs are designed to enable students to acquire both methodological sophistication and substantive knowledge in a variety of fields.

The graduate program in Political Science encourages the study of a variety of substantive concerns, methodological approaches, and research skills. Among the department's special areas of strength are United States politics and political behavior (legislative politics, public opinion and voting, parties and interest groups, and judicial process); political and social theory; international relations and peace science; and the politics of western and eastern Europe, Latin America, and South Asia; international conflict; international political economy; democratization; social movements; political culture; gender and politics. A dual-degree program with Women's Studies is also available.

Admission Requirements

Entrance to the Political Science graduate program occurs in the fall semester. Applications must be received by the department not later than January 15 for fall admission. However, the department will begin accepting applications as of September 1.

The Department of Political Science requires M.A. and Ph.D. program applicants to submit transcripts, Graduate Record Examinations (GRE) scores (verbal, quantitative, and analytical), a statement of career plans and proposed emphasis in political science, at least three letters of recommendation from persons familiar with the applicant's academic performance, and a writing sample demonstrating research and/or analytical skills. Students whose native language is not English must also submit the results of the Test of English as a Foreign Language (TOEFL). Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Students can be admitted to the master's program or, after passing a Ph.D. candidacy exam, can be admitted to the Ph.D. program with a master's degree.

Master's Degree Requirements

Depending on the student's previous methodological training, 30 credits of course work, including an essay, are required for a master's degree. The course work includes a methodological core of 9 credits (PL SC 501, 502, and 503); 12 credits in a primary field (including the survey seminar in the field); 6 credits in a secondary field; and 3 credits for the M.A. essay. Students also take a seminar on teaching and professional development in political science. There are no language requirements for the degree. Every master's candidate is required to pass an examination of their master's essay.

In the case of transfer students, a maximum of 10 credits earned in an advanced degree program at another university or in another department at Penn State will count toward the 30-credit requirement.

Doctoral Degree Requirements

The Department of Political Science requires a minimum total of 60 postbaccalaureate credits for the Ph.D. Course work accepted for the M.A. in Political Science will count toward the 60-credit requirement. At least 45 credits, exclusive of the dissertation, must be in political science.

In the case of transfer students, a maximum of 30 credits earned in an advanced degree program at another university or in another department at Penn State will count toward the 60-credit requirement.

The department requires that a student complete the designated "core" courses in methodology (PL SC 501, 502, and 503) and a seminar on teaching and professional development in political science. Ph.D. degree candidates must present three fields for the purposes of comprehensive examinations. The major and one of the minor fields must be selected from the department's recognized fields, and one of the minor fields may be outside political science. The major field requires a minimum of 15 credits; each minor field requires a minimum of 9 credits.

The communication and foreign language requirement for the Ph.D. may be satisfied by advanced course work and competence developed in foreign languages, statistics, or other research methods.

Other Relevant Information

Penn State is a member of the Committee on Institutional Cooperation (CIC), an association of the Big Ten universities and the University of Chicago. The CIC sponsors the Traveling Scholars program, which provides doctoral-level students with an opportunity to study at another CIC university. In addition to participating in CIC programs, the department sponsors attendance at the ICPSR Summer program at the University of Michigan.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

POLITICAL SCIENCE (PL SC) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

Last updated by Publications: 11/05/09

Project Management (PRMGT)

JEFFREY PINTO, Program Chair
Penn State Erie, The Behrend College
Station Road
Erie, PA 16563

The Master of Project Management (MPM) is a 30-credit graduate degree program that emphasizes all aspects of project management theory and practice. The MPM is interdisciplinary and utilizes problem-based learning as well as a combination of face-to-face and Web-based instructional methods to transcend time and space, and to support effective teaching and learning. The key themes of the MPM include: planning, cost, and value management; project control; human issues in project management; strategic issues in project management; and commercial and procurement law as it relates to project management.

Degree Requirements

Students complete eight required courses (24 credits) in which they apply course concepts to project management scenarios through the use of cases, simulations or actual situations in their employing organizations. The required corpuses are:

MANAGEMENT (MANGT)
510. Project Management (3)
515. Cost adn Value Management (3)
520. Planning and Resource Management (3)
525. Commercial Law and Project Management (3)
531. Organizaitons (3)
535. Interpersonal and Group Behavior (3)
540. Strategy: Corporate, Business, and Project (3)
575. Managment of Projects (3)
596. Independent Studies (6)

In addition, students take 6 credits of elective courses. Electives may include additional program-approved courses or an applied research project focusing on some aspect of project management completed as an independent study. All students must attend a minimum of one on-site residency experience for two to three days in order to complete the graduation requirements of the program. Attendance at additional annual residency events is encouraged but optional.

Admission Requirements

Only candidates who demonstrate high promise of success for graduate work are admitted to the MPM program. All applicants must have received from a regionally accredited institution a baccalaureate degree earned under residence and credit conditions that are deemed substantially equivalent to those currently required by Penn State. Admission decisions are based on undergraduate grade-point average, Graduate Management Admission Test (GMAT) scores, and a personal essay.

Applicants must achieve a minimum GMAT score of 450. When this score is added to the applicant's undergraduate grade-point average, multiplied by 200, the total must be at least 1,050 in order to meet minimum requirements for admission to the MPM program. Either the applicant's cumulative undergraduate grade-point average or the junior/senior grade-point average can be used for this calculation. Applicants must also demonstrate proficiency in writing by obtaining at least a 4.0 on the analytical writing assessment portion of the GMAT, or by earning a grade of B or higher in a college English composition course. The MPM program emphasizes application of course concepts to actual project management opportunities and problems. Therefore, students who currently are, or previously were, employed as project managers or project team members will derive the greatest benefit from the program. All applicants must provide evidence of sufficient current or previous work experience that will enable them to successfully complete course assignments requiring the application of course concepts to real project management situations. This evidence may be provided in either the form of three letters of recommendation from individuals who know the applicant in a professional capacity or through nomination to participate in the program by an appropriate official within the applicant's employing organization. Those who write letters of recommendation or submit nominations on behalf of the candidate will be asked to attest to the nominee's suitability for the program of study considering factors such as the applicant's length of employment, level and areas of work responsibility, personal qualities, career goals, maturity of purpose, and program requirements to apply course concepts to work-related issues. Applicants are encouraged to consult with the program chair concerning the suitability of their work experiences in relationship to program requirements.

The language of instruction at Penn State is English. All international applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the Internet-based test (iBT). The minimum composite score for the IELTS is 6.5. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales.

All students must be computer literate and have ready and reliable access to a computer and the Internet to successfully complete the MPM program. They must know how to use word processing software, log on to an Internet provider, and use e-mail. Additionally, MPM students will use Microsoft Office in their coursework that will require they have a working knowledge of Microsoft Office programs such as Word, Excel, Power Point, and Access. Access to fax facilities may be needed as an additional form of communications between student and instructor or between students.

Course Scheduling Considerations

The recommended maximum course load is 6 credits per semester for students working full-time. MANGT 510 must be taken in the first semester of study and is a prerequisite or co-requisite for all other courses in the program. MANGT 575, Management of Projects, is a problem-based capstone course that integrates the themes necessary to appreciate the overall challenge of project management. The course includes a final, integrative and comprehensive project based on the identification and analysis of real project management problems from the students' work organizations. This written assignment requires the integration of theory from previous courses along with significant library and literature searches to analyze and propose solutions to these problems. MANGT 575 must be taken following completion of at least 18 credits. No more than one of the required courses may be taken concurrently with MANGT 575.

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-096

Review Date: 01/12/2010

Last updated by Publications: 7/7/05

Psychology (PSY)

Program Home Page

MELVIN M. MARK, *Head of the Department*
Department office: 111 Moore Building
814-865-9514

Degrees Conferred:

Ph.D., M.S.
Dual-Title Doctoral Degree in Psychology and Language Science

The Graduate Faculty

- Reginald B. Adams Jr., Ph.D. (Dartmouth) Assistant Professor of Psychology
- Peter A. Arnett, Ph.D. (Wisconsin, Madison) Associate Professor of Psychology
- Sandra T. Azar, Ph.D. (Rochester) Professor of Psychology
- Sheri Berenbaum, Ph.D. (California) Professor of Psychology
- Karen L. Bierman, Ph.D. (Denver) Distinguished Professor of Psychology
- Alysia Y. Blandon, Ph.D. (Michigan) Assistant Professor of Psychology
- Frederick M. Brown, Ph.D. (Virginia) Associate Professor of Psychology
- Kristen A. Buss, Ph.D. (Wisconsin) Associate Professor of Psychology
- Richard A. Carlson, Ph.D. (Illinois) Professor of Psychology
- Mark A. Casteel, Ph.D. (Nebraska) Associate Professor of Psychology
- Louis G. Castonguay, Ph.D. (SUNY, Stony Brook) Professor of Psychology
- Jeanette Cleveland, Ph.D. (Penn State) Professor of Psychology
- Pamela M. Cole, Ph.D. (Penn State) Professor of Psychology
- Peter B. Crabb, Ph.D. (Temple) Associate Professor of Psychology
- Nancy A. Dennis, Ph.D. (Catholic U of America) Assistant Professor of Psychology
- James L. Farr, Ph.D. (Maryland) Professor of Psychology
- Karen Gasper, Ph.D. (Illinois) Associate Professor of Psychology
- Mary Gergen, Ph.D. (Temple) Professor of Psychology
- Rick O. Gilmore, Ph.D. (Carnegie Mellon) Associate Professor of Psychology
- Alicia A. Grandey, Ph.D. (Colorado State) Associate Professor of Psychology
- Monica E. Gregory, Ph.D. (Oklahoma) Associate Professor of Psychology
- Frank G. Hillary, Ph.D. (Drexel) Assistant Professor of Psychology
- Cynthia L. Huang-Pollock, Ph.D. (Michigan State) Assistant Professor of Psychology
- Sam Hunter, Ph.D. (Oklahoma) Assistant Professor of Psychology
- Rick R. Jacobs, Ph.D. (California) Professor of Psychology
- John A. Johnson, Ph.D. (Johns Hopkins) Professor of Psychology
- Alexay Kozhevnikov, Ph.D. (Yale) Assistant Professor of Physics and Psychology
- Judith F. Kroll, Ph.D. (Brandeis) Liberal Arts Research Professor of Psychology and Linguistics
- Kenneth N. Levy, Ph.D. (CUNY) Assistant Professor of Psychology
- Ping Li, Ph.D. (Leiden U) Professor of Psychology and Linguistics
- Lynn S. Liben, Ph.D. (Michigan) Distinguished Professor of Psychology
- Melvin M. Mark, Ph.D. (Northwestern) Professor of Psychology
- Amy D. Marshall, Ph.D. (Indiana) Assistant Professor of Psychology
- Gerald E. McClearn, Ph.D. (Wisconsin) Evan Pugh Professor of Health and Human Development and Psychology
- Michael D. McNeese, Ph.D. (Vanderbilt) Associate Professor of Information Sciences and Technology, and Psychology
- Susan Mohammed, Ph.D. (Ohio) Associate Professor of Psychology
- Ginger Moore, Ph.D. (Pittsburgh) Assistant Professor of Psychology
- Kevin R. Murphy, Ph.D. (Penn State) Professor of Psychology
- Jenae Neiderhiser, Ph.D. (Penn State) Professor of Psychology
- Keith E. Nelson, Ph.D. (Yale) Professor of Psychology
- Michelle G. Newman, Ph.D. (SUNY, Stony Brook) Associate Professor of Psychology and Psychiatry
- Aaron L. Pincus, Ph.D. (British Columbia) Associate Professor of Psychology
- Brian Rabian, Ph.D. (George Washington) Clinical Associate Professor of Psychology
- Richard J. Ravizza, Ph.D. (Vanderbilt) Associate Professor of Psychology
- William J. Ray, Ph.D. (Vanderbilt) Professor of Psychology
- Frank E. Ritter, Ph.D. (Carnegie Mellon) Associate Professor of Information Sciences and Technology, and Psychology
- David A. Rosenbaum, Ph.D. (Stanford) Distinguished Professor of Psychology
- Stephanie A. Shields, Ph.D. (Penn State) Professor of Women's Studies and Psychology
- Margaret L. Signorella, Ph.D. (Penn State) Professor of Psychology
- José Soto, Ph.D. (California, Berkeley) Assistant Professor of Psychology
- Janet Swim, Ph.D. (Minnesota) Professor of Psychology
- Hoben Thomas, Ph.D. (Claremont) Professor of Psychology
- Theresa K. Vescio, Ph.D. (Kansas) Associate Professor of Psychology and Women's Studies
- Daniel J. Weiss, Ph.D. (Harvard) Associate Professor of Psychology
- Michael Wenger, Ph.D. (Binghamton) Associate Professor of Psychology
- Stephen Wilson, Ph.D. (Pittsburgh) Assistant Professor of Psychology

The graduate Psychology program is characterized by highly individualized study leading to the Ph.D. degree. Emphasis is placed on research, teaching, and professional career development. Each student is associated with one of the six program areas offered in the department: *Clinical* (including *Child Clinical*; *Cognitive*; *Developmental*; *Psychobiology; Industrial/Organizational*; and *Social.* An individual's particular pattern of interests dictates in part the course of study followed. Within all areas, research is an integral part of study; usually, the research is empirical in focus, but it may be applied or basic, depending on the problem of interest.

The department has laboratories, computer facilities, darkroom, and shop, and students have access to the large resources of the University, which include excellent computation facilities and a large open-stack library. Opportunities for practicum experience are available; e.g., clinical students find practicum in local mental health centers, while industrial students find placement in appropriate

business or industrial settings.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) verbal and quantitative portions are required; scores from the Miller Analogies Test (MAT) are optional. All applicants who were psychology majors as undergraduates should provide scores from the advanced psychology (subject) GRE test. Applicants with superior undergraduate (particularly junior and senior years) or graduate grade-point averages will be considered for admission. Although a major in psychology is not required, applicants should have a broad undergraduate background that includes 12 credits in psychology. Undergraduate study in psychology should include a course in statistics and a psychological methodology course. Requirements listed above are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin.*

Master's Degree Requirements

The psychology department does not have a graduate program designed for students seeking only the master's degree. A master's thesis, or the department's equivalent (an acceptable published journal article), is required for advancement to candidacy for the Ph.D. degree in Psychology. Usually, but not always, the master's thesis centers on an empirical research topic. The typical thesis involves a literature review, data collection, analysis, and discussion. A master's degree is not awarded unless a thesis is submitted to the Graduate School. Students must successfully propose a thesis study by the end of the second year and have a successfully defended a thesis by the end of their third year in the program.

Doctoral Degree Requirements

All students in their first year of residency must satisfactorily complete the department's English proficiency requirement (PSY 501).

Students must complete (within their first 60 graduate credits for students without previous graduate credit) 6 departmentally approved graduate credits in statistics with a grade of B or better. Students must complete 18 credits in a suitably selected major area; majors usually are defined by one of the six program areas noted above. In addition to the major area credits, students must complete a minimum of 12 credits outside the major area. Two options exist for completing these 12 credits: (1) completing four courses in APA-recommended breadth areas, or (2) completing course work in a particular area of expertise outside the major. Some areas may have additional recommended or required courses as well. The Ph.D. comprehensive examination must be taken by the time 70 graduate credits are earned, or prior to the student's fourth year in residency, whichever comes first. The department has no foreign language requirement.

Applied Linguistics Option

The program offers an option in Applied Linguistics which includes 18 credits in APLNG/LING offered in the Linguistics and Applied Language Studies program. Underpinning the option is the synthesis of knowledge related to how language is acquired, understood, and spoken by children and adults who use one or more languages.

Other Relevant Information

The Department of Psychology makes every effort to recruit and train minority psychologists. Support for minority students is coordinated by the department, the Graduate School Minority Graduate Scholars Award Program, and the American Psychological Association Minority Fellowship Program. In addition, the department often has funded minority students through minority training programs and special minority research programs.

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Dual-Title Graduate Degree in Psychology and Language Science

Graduate students with research and educational interests in Psychology and Language Science may apply to Psychology and Language Science PH.D. Graduate Program. The goal of the dual-title degree Psychology and language Science graduate program is to enable graduate students from Psychology to acquire the knowledge and skills of their major area of specialization in Psychology, while at the same time gaining the perspective and methods of the Language Sciences.

Admission Requirements

To pursue a dual-title degree under this program, the student must first apply to the Graduate School and be admitted through the Psychology Department (see below for admission requirements for the Graduate Program in Psychology). Upon admission to the Psychology Program and with a recommendation from a Language Science program faculty member in the Department of Psychology, the student's application will be forwarded to a committee that will include the Director of the Linguistics Program, one of the Co-Directors of the Center for Language Science, and a third elected faculty member within the Center for Language Science. All three committee members will be affiliated with the Program in Linguistics. Upon the recommendation of this committee, the student will be admitted to the dual-title degree program in Language Science.

Admission Requirements for Incoming Graduate Students in Psychology

Most incoming graduate students have earned an undergraduate degree in psychology. In some cases, students from other majors are also admitted, but it is expected that applicants will have a background in psychology before applying. Graduate Record Exam (GRE) is required; however, the subject exam is not required. The TOEFL exam is required for international students except for those applicants who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize,

British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States and Wales. All international students will be required to take the English Proficiency Exam upon arrival at the Penn State campus. Students are asked to complete a departmental application form, write a statement of purpose, and include a writing sample in the application materials.

Requirements for the Dual-Title Ph.D. Degree in Psychology and Language Science

Two Language Science proseminar courses (Ling 521 and Ling 522; 6 credits). One 3 credit research internship with a Language Science faculty mentor from an outside area. The 3 credit internship required by the Psychology program may satisfy both the Psychology requirement and the Language Science requirement (for 6 total credits of internship to be completed with two faculty members from the Language Science program). Students will choose one course among the following: CSD 596, GER 596, LING 596, PSY 596, SPAN 596.

Final course selection is determined by the student in consultation with their dual-title program advisors and their major program advisors. Students who already hold a master's degree from another institution may petition to have equivalent course credits accepted.

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-097

Review Date: 1/12/2010

Last updated by Publications: 9/21/09

Public Administration (P ADM)

www.hbg.psu.edu (Opens New Window)

JEREMY F. PLANT, *MPA Coordinator*
Penn State Harrisburg
777 W. Harrisburg Pike
W-160 Olmsted Building
Middletown, PA 17057

Degrees Conferred:

M.P.A., Ph.D.

The Core Graduate Faculty

- Beverly A. Cigler, Ph.D. (Penn State) *Professor of Public Policy and Administration*
- M. A. DuPont-Morales, Ph.D. (Northeastern) *Associate Professor of Criminal Justice*
- Shaun L. Gabbidon, Ph.D. (Indiana University of Pennsylvania) *Associate Professor of Criminal Justice*
- Michael Kenney, Ph.D. (University of Florida) *Assistant Professor of Public Policy*
- Cynthia Massie Mara, Ph.D. (VPI) *Associate Professor of Health Care Administration and Policy*
- Goktug Morcol, Ph.D. (V.A. Polytechnic Institute & State Univ.) *Associate Professor of Public Administration*
- Carol R. Nechemias, Ph.D. (Ohio State) *Associate Professor of Public Policy*
- Steven A. Peterson, Ph.D. (SUNY at Buffalo) *Professor of Politics and Public Affairs*
- Jeremy F. Plant, Ph.D. (Virginia) *Professor of Public Policy and Administration*
- Bing Ran, Ph.D. (Waterloo) *Assistant Professor of Public Administration*
- James Ruiz, Ph.D. (Sam Houston State) *Assistant Professor of Criminal Justice*
- Jill S. Rumberger, Ph.D. (Penn State) *Assistant Professor of Health Administration*
- Barbara A. Sims, Ph.D. (Sam Houston State) *Associate Professor of Criminal Justice*
- Triparna Vasavada, Ph.D. (SUNY-Albany) *Assistant Professor of Public Administration*
- Matthew Woessner, Ph.D. (Ohio State University) *Assistant Professor of Public Policy*
- James T. Ziegenfuss, Jr., Ph.D. (Pennsylvania/Wharton) *Professor of Management and Health Care Systems*

MPA Program

The Master of Public Administration (MPA) program is intended for those with career interests in public management, health and human services, government, and other public service and nonprofit organizations. The curriculum blends theoretical and applied concepts and assures “real-world” experiences for the novice administrator. In addition, it requires that students devote attention to general professional development. The MPA program is accredited by the National Association of Schools of Public Affairs and Administration.

FULL-TIME OR PART-TIME--Students may begin the program in any semester. Three courses (or 9 credits) per semester are considered a normal course load for full-time students. Part-time students typically take one or two 3-credit courses each semester and one or two courses during the summer session to maintain steady progress toward the degree. The program, including an internship in a public agency or nonprofit organization for those without three years of managerial, supervisory, or professional experience, requires eighteen to twenty-four months of full-time study, or three to five years on a part-time basis.

Admission Requirements

Applicants must have received their baccalaureate degree from an accredited college or university prior to starting the graduate program. Applicants who are still completing their baccalaureate requirements at the time of application may be admitted to the Graduate School conditional on the awarding of the baccalaureate degree.

Admission to the MPA program is based on clear suitability for the program as demonstrated by the application as a whole, including the following: a completed application with the application fee; evidence of a bachelor's degree from an accredited college; a statement of career and educational goals; a successful undergraduate record with a grade-point average of 3.00 (either as the cumulative GPA or for the last 60 hours of relevant course work); satisfactory scores on the Graduate Record Examination (GRE), Graduate Management Admission Test (GMAT), or Law School Admission Test (LSAT) if the GPA is less than 3.0; and three references willing to provide recommendations.

Prerequisites

All students admitted to the MPA program must show prerequisite 3-credit course work in statistics and statistical software with a satisfactory grade. Students without prior course work in statistics must fulfill this prerequisite within two semesters of admission. Credits earned do not count toward the MPA requirement.

Degree Requirements

The MPA degree program requires 36 graduate credits—18 in core courses, 15 in electives, and 3 for the master's project. Up to 6 credits of 400-level courses may be taken as electives, with the approval of an adviser. In addition, a 9-credit internship is required of students who do not have at least three years of full-time relevant work experience that consists of supervisory, managerial, or professional work. The internship is waived for students with this experience before they enter the program or who gain it during the program.

REQUIRED CORE COURSES (18 credits)

P ADM 500, P ADM 502, P ADM 503, P ADM 505, P ADM 506, P ADM 510

ELECTIVE CONCENTRATION AREA (15 credits)

With the faculty adviser's approval, a student selects 15 credits of electives. Concentrations offered are Government Administration, Health Care Management and Policy, Human Resources Management, Information Resource Management, Policy Analysis, and Criminal Justice, as well as the general Public Administration degree.

Examples of suitable elective courses: P ADM 507, P ADM 511, P ADM 512, P ADM 514, P ADM 515, P ADM 516, P ADM 522, P ADM 523, P ADM 524, P ADM 531, P ADM 532, P ADM 533, P ADM 534, P ADM 535, P ADM 550, P ADM 556, P ADM 557, P ADM 558, CRIMJ 563, CRIMJ 564, and CRIMJ 565. Courses listed under the Master of Health Administration program may also be taken: H ADM 539, H ADM 540, H ADM 541, H ADM 542, H ADM 543, H ADM 545, H ADM 546, H ADM 548, H ADM 551, H ADM 552.

MASTER's PROJECT--P ADM 594

INTERNSHIP IN PUBLIC ADMINISTRATION--P ADM 595 (if required)

Ph.D. Program

The Doctor of Philosophy in Public Administration provides a broad-based academic program combining conceptual foundations with research and analytical skills. The goal of the program is to educate professionals with the ability to create and apply knowledge through teaching, research, consulting, and management.

Graduates of the program work in such occupations as:

- university or college professor
- president of community hospital
- senior positions in state and federal government
- senior training officer national executive development institute
- health care consultant
- president, non-profit organization

The Program retains the traditional requirements of the Ph.D. degree--advanced coursework, comprehensive examinations, residency, a research dissertation, final oral examination, and standards of excellence--in a program that allows students to combine study and work. Students may pursue the program on a full- or part-time basis. The emphasis is placed in critical thinking, research, writing, and mastery of a broad body of literature. In the emerging "information age," public administrators are both producers and consumers of research. The roles of administrator and scholar are increasingly blurred, as scientific reasoning and data gathering increasingly permeates public managerial decision making. Creating and accessing knowledge that is useful to address organizational and policy issues is increasingly important.

Application for Admission

To assure course availability and maximize progress, applicants should carefully consider when to apply to the Program and begin study. In general, students should plan to begin taking P ADM 570 (Scope and Methods of Public Administration) and other doctoral seminars during the Fall Semester.

The following information should also help applicants decide when to apply to the Program:
Fall Admission:

- Applicants for fellowships and assistantships must complete and submit materials by January 30.
- Applicants who must take one or more prerequisite courses typically should apply by October 31.
  This will enable them to take the necessary prerequisite courses during the Spring Semester and/or Summer Term and begin doctoral seminars the next Fall. If in doubt about the need for prerequisites, an applicant should meet the October 31 deadline.
- Students who are not required to take prerequisite courses may submit their application materials by October 31 or March 15. However, we encourage students to apply at the earliest possible date.
  The Program Coordinator can answer individual applicant questions about application and entrance dates.

Admission Requirements

Applicants for the Doctor of Philosophy in Public Administration should hold a masters degree in public administration, public policy, or a related field such as business, economics, political science, or sociology. Applicants with masters degrees in other fields also will be considered. Students may be required to take additional courses after admission to the program to make up for any deficiencies.

A student must have taken the following graduate courses as program prerequisites or corequisites: Public Organization and Management (P ADM 500), Introduction to Public Policy Analysis (P ADM 507), Research Methods (P ADM 503), and Organization Behavior (P ADM 510).

In addition, most applicants should have five years of relevant professional work experience.

Students are required to submit the following:

- a completed application, with the application fee
- two official transcripts of all undergraduate and graduate course work scores from the Graduate Record Exam (GRE), with official verification
- three letters of reference attesting to both academic and professional capabilities (at least two of the three letters should be from academic sources, such as prior professors or academic advisors)
- a letter of approximately 500 words outlining significant work experience, career goals, and academic objectives
- a recent personal vita
- a substantial academic paper written for a previous graduate course(e.g. seminar paper)

Interviews: The Admissions Committee interviews individuals whose application material indicates they qualify for entry into the Program. These interviews may be face-to-face or by telephone. Interviews help assure a good fit between individual interests and the Program.

International Students

Application deadlines: International student application materials must meet the following deadlines:
January 30 for Fall, September 30 for Spring, February 28 for Summer.*
*Applications received after the deadlines will be processed for the following semester.

Language Proficiency: International students must have received either the bachelors or masters degree from a program that uses English as the primary language.

Students for whom English is not a first language also are required to pass the Test of ENglish as a Foreign Language (TOEFL) [www.toefl.org(TOEFL) (Opens New Window)] with a score of 600 or higher (Paper-Based Test) or 250 (Computer-Based Test) or higher.

Degree Requirements

Students progress through the following phases and take the required courses indicated as part of their study for the Ph.D.

Precandidacy and Provisional Admission --Applicants who do not have necessary background, but otherwise meet the criteria for admission may be admitted provisionally and must (1) make up any deficiencies in graduate courses in public administration noted in the letter of acceptance, (2) complete P ADM 570 (Scope and Methods), P ADM 575 (Research Design), and at least one course from the P ADM 571, P ADM 572, P ADM 573, and P ADM 574 seminar series, with an average of 3.5 or better, and (3) pass a candidacy exam. Students who must make up deficiencies are considered to be provisionally admitted into the program. A student may remain in this temporary classification for a period of no longer than two semesters following admission. Upon successful completion of the requisite courses noted in the letter (with a 3.5 grade point average), the student will be removed from provisional status and be regularly enrolled. It is to be emphasized that the provisional condition must be met before a student reaches an academic benchmark (doctoral candidacy, comprehensive, and final oral examination). A student will not be permitted to graduate with a provisional status remaining on his or her record.

Comprehensive Examination--Candidates take additional course work to prepare for comprehensive examinations in three subfields of study, complete a period of residency, and write the Ph.D. dissertation. The three formal subfields of specialization are: organization theory and behavior, policy analysis and governance, and public management. Additional subfields of study, such as Health Care Management and Policy, Criminal Justice, Management Information Systems, and Training and Development may be selected with the approval of the student's doctoral committee.

Residency--A period of two consecutive semesters of concentrated study and research as a full-time student--9 credits per semester.

The Dissertation

Under guidance from the dissertation committee, the candidate prepares a detailed research proposal that serves as the basis for the written dissertation. The writing and defense of this original contribution to the theory of public administration is the capstone to the Ph.D. program.

Grade Point Average and Time Limit

Part-time students can complete the program in approximately seven to eight years of continuous study. Full time students may complete the Program in four to five years. Students must have a 3.50 grade-point average to graduate.

Financial Aid

There are a limited number of scholarships, fellowships, and research grants available, as well as graduate assistantships. Many students work full-time and take classes part-time. In many cases, employers have a tuition-reimbursement plan paying for partial or full tuition. To find other options available to you, contact the Financial Aid Office at 717-948-6307.

PUBLIC ADMINISTRATION (P ADM) course list

PUBLIC ADMINISTRATION, JURIS DOCTOR AND MASTER OF PUBLIC ADMINISTRATION (J.D./M.P.A.)

STEVEN A. PETERSON, *Program Coordinator*
Penn State Harrisburg
777 W. Harrisburg Pike
Middletown, PA 17057-4898
717-948-6050
www.hbg.psu.edu (Opens New Window)

Degrees Conferred:

J.D./M.P.A.

The Dickinson School of Law of The Pennsylvania State University and the School of Public Affairs of Penn State Harrisburg, the Capital College, offer a cooperative program leading to the degrees of Juris Doctor, to be granted by Dickinson, and Master of Public Administration, to be granted by Penn State Harrisburg.

Admission Requirements

In order to be admitted to the program, students must first be admitted to The Dickinson School of Law under its regular admission procedures. Dickinson need not forward applications of all DSL admittees who have expressed interest in the MPA program and can withhold support for some admittees until they have demonstrated proficiency in their legal studies and a capacity for dual degree study. Penn State Harrisburg will make independent admissions decisions as to all dual degree applicants.

The Dickinson Admissions Office requires: application forms for DSL and PSH Graduate School, the Law School Admission Test (LSAT), a completed LSDAS report, a one-page personal statement, employment record since high school, and two recommendations.

The Penn State Harrisburg Admissions Office requires: completed applications (Graduate School and MPA), with the application fee; evidence of a bachelor's degree from an accredited college; a statement of career and educational goals; a successful undergraduate record with a grade-point average of 3.0 (either as the cumulative GPA or for the last 60 hours of relevant course work); satisfactory scores on the Graduate Record Examination (GRE), Graduate Management Admission Test (GMAT), or Law School Admission Test (LSAT) if junior–senior or cumulative GPA is less than 3.0); and three names of references willing to provide recommendations.

Prerequisites

All students admitted to the MPA program must show prerequisite course work in statistics and statistical software with a satisfactory grade. Students without prior course work in statistics must fulfill this prerequisite within two semesters of admission. Credits earned do not count toward the J.D./M.P.A. degree.

Degree Requirements

To be eligible to earn the Juris Doctor degree, a candidate must: earn credit for 88 semester hours of course work, have a cumulative average of at least 70.00, complete all required courses (currently totaling 41 semester hours) plus at least one seminar, and complete six semesters in residence.

The MPA degree program requires 36 graduate credits—18 in core courses, 15 in electives, and 3 for the Master's Project.

A maximum of 9 credits for Dickinson School of Law course work may be transferred for credit toward the MPA degree at Penn State Harrisburg, subject to Harrisburg's approval based on relevance to the MPA program.

A maximum of 9 credits for MPA course work with a grade of B or better may be transferred for credit toward the J.D. degree at Dickinson. Courses for which such credit may be applied shall be subject to approval by the Dickinson faculty.

It is anticipated that students will complete a minimum of 79 credits from Dickinson and 27 credits (not including the internship) from Penn State Harrisburg in order to earn the J.D. and M.P.A. degrees. A student in the program, however, may obtain either degree prior to completing all requirements for the other degree. Students must earn at least a 3.0 grade-point average to be eligible for the M.P.A. degree.

Last Revised by the Department: Spring Semester 2005

Blue Sheet Item #: 33-04-275

Review Date: 1/18/05

Date last updated by Publications: 4/18/08

Public Health Preparedness (P H P)

Program Home Page (Opens New Window)

Robert A. Cherry, *Medical Director*, Penn State Shock Trauma Center; *Chief*,
Section of Trauma and Critical Care, Penn State Milton S. Hershey Medical Center
College of Medicine, C1524
717-531-6066

Degrees Conferred:

M.H.S., Master of Homeland Security (Penn State University Park)

The Graduate Faculty

- Robert A. Cherry, M.D. (Columbia) *Assistant Professor of Surgery*
- Elizabeth Carney, DVM (Iowa State) *Assistant Professor of Comparative Medicine*
- Peter K. Forster, Ph.D. (Penn State) *Instructor of Political Science*
- Kevin P. Furlong, Ph.D. (Utah) *Professor of Geosciences*
- Jim Holliman, M.D. (Washington) *Professor of Emergency Medicine*
- Gretchen A. Kuldau, Ph.D. (California) *Assistant Professor of Plant Pathology*
- Eugene J. Lengerich VMD, MS (U of Penn), *Associate Professor of Health Evaluation Sciences*
- Craig Meyers, Ph.D. (UCLA) *Professor of Microbiology and Immunology*
- Kevin R. Murphy, Ph.D. (Penn State) *Professor and Head of Psychology*
- Roxanne Parrott, Ph.D. (Penn State) *Professor of Communication Arts and Sciences and Health Policy Administration*
- Zhengmin Qian, M.D., Ph.D. (Rutgers) *Assistant Professor of Health Evaluation Services*

The M.H.S. in Public Health Preparedness is designed to provide both science and nonscience post-baccalaureate students with broad training in public health preparedness as it relates to issues surrounding homeland security. The curriculum will be delivered in a distance education format to accommodate the needs and careers of professionals who are already working in or wish to transition into the field of homeland security. The program's target audience may include federal, state, and local public health officials, public affairs administrators, emergency management professionals, health care professionals, first responders, criminal justice and law enforcement personnel, military staff, and members of corporate security.

Graduates of the program will have a fundamental understanding of disaster communication, the principles of hazard analysis and incident management with respect to chemical, biological, radiological, and nuclear incidents, disaster planning and coordination, agricultural safety and security, critical infrastructure protection, and the political, legal, psychological and social aspects of terrorism.

Admission Requirements

The objective of the admissions process is to identify and admit qualified graduate students who have the capacity, motivation and intellect to protect and serve local, state, and national interests with respect to the occurrence of or threat of a natural disaster or terrorist attack.

Qualified candidates will have a baccalaureate degree from a regionally accredited institution and are expected to have a 3.0 or higher undergraduate grade point average on a 4.0 scale. Scores on the General Test of the Graduate Record Examination (GRE) are generally required for all applicants. GRE requirements may be waived in selected cases for those with advanced degrees who have demonstrated the ability to perform graduate level work and have submitted scores for consideration on comparable standardized tests, such as the GMAT, MCAT, or LSAT. A statement of professional experience and goals (up to 500 words) and the candidate's CV must accompany the application. Three letters of recommendation that attest to the applicant's readiness for graduate study are also required.

Applicants whose native language is not English must provide evidence of proficiency in English with a minimum TOEFL score of 550 (paper-based test) or 220 (computer-based test). Special backgrounds, abilities, and interests related to homeland security are desirable. Students will be required to possess a suitably configured personal computer and Internet connections.

Transfer Credit

A maximum of 10 credits of high-quality graduate work done at a regionally accredited institution may be applied toward the requirements for the master's degree. However, credits earned to complete a previous master's degree, whether at Penn State or elsewhere, may not be applied to a second master's degree program at Penn State. Approval to apply any transferred credits toward a degree program must be granted by the student's academic adviser, the program head or graduate officer, and the Graduate School. Transferred academic work must have been completed within five years prior to the date of first degree registration at the Graduate School of Penn State, must be of at least B quality (grades of B- are not transferable), and must appear on an official graduate transcript of an accredited university. Pass-fail grades are not transferable to an advanced degree program unless the "Pass" can be substantiated by the former institution as having at least B quality.

Funding Sources

World Campus students who are enrolled in a degree program and meet all other federal student aid eligibility requirements may be eligible for federal aid programs. Students must complete the Free Application for Federal Student Aid (FAFSA) to be considered for student aid.

Other Financing Options

- **Tuition Assistance Programs:** Students should check with their employer on the availability of tuition assistance programs to help cover graduate school costs.
- **Veterans Programs:** Veterans enrolled in degree programs may be eligible for reimbursement when they successfully complete a World Campus course. Students should contact their local Office of Veterans Programs, or Penn State's Office of Veteran's Programs.
- **Alternative Loans:** World Campus students who need to explore additional financing options are encouraged to review the following private educational lenders:
  - Citiassist
  - TERI Continuing Education Loans--for World Campus students who are non-degree or taking continuing education units

(CEUs)

- **World Campus Student Fund:** This scholarship is funded annually by World Campus staff members and students who understand that financial aid is not always available to distance learners--and when it is, the eligibility requirements are often difficult to meet. All scholarship monies awarded will be deposited directly into the recipients' student accounts at Penn State.
- **Trustee Scholarship Program:** Eligible students demonstrating financial need as determined by the Free Application for Federal Student Aid (FAFSA) will be contacted.

Degree Requirements

To be awarded a Master of Homeland Security degree in Public Health Preparedness, the student must successfully earn a total of 30 credit hours, of which at least 18 must be in 500-level courses. Students are expected to maintain a B (3.0) or better average in academic courses to be retained in the program. Each candidate must complete a project report on a topic related to public health preparedness in homeland security.

Faculty Advisers

All graduate students will be assigned a faculty adviser to encourage and mentor students in their educational pursuits, and to provide students with advice on research projects and career opportunities. Interactive communication is available through telephone sessions and video conferencing. On-site campus visits are encouraged, but not required.

Library Resources

The Penn State University Libraries provide an extraordinary array of collections and services to students who participate in classes through the World Campus. Students will have a Penn State Access Account that will allow them to access the online catalog, databases, digital library projects, and the growing number of full-test resources. The Libraries are able to service requests to scan print documents and deliver PDF documents at no charge through the University network. Students can also utilize the "ASK" reference service, which allows students to seek assistance through phone, e-mail, or synchronous online chats. Materials not owned by Penn State can be obtained through Interlibrary Loan services. ILLIAD, a service available through the Libraries' Web site, allows students to make and track their interlibrary loan requests without the need for an intermediary. The Libraries also operate an Electronic Reserves service that allows faculty members to make electronic materials available to students enrolled in a particular course. Students are always welcome to contact one of the Libraries' subject specialists for personalized assistance with their information needs.

PRESCRIBED COURSES: 27 credits

HOMELAND SECURITY (HLS)
410. Public Health Preparedness for Disaster and Bioterrorism Emergencies I (3)
510. Public Health Preparedness for Disaster and Bioterrorism Emergencies II (3)
520. Agricultural Biosecurity (3)
527. Public Health Evaluation of Disasters and Bioterrorism (3)
530. Critical Infrastructure Protection of Health Care Delivery Systems (3)
553. Disaster Communication (3)
558. Disaster Psychology (3)
594. Research Project (3)

GEOSCIENCES (GEOSC)
402Y. Natural Disasters (3)

POLITICAL SCIENCE (PL SC)
439. The Politics of Terrorism (3)

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

GEOSCIENCES (GEOSC) course list
HOMELAND SECURITY (HLS) course list
POLITICAL SCIENCE (PL SC) course list

Date last reviewed by Publications: 01/08/08

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-07-011

Review Date: 6/17/08

Public Health Sciences (PHS)

Program Home Page (Opens New Window)

VERNON M. CHINCHILLI, *Chair of the Department of Public Health Sciences*
College of Medicine, Penn State Milton S. Hershey Medical Center
Hershey, PA 17033
717-531-7178

Degree Conferred:

M.S.

The Graduate Faculty

Roger T. Anderson, Ph.D. (Johns Hopkins) Professor of Public Health Sciences, Chief, Health Services Research Division
Kwangmi Ahn, Ph.D. (SUNY Stony Brook) Assistant Professor of Public Health Sciences
Vernon M. Chinchilli, Ph.D. (North Carolina) Professor of Biostatistics; Department Chair
Christopher S. Hollenbeak, Ph.D. (Washington U) Associate Professor of Public Health Sciences
Tonya S. King, Ph.D. (North Carolina) Associate Professor of Public Health Sciences
Kristen Kjerulff, Ph.D. (Illinois) Professor of Public Health Sciences
Eugene J. Lengerich, V.M.D. (Pennsylvania) Professor of Public Health Sciences
Duanping Liao, Ph.D. (North Carolina) Professor of Public Health Sciences
Jiangang (Jason) Liao, Ph.D. (Johns Hopkins) Professor of Public Health Sciences
Thomas A. Lloyd, Ph.D. (Harvard) Professor of Public Health Sciences; Chief, Epidemiology Division
David T. Mauger, Ph.D. (Michigan) Professor of Public Health Sciences; Chief, Biostatistics Division
Joshua Muscat, Ph.D. (NYU) Professor of Public Health Sciences
John Richie, Ph.D. (Louisville) Professor of Public Health Sciences
Michele L. Shaffer, Ph.D. (Penn State) Associate Professor of Public Health Sciences
Li Wang, PhD (Penn State) Assistant Professor of Public Health Sciences
Carol S. Weisman, Ph.D. (Johns Hopkins) Distinguished Professor of Public Health Sciences and OB/GYN
Robin Taylor Wilson, Ph.D. (Iowa) Assistant Professor of Public Health Sciences
Rongling Wu, Ph.D. (U Washington) Professor of Public Health Sciences and Statistics

The Master's Program in Public Health Sciences includes graduate-level course work in biostatistics, epidemiology, and health services research, and provides knowledge and insight required in health related research. Students learn population-based methods for planning, executing, analyzing, and disseminating research results, and methods for evaluating and improving health care practices.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*. Prospective applicants for this program should have at least a bachelor's degree in a biological, physical, or behavioral science. Please see the program Web page for specific program application requirements.

Master's Degree Requirements

Each student in Public Health Sciences is expected to acquire breadth of knowledge in the disciplines of Biostatistics, Epidemiology and Health Services Research, and skills in the areas of experimental design, data collection and quantitative analysis. The PHS Master of Science degree can lead to careers in a wide variety of fields and settings, including academic health centers; the health insurance industry; health services networks; local, state, and federal government agencies; and the pharmaceutical industry. Each student must complete at least 30 credits at the 500 level, including 3 research credits and 27 credits of formal course work. Each student must carry out a research project concluding with a manuscript suitable for publication.

Prescribed Courses: 16 credits

PHS 520(3), PHS 521(3), PHS 536(3), PHS 550(3), PHS 551(3), PHS 500(1)

Additional Courses: 11 credits

PHS 510(3), PHS 511(1), PHS 518(1), PHS 519(1), PHS 522(3), PHS 535(3), PHS 540(1), PHS 541(1), PHS 552(3), PHS 560(1), PHS 561(1), PHS 570(3), PHS 580(3), PHS 581(1)

Research Courses: 3 credits

PHS 594(3)

Courses in Health Policy and Administration (HPA) and Statistics (STAT) may be taken as elective courses and will be considered on an individual basis in consultation with the student's academic adviser.

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

PUBLIC HEALTH SCIENCES (PHS) course list

HEALTH ADMINISTRATION (H ADM) course list

STATISTICS (STAT) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 6/1/04
Last Revised by the Department: Summer Session 2008
Blue Sheet Item #: 36-04-065
Review Date: 1/15/08
Last updated by Publications: 5/27/09

Quality and Manufacturing Management (QMM)

Program Home Page (Opens New Window)

RUSSELL BARTON, *Co-Director; Professor of Management Science and Information Systems*
ROBERT VOIGT, *Co-Director; Professor of Industrial and Manufacturing Engineering*
344 Leonhard Building
814-863-5802
qmm@psu.edu

Degree Conferred:

M.M.M.

Penn State's Master of Manufacturing Management (M.M.M.) degree is offered by the Quality and Manufacturing Management (QMM) program. The degree is conferred by both the College of Engineering and the Smeal College of Business. This interdisciplinary graduate program is designed to prepare students for careers in manufacturing, consulting, services, and operations. The program is offered on a full-time basis only and requires nine months of continuous study during a normal academic year. An appropriate internship experience is a precondition for entrance to the program if the applicant does not have sufficient work experience to waive the internship requirement. Students take 32 credits of work in eleven core courses.

The program develops future executives who possess in-depth, relevant manufacturing knowledge bridging engineering and management. Graduates are afforded a life-changing experience that provides them with a unique set of engineering, business, and quality skills combined with a suite of communication skills critical to management success. Students fuse Six Sigma certification with corporate social responsibility and emotional intelligence to become well-rounded leaders. MMM students develop business plans and analyze and predict corporate financial performance in a global marketplace. They emerge from Penn State as international leaders understanding the fundamentals of materials and processes and project confidence in product and manufacturing system design.

Admission Requirements

The program draws its students from two groups: practicing professionals from industry and individuals who have graduated from, or are currently enrolled in, a business administration, science, or engineering program. Applicants who expect to graduate with a B.S. in engineering, science, or business administration may apply for admission to the program in their senior year.

All applicants must submit scores from the GRE or the GMAT. International students must also submit TOEFL scores. However, the TOEFL requirement is waived for international students who have successfully completed undergraduate work in an American college or university. The average grade-point average is 3.0; the average GRE score is 1100 on the verbal and quantitative sections and 4.0 on the analytical section. The average GMAT score is 580.

All applicants must have taken the prerequisite mathematics, computer science, and statistics courses or equivalents **prior to** starting the program. Applicants **cannot** register until they have completed these courses. For a listing of the prerequisite courses, visit www.mmmdegree.psu.edu (Opens New Window)

Degree Requirements

The M.M.M. degree requires 32 credits of graduate work on a full-time basis. The courses are as follows: QMM 491 or QMM 492; QMM 552, QMM 561, QMM 562, QMM 581, QMM 582, QMM 593, QMM 851, QMM 871, QMM 872, and QMM 891.

In some instances, course changes are being considered and prospective students should consult with the M.M.M. degree program to determine what new requirements might be in effect. The program co-directors are authorized to make suitable substitutions in the above curriculum in consultation with the faculty steering committee.

Student Aid

A limited number of partial scholarships are available for students in the program.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

QUALITY AND MANUFACTURING MANAGEMENT (QMM) course list

Only students enrolled in the M.M.M. degree program may take the 500- and 800-level courses.

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/24/04

Last updated by Publications: 8/20/09

Recreation, Park and Tourism Management (RPTM)

Program Home Page (Opens New Window)

GARRY CHICK, *Department Head, Recreation, Park, and Tourism Management*

LINDA L. CALDWELL, *Professor-in-Charge*
201C Mateer Building
814-863-8983
llc7@psu.edu

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Christine Buzinde, Ph.D. (Illinois), Assistant Professor of Recreation, Park, and Tourism Management
- Linda L. Caldwell, Ph.D. (Maryland), Professor of Recreation, Park, and Tourism Management
- Garry Chick, Ph.D. (Pittsburgh), Professor of Recreation, Park, and Tourism Management
- John Dattilo, Ph.D. (Illinois) Professor of Recreation, Park, and Tourism Management
- Alan R. Graefe, Ph.D. (Texas A&M), Associate Professor of Recreation, Park, and Tourism Management
- Deborah L. Kerstetter, Ph.D. (Penn State), Associate Professor of Recreation, Park, and Tourism Management
- Duarte B. Morais, Ph.D. (Clemson), Assistant Professor of Recreation, Park, and Tourism Management
- Andrew J. Mowen, Ph.D. (Penn State), Assistant Professor of Recreation, Park, and Tourism Management
- George Vahoviak, Ph.D. (Penn State) Affiliate Associate Professor of Recreation, Park, and Tourism Management; Program Director, Shaver's Creek Center
- Careen Yarnal, Ph.D. (Penn State), Assistant Professor of Recreation, Park, and Tourism Management
- Harry C. Zinn, Ph.D. (Colorado), Associate Professor of Recreation, Park, and Tourism Management

The graduate program is designed to prepare students for administrative, supervisory, research, and teaching positions in public and private recreation and park systems, in colleges and universities, in voluntary agencies and institutions, and in commercial ventures.

The program is oriented to meet the specific needs and research interests of the candidate. Students may pursue interests in the community, including public park and recreation systems, voluntary agencies, and private commercial enterprises; tourism; institution and community-oriented therapeutic settings concerned with many different disabilities and utilizing a variety of activity modalities; park planning, resource management, interpretive services, outdoor education, and outdoor recreation services.

Admission Requirements

Scores from the Graduate Record Examination (GRE) are required for admission to the master's and doctoral programs. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

For admission to the graduate program, a bachelor's or master's degree is required. Candidates from majors other than recreation and parks are welcome to apply; however, additional course work is required. Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. All students must write a thesis.

There are no additional requirements beyond the general Graduate School requirements for the master's degree. Doctoral degree requirements include a 3.20 average for the master's degree work; understanding of a foreign culture; computer competency; and at least one year's experience in the recreation and parks field before completion of the degree.

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

RECREATION, PARK AND TOURISM MANAGEMENT (RPTM) course list

DATE LAST REVIEWED BY THE GRADUATE SCHOOL: 5/21/04

Last Revised by the Department: Summer Session 2007

Blue Sheet Item #: 35-07-448

Review Date: 6/12/07

Last updated by Publications: 8/21/09

Rural Sociology (R SOC)

Program Home Page (Opens New Window)

STEPHEN M. SMITH, *Head of the Department of Agricultural Economics and Rural Sociology*
103 Armsby Building
814-865-5461

Degrees Conferred:

Ph.D., M.S., M.Agr.

The Graduate Faculty

- Kathryn J. Brasier, Ph.D. (Wisconsin--Madison) Assistant Professor of Rural Sociology
- Gretchen T. Cornwell, Ph.D. (Penn State) Assistant Professor of Rural Sociology
- Leland L. Glenna, Ph.D. (Missouri) Assistant Professor of Rural Sociology, and Science, Technology, and Society
- Clare Hinrichs, Ph.D. (Cornell) Associate Professor of Rural Sociology
- Leif I. Jensen, Ph.D. (Wisconsin) Professor of Rural Sociology
- Albert E. Luloff, Ph.D. (Penn State) Professor of Rural Sociology
- Diane K. McLaughlin, Ph.D. (Penn State) Associate Professor of Rural Sociology
- Anouk Patel-Campillo, Ph.D. (Cornell) Assistant Professor of Rural Sociology
- Carolyn E. Sachs, Ph.D. (Kentucky) Professor of Rural Sociology
- Joan S. Thomson, Ph.D. (Wisconsin) Professor of Agricultural Communications
- James Van Horn, Ph.D. (Ohio State) Professor of Rural Sociology
- Fern K. Willits, Ph.D. (Penn State) Distinguished Professor of Rural Sociology

All degree programs emphasize a comprehensive understanding of the various facets of societal organization pertinent to the rural sector. While breadth is encouraged, areas of special interest and research include rural social change, community structure, population, rural community development, the structure of agriculture, natural resources, and the environment.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Prerequisites for the master's program include 3 credits in rural sociology or sociology, and additional credits in either field. If the entering student does not have these prerequisites, they must be made up at the University during the early part of the master's program.

Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Degree Requirements

All students are required to have training in sociological theory, statistics, and research methods.

There is no foreign language requirement for the Ph.D. degree; the student is expected to substitute such courses and instruction necessary to generate superior capabilities of inquiry into an analysis of basic and/or applied rural sociological problems.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

RURAL SOCIOLOGY (R SOC) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/29/04

Last updated by Publications: 9/2/09

Russian and Comparative Literature

B. RICHARD PAGE, *Associate Professor of German and Linguistics; Head, Department of Germanic and Slavic Languages and Literatures*
427 Burrowes Building
814-865-5481

CAROLINE D. ECKHARDT, *Head, Department of Comparative Literature*
427 Burrowes Building
814-863-0589

Degree Conferred:

M.A. in Russian and Comparative Literature

The Department of Germanic and Slavic Languages and Literatures and the Department of Comparative Literature offer a joint master's degree in Russian and Comparative Literature. The program enables students to concentrate in Russian literature at the graduate level while having the advantages of a comparative context. Students completing this M.A. will acquire an in-depth understanding of Russian literature and culture and will be proficient in Russian and one other foreign language. Graduates should be prepared for service with the U.S. government or an international corporation, or to continue graduate study either in Russian or comparative literature.

Admission Requirements

Requirements listed here are in addition to the general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*. Students with appropriate course backgrounds and a 3.00 junior/senior average (on a 4.00 scale) will be considered for admission. Scores from the Graduate Record Examination (GRE) are required. It is expected that students entering this degree program will have proficiency in Russian language and will have completed the B.A. in Russian or Comparative Literature. Students in other humanistic fields such as philosophy or history who have studied some literature and are proficient in Russian are welcome to apply.

Master's Degree Requirements

Candidates for the M.A. degree must earn a minimum of 33 credits of which at least 18 must be at the 500 level. Required courses in Russian include RUS 530 (Seminar in Nineteenth-Century Russian Literature), RUS 525 (Pushkin), and RUS 560 (History of the Russian Language) or RUS 542 (Seminar in Russian Literature in the Twentieth Century) plus an additional 6 credits. Required courses in comparative literature include CMLIT 501 plus an additional 12 credits in comparative literature. Also required are an additional 3 credits in Russian, comparative literature, or another approved area; passing of a proficiency examination in Russian; demonstration of reading knowledge of one other foreign language; and the completion of an acceptable M.A. paper.

Student Aid

A number of teaching assistantships are available in the Departments of Comparative Literature and Germanic and Slavic Languages and Literatures for students taking advanced degrees in these disciplines. There is also a graduate assistant position for an editorial assistant. See also the fellowships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*.

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

Last updated by Publications: 8/20/09

School Psychology (S PSY)

Program Home Page (Opens New Window)

KATHY RUHL, *Head, Department of Educational and School Psychology and Special Education*
125 CEDAR Building
814-865-6072

JAMES C. DiPERNA, *In Charge of Graduate Programs in School Psychology*
105 CEDAR Building
814-863-2405
jcd12@psu.edu

Degrees Conferred:

Ph.D., M.S., M.Ed.

The Graduate Faculty

- James C. DiPerna, Ph.D. (Wisconsin) Assistant Professor of Education
- Joseph L. French, Ed.D. (Nebraska) Professor Emeritus of Education
- Robert L. Hale, Ph.D. (Nebraska) Professor of Education
- Ronald A. Madle, Ph.D. (Penn State) Adjunct Associate Professor of Education
- Bonnie J. F. Meyer, Ph.D. (Cornell) Professor of Educational Psychology
- Barbara A. Schaefer, Ph.D. (Pennsylvania) Assistant Professor of Education
- Beverly Vandiver, Ph.D. (Ball State) Associate Professor of Education

This intercollege program is based primarily on courses in educational psychology, psychology, and special education. In addition, courses are often drawn from counselor education, human development and family studies, educational theory and policy, educational administration, and curriculum and instruction. The objective is to develop a psychologist capable of providing health care who is interested in and knowledgeable about education and psychology in the school setting. The school psychologist must utilize professional skill and knowledge about children and youth to make contributions that are meaningful to and utilized by teachers, other school personnel, and parents. The development of competencies needed by a fully qualified school psychologist requires at least the education represented by a doctoral degree.

Practicum facilities, in addition to those in nearby public schools, include the Center for Educational Diagnosis and Remediation, the School Psychology Clinic, the Communication Disorders Clinic, the Reading Center, and the Psychology Clinic. Facilities for work with children are also available through other academic units, as well as through assistantship assignments.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Only those students who anticipate a doctoral degree will be admitted. Students are selected within the limitations of program facilities. Priority is given to applicants with work experience with children.

An undergraduate major emphasizing work in psychology and/or education is preferred, but students with fewer than 20 upper-division credits in psychology, educational psychology, or special education may be admitted with limited deficiencies to be fulfilled concurrently with their graduate work. Requirements for admission include a minimum of one-third of graduate credits of A quality; undergraduate GPA of B or higher; satisfactory recommendations from two or more professors, preferably psychologists; and a score of 1000 or higher on the two general sections or a score of 1500 or higher, including the analytical or an advanced test, of the Graduate Record Examination. Exceptions may be made for students with special backgrounds, abilities, and interests.

Master's Degree Requirements

Students entering the program with a bachelor's degree complete the M.S. as prescribed by the Graduate School.

Students qualifying for a certificate to practice in the schools must meet standards specified by the Pennsylvania Department of Education. These include, but are not limited to, a master's degree, about 60 graduate credits, practicum experiences, and successful completion of precertification tests.

Doctoral Degree Requirements

Students may be admitted with a master's degree from school psychology programs from other institutions or from related programs in this or other universities. The doctoral program includes a predissertation research requirement; the core program described here (which qualifies the candidate for a school psychology certificate); a special proficiency of 6 to 18 credits; an internship; and a dissertation.

Students completing the School Psychology Core Program will have courses in the biological bases of behavior, the cognitive bases of behavior, the social bases of behavior, personality theory or abnormal psychology, human development, professional ethics and standards, research design and methodology, statistics, psychometrics, counseling theory, educational foundations, educational administration, the education of exceptional children, and curriculum.

Other Relevant Information

The program has been accredited by the American Psychological Association, the National Commission for Accreditation in Teacher Education (NASP), and the Pennsylvania Department of Education.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of

the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

SCHOOL PSYCHOLOGY (S PSY) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/12/04

Last updated by Publications: 1/22/10 (link check)

Science/Business, Integrated Five-Year Program

Degree Conferred:

B.S./M.B.A. Degrees

This special program is a cooperative effort between the Eberly College of Science and the Smeal College of Business. The program will provide an opportunity for students to combine and accelerate an undergraduate program in the basic sciences with a graduate program in business administration. Students admitted to this program will have the opportunity to earn a B.S. degree in General Science from the Eberly College of Science and an M.B.A. in Business Administration from the Smeal College in a total of five years. The first three years of study will include courses that satisfy the undergraduate science and General Education components of the program, and the last two years will satisfy the graduate business components of the program.

Initial program admission decisions are made jointly by the Eberly College of Science and the Smeal College of Business. The decision to extend an invitation to join the program as an undergraduate is reached through a multi-step process. First, applicants meeting all program criteria will be initially reviewed. Then a limited number of top candidates will be selected for on campus interviews by representatives of the Eberly College of Science and the Smeal College of Business. Successful interviewees will be offered admission to the accelerated program.

During the third year of the program, students formally apply to the MBA program in the Smeal College of Business. Applications are reviewed against the same criteria used for all MBA applicants, including undergraduate record, GMAT scores and related work experience. Successful candidates will gain admission into the MBA program for their fourth year of study. Students will then earn their B.S. degree during the first year of M.B.A. course work, and earn their M.B.A. degree at the end of their second year of graduate study. In addition to the regular fall and spring semester course work, program students are expected to earn credit during summer session through Cooperative Education experiences and participate in the MBA internship program.

This program seeks to combine an undergraduate program with graduate study in a professional school, and it proposes to attract and select excellent students with defined career goals. It is important to note that students in this program will have completed at least 112 undergraduate credits before entering the MBA component of the program. They will satisfy all of Penn State's undergraduate General Education requirements and will complete the science course requirements that a General Science student with the General option does. The main elements that are different for students in the accelerated program as compared with regular four-year General Science major (General option) are that in the accelerated program students use elective credits for summer Co-op experiences and for 12 transfer credits from their first year of MBA studies. These 12 credits will be "double counted" on both the undergraduate and graduate transcripts. Accelerated students also will have an opportunity to take special "bridge" courses including 1- and 2-credit seminar classes that will focus on traversing the boundaries among science, technology, and business.

DATE LAST REVIEWED: 3/18/03

Last updated by Publications: 7/1/05

Sociology (SOC)

Program Home Page (Opens New Window)

JOHN D. McCARTHY, *Head of the Department of Sociology and Crime, Law, and Justice*
211 Oswald Tower
814-863-8260

Degrees Conferred:

M.A., Ph.D.

The Graduate Faculty

- Duane Alwin, Ph.D. (Wisconsin) McCourtney Professor of Sociology, Demography, and Human Development and Family Studies
- Paul Amato, Ph.D. (James Cook, Australia) Professor of Sociology and Demography
- Roy L. Austin, Ph.D. (Washington) Associate Professor of Sociology and Justice
- Alan A. Block, Ph.D. (California, Los Angeles) Professor of Crime, Law, and Justice, and Jewish Studies
- Alan Booth, Ph.D. (Nebraska) Distinguished Professor Emeritus of Sociology, Human Development, and Demography
- Richard Bord, Ph.D. (Iowa) Professor Emeritus of Sociology
- Lori Burrington, Ph.D. (Ohio State) Assistant Professor of Crime, Law, and Justice
- Frank Clemente, Ph.D. (Tennessee) Professor of Sociology
- Stephen R. Couch, Ph.D. (SUNY) Professor of Sociology
- Gordon F. De Jong, Ph.D. (Kentucky) Distinguished Professor of Sociology and Demography; Director, Graduate Program in Demography
- Francis Dodoo, Ph.D. (Pennsylvania) Professor of Sociology and Demography
- James Eisenstein, Ph.D. (Yale) Professor Emeritus of Political Science and Crime, Law, and Justice
- Richard Felson, Ph.D. (Indiana) Professor of Crime, Law, and Justice, and Sociology
- Roger Finke, Ph.D. (Washington) Professor of Sociology and Religious Studies
- Glenn Firebaugh, Ph.D. (Indiana) Professor of Sociology and Demography
- Michelle Frisco, Ph.D. (Texas) Assistant Professor of Sociology and Demography
- Emily Greenman, Ph.D. (Michigan) Assistant Professor of Sociology
- Melissa Hardy, Ph.D. (Indiana) Distinguished Professor of Human Development and Family Studies, Sociology, and Demography
- Michael Hecht, Ph.D. (Illinois) Distinguished Professor of Speech Communication, and Crime, Law, and Justice
- Julie Horney, P{h.D. (California, San Diego) Professor of Crime, Law, and Justice; Graduate Officer
- Craig Humphrey, Ph.D. (Brown) Professor Emeritus of Sociology
- John Iceland, Ph.D. (Brown) Professor of Sociology and Demography
- David R. Johnson, Ph.D. (Vanderbilt) Professor of Sociology, and Human Development and Family Studies; Director, Survey Research Center
- Kurt Johnson, Ph.D. (Nebraska) Research Associate, Social Science Research Institute
- Michael P. Johnson, Ph.D. (Michigan) Professor Emeritus of Sociology, Women's Studies, and African and African American Studies
- Valarie King, Ph.D. (Pennsylvania) Associate Professor of Sociology, Demography, and Human Development and Family Studies
- John H. Kramer, Ph.D. (Iowa) Professor of Sociology, and Crime, Law, and Justice
- Derek Kreager, Ph.D. (Washington) Assistant Professor of Crime, Law, and Justice
- Nancy S. Landale, Ph.D. (Washington) Professor of Sociology and Demography
- Barrett A. Lee, Ph.D. (Washington) Professor of Sociology and Demography
- Doris MacKenzie, Ph.D. (Penn State) Professor of Crime, Law, and Justice
- Molly Martin, Ph.D. (Wisconsin) Assistant Professor of Sociology and Demography
- Michael Massoglia, Ph.D. (Minnesota) Assistant Professor of Crime, Law, and Justice
- Jennifer Mastrofski, Ph.D. (Penn State) Associate Professor of Administration of Justice
- Stephen Matthews, Ph.D. (Wales) Associate Professor of Sociology, Anthropology, and Demography
- John D. McCarthy, Ph.D. (Oregon) Professor of Sociology
- Hart Nelsen, Ph.D. (Vanderblit) Professor Emeritus of Sociology
- R. Salvador Oropesa, Ph.D. (Washington) Professor of Sociology and Demography
- D. Wayne Osgood, Ph.D. (Colorado) Professor of Crime, Law, and Justice, and Sociology
- William Parsonage, Ph.D. (South Dakota) Professor Emeritus of Crime, Law, and Justice
- Evelyn Patterson, Ph.D. (Pennsylvania) Assistant Professor of Crime, Law, and Justice, Sociology, and Demography
- Roland Pellegrin, Ph.D. (North Carolina) Professor Emeritus of Sociology
- Eric Plutzer, Ph.D. (Washington-St. Louis) Associate Professor of Political Science and Sociology
- Suet-Ling Pong, Ph.D. (Chicago) Associate Professor of Education and Sociology
- Richard Ritti, Ph.D. (Cornell) Professor Emeritus of Crime, Law, and Justice
- R. Barry Ruback, Ph.D. (Pittsburgh) Professor of Crime, Law, and Justice, and Sociology
- Eric Silver, Ph.D. (SUNY, Albany) Associate Professor of Crime, Law, and Justice, and Sociology
- Graham B. Spanier, Ph.D. (Northwestern) Professor of Human Development, Sociology, and Family, and Community Medicine
- Jeremy Staff, Ph.D. (Minnesota) Assistant Professor of Crime, Law, and Justice, and Sociology
- Darrell J. Steffensmeier, Ph.D. (Iowa) Professor of Sociology and Crime, Law, and Justice
- C. Shannon Stokes, Ph.D. (Kentucky) Professor of Rural Sociology, Sociology, and Demography
- Marylee C. Taylor, Ph.D. (Harvard) Associate Professor of Sociology
- George Theodorson, Ph.D. (Cornell) Professor Emeritus of Sociology
- Kevin J. A. Thomas, Ph.D., (Pennsylvania) Assistant Professor of African and African American Studies, Sociology, and Demography
- Jenny Trinitapoli (Texas) Assistant Professor of Sociology, Demography, and Religious Studies)
- Jeffery T. Ulmer, Ph.D. (Penn State) Associate Professor of Crime, Law, and Justice, and Sociology
- Jennifer Van Hook, Ph.D. (Texas) Associate Professor of Sociology and Demography
- Edward Walsh, Ph.D. (Michigan) Professor Emeritus of Crime, Law, and Justice
- Susan Welch, Ph.D. (Illinois) Professor of Political Science and Crime, Law, and Justice

The graduate program in Sociology offers advanced education for students who intend to pursue academic careers in sociology or who aspire to nonacademic research positions.

The M.A. and Ph.D. programs provide training in general social theory, research methodology, statistics, and a number of traditional and developing substantive specialties. In consultation with faculty advisers, students select two specialties that are among the department's

strengths, such as classical and contemporary theory; community and environment; demography; family, life course, and aging; quantitative methods; social psychology; and stratification and social change.

Alternate specialty areas not listed above may be selected as the major or the minor, with the approval of the graduate committee. Students may elect to pursue a dual-title degree in Sociology and Demography. For details, refer to the Demography program description. A separate Ph.D. program in Crime, Law, and Justice is also housed within the department. Please see the CLJ program description for details.

All students who intend to pursue doctoral work are expected to earn an M.A. degree in their normal progress to the Ph.D.

Course work outside the department is encouraged. Areas of study related to sociology, such as rural sociology, geography, economics, business administration, statistics, cultural anthropology, political science, and human development and family studies are available at the University.

Special department-related research and training facilities include on-site computer laboratories and the Social Science Research Center, the Population Research Institute, the Center for Research on Crime and Justice, and the Pennsylvania Commission on Sentencing. Additional University facilities used by sociology faculty and graduate students include the Computation Center (containing information about the extensive databases provided through the Inter-University Consortium for Political and Social Research) and the Gerontology Center.

Admission Requirements

Applications will be accepted through January 1 for fall admission the following year. Selection is based on undergraduate grades (and where applicable, record of previous graduate work); letters of recommendation; statement of purpose; a sample of written work, such as a term paper; and Graduate Record ExaminationS (GRE) verbal and quantitative scores. The best-qualified applicants will be accepted up to the number of spaces available. Students with limited prior training in sociology may be accepted, with the provision that they make up background deficiencies in the early part of their graduate program.

Degree Requirements

Required courses for the M.A. include a two-semester proseminar, one seminar each in research methods and social theory, and two seminars in social statistics. Students complete an M.A. thesis during their second year of the program.

A candidacy examination is required of all students seeking the Ph.D. This evaluation by the departmental Graduate Committee is based on the student's seminar papers, research proposal, and record of course performance and on faculty assessments of the student's ability to complete a high-quality Ph.D. program. For those admitted to the Ph.D. candidacy, a lab in teaching sociology is required, along with substantive courses in the student's major and minor areas of concentration. A comprehensive examination must be passed before the period of intensive dissertation research begins.

The Department of Sociology has no formal foreign language or communication requirement. However, students are encouraged to pursue additional training in statistics, computer science, foreign language, technical writing, specialized methods, or specialized theory that will further dissertation and career plans.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, teaching assistantships support many students admitted to the program. Research assistantships also are available to qualified students through individual faculty members' grants and contracts. A number of federal agencies also offer fellowships for graduate study in sociology.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

SOCIOLOGY (SOC) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

Last updated by Publications: 2/2/10

Software Engineering (SWENG)

Program Home Page (Opens New Window)

JAMES A. NEMES, *Professor and Division Head, Engineering*
School of Graduate Professional Studies
Penn State Great Valley
30 East Swedesford Road
Malvern, PA 19355-1443
610-648-3335
gvengin@psu.edu

The Graduate Faculty

- Adrian Barb, Ph.D. (University of Missouri) *Assistant Professor of Information Science*
- Joanna Defranco, Ph.D. (New Jersey Institute of Technology) *Assistant Professor of Information Science*
- Nil H. Ergin, Ph.D. (University of Missouri-Rolla), *Assistant Professor of Systems Engineering*
- Kathryn Jablokow, Ph.D. (Ohio State) *Associate Professor of Mechanical Engineering*
- Phillip A. Laplante, Ph.D. (Stevens Institute of Tech) P.E. *Associate Professor of Software Engineering*
- John I. McCool, Ph.D. (Temple) *Distinguished Professor of Industrial and Manufacturing Engineering*
- Colin J. Neill, Ph.D. (Wales) *Associate Division Head and Professor of Software Engineering*
- James A. Nemes, D.Sc. (George Washington University) *Professor and Division Head*
- Michael J. Piovoso, Ph.D. (Delaware) *Professor of Electrical Engineering*
- Robin G. Qui, Ph.D. (Penn State) *Associate Professor of Information Science*
- David W. Russell, Ph.D. (CNAA, London) *Professor of Electrical Engineering*
- Raghvinder Sangwan, Ph.D. (Temple) *Associate Professor of Software Engineering*
- Kailasam Satyamurthy, Ph.D. (Clemson) *Assistant Professor of Engineering and Management*

This professional master's degree program, available at Penn State Great Valley, focuses on various aspects of software engineering. The primary goal of the program is to prepare students to develop the next generation of software products and services for consumers, industry, and government. The curriculum includes comprehensive, intensive coverage of modern software concepts and techniques, and emphasizes a holistic approach, encompassing financial, legal, and presales issues; technical concepts; software design techniques; methods; and project management.

The program is constituted by four, 9-credit modules of study. Each module is designed for in-depth coverage of a specific area of study (e.g., modem software methods, algorithms, information science). Two of the modules are required; one centers on professional, skill-based topics such as software project management or business communications, and includes the option to select a professional paper or the advanced software studio. The second required module comprises 9 credits of advanced software engineering course work. Graduate instruction is under the direction of a faculty committee.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

The Master of Software Engineering (M SE) program is designed for students with technical backgrounds. Admission will be granted if the applicant has the necessary program prerequisites and a faculty member in the student's interest area agrees to serve as adviser. Candidates lacking in a modem programming language can meet that requirement by scheduling the 400-level software engineering studio. Scores from the Graduate Record Examinations (GRE) are not an entrance requirement unless the applicant has a junior/senior grade-point average below 3.00 (on a 4.00 scale).

Students with a 3.00 junior/senior average in an appropriate technical degree program will be considered for admission. The best-qualified applicants will be accepted. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Entering graduate students for whom English is not their first language are required to have a score of at least 550 on the TOEFL (Test of English as a Foreign Language).

Program Requirements

All candidates must complete two required 9-credit core modules, for a total core curriculum of 18 credits, and two other 9-credit modules. At least 15 credits of selected courses must be at the 500 level.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

SOFTWARE ENGINEERING (SWENG) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 6/1/04

Last updated by Publications: 8/20/09

Soil Science (SOILS)

Program Home Page (Opens New Window)

D. M. SYLVIA, *Head of the Department of Crop and Soil Sciences*
116 Agricultural Sciences and Industries Building
814-865-2025

R. C. STEHOUWER, *Chair of the Graduate Program in Soil Science*
417 Agricultural Sciences & Industries Building
814-863-7640

Degrees Conferred:

Ph.D., M.S.

The Graduate Faculty

- Douglas B. Beegle, Ph.D. (Penn State) Professor of Agronomy
- Mary Ann Bruns, Ph.D. (Michigan) Assistant Professor of Soil Microbial Ecology
- Ray B. Bryant, Ph.D. (Purdue) Adjunct Professor of Soil Science
- Edward J. Ciolkosz, Ph.D. (Wisconsin) Professor of Soil Genesis and Morphology
- Rick L. Day, Ph.D. (Penn State) Associate Professor of Science and Environmental Information Systems
- Jerzy Dec, Ph.D. (Warsaw, Poland) Research Associate
- Curtis J. Dell, Ph.D. (Kent State) Adjunct Assistant Professor of Soil Science
- Sjoerd W. Duiker, Ph.D. (Ohio State) Associate Professor of Soil Management and Applied Soil Physics
- William E. Easterling, Ph.D. (UNC, Chapel Hill) Professor of Geography and Agronomy
- Daniel D. Fritton, Ph.D. (Iowa State) Professor of Soil Physics
- Peter J. A. Kleinman, Ph.D. (Cornell) Adjunct Assistant Professor of Soil Science
- Sridhar Komarneni, Ph.D. (Wisconsin) Professor of Clay Mineralogy
- Hangsheng Lin, Ph.D. (Texas A&M) Associate Professor of Hydropedology/Soil Hydrology
- Carmen Enid Martinez, Ph.D. (Rutgers) Assistant Professor of Environmental Soil Chemistry
- Andrew S. McNitt, Ph.D. (Penn State) Assistant Professor of Turfgrass Science
- Gary W. Petersen, Ph.D. (Wisconsin) Distinguished Professor of Soil and Land Resources
- Andrew S. Rogowski, Ph.D. (Iowa State) Adjunct Professor of Soil Physics
- Maxim J. Schlossberg, Ph.D. (Georgia) Assistant Professor of Turfgrass Nutrition and Soil Fertility
- Andrew N. Sharpley, Ph.D. (Massey, New Zealand) Adjunct Professor of Soil Science
- Richard C. Stehouwer, Ph.D. (Ohio State) Assistant Professor of Environmental Soil Science
- David M. Sylvia, Ph.D. (Cornell) Professor of Soil Microbiology
- John E. (Jack) Watson, Ph.D. (Arizona) Professor of Soil Science
- Ann M. Wolf, Ph.D. (Penn State) Affiliate Assistant Professor of Soil Science

The Soil Science program is administered in the Department of Crop and Soil Sciences, College of Agricultural Sciences. Each student will be associated with an adviser who may provide financial support, research facilities, and/or office space. Applicants are encouraged to explore, study, and research opportunities by contacting faculty who may be prospective advisers.

This program provides opportunities for candidates interested in soil and related water resources to become a professional leader and an independent scholar. Faculty in this program are competent to prepare candidates in the subfields of Soil Science including: soil genesis, soil classification, soil morphology, soil mapping, soil physics, soil chemistry, soil mineralogy, soil microbiology, soil fertility, soil conservation, geographic information systems, computer mapping, watershed analysis, soil hydrology, soil and water management, resource inventory and assessment, remote sensing, land evaluation, land waste disposal, and land management.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination, are required for admission. At the discretion of the graduate standards committee, a student may be admitted provisionally for graduate study in the program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

Prerequisites for major work in Soil Science vary with the area of specialization and the degree sought, but courses in chemistry, mathematics, physics, geology, basic and applied biological sciences, and English communication skills are required. Applicants for the M.S. degree should have a baccalaureate degree including 76 credits of basic and applied natural sciences. Admission to the Ph.D. program usually requires an M.S. or equivalent degree with a minimum cumulative grade-point average of 3.25 (on a 4.00 scale). Applicants for the Ph.D. program will be evaluated on the quality of work completed in all previous degree programs. Students who lack some of the prerequisite courses may be admitted but are required to take these courses without degree credit. The best-qualified applicants will be accepted up to the number of spaces available for new students.

Master's Degree Requirements

In addition to the general requirements for the M.S. degree as defined by the Graduate School, the department requires 12 credits of 400- or 500-level formal courses in the major field of which 6 must be 500-level. Participation in at least one colloquium course each semester is required and students must complete at least 1 credit of colloquium (SOILS 590), as well as 1 credit of Teaching Experience (SOILS 602). An advisory committee will be appointed for each student and additional courses and requirements may be determined by this advisory committee.

A thesis based on field or laboratory research is required for the M.S. degree. M.S. candidates must pass a final examination.

Doctoral Degree Requirements

Beyond the general requirements for the Ph.D. defined by the Graduate School, the department has a number of specific requirements regarding course level and distribution that are defined in the departmental publication "Graduate Degrees in Soil Science." While a

minimum number of courses for the degree is not specified, the doctoral advisory committee has the responsibility of specifying courses and credits essential for the education and development of the candidate. Students are expected to be educated in depth in a specific subfield of Soil Science and to have a perspective of the general field. Normally, 55 to 60 credits in formal course work beyond the B.S. degree are required.

Doctoral candidates are required to participate regularly in a departmental colloquium and to register for at least 2 credits of Colloquium (SOILS 590) during the Ph.D. program. A teaching experiecne, consisting of two separate semesters, is also required of all Ph.D. students.

The communication and foreign language requirement for the Ph.D. degree may be met either by demonstrating a knowledge of at least one foreign language or by completing at least 6 credits of course work in an area of English communications approved by the student's advisory committee.

Graduate students with research and educational interests in biogeochemistry may apply to the Biogeochemistry Dual-Title Degree Program. Students in the Biogeochemistry Dual Title program are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program and a member of the Biogeochemistry faculty. Additional coursework from an approved list of courses is required. All students must pass a candidacy examination that includes an assessment of their potential in the field of biogeochemistry. A single candidacy examination that includes biogeochemistry will be administered for admission into the student's Ph.D. program, as well as the biogeochemistry dual-title. The structure and timing of this exam will be determined jointly by the dual-title and major program. The student's doctoral committee should include faculty from the major program of study and also faculty with expertise in biogeochemistry. The field of biogeochemistry should be integrated into the comprehensive examination. A Ph.D. dissertation that contributes fundamentally to the field of biogeochemistry is required.

Other Relevant Information

Every student has a close professional relationship with his or her faculty adviser. While research that is done for the thesis will be on subjects that fall within the ongoing research program of the adviser, students are encouraged to propose research projects that are of interest to them. For the most part, all costs relative to the research program will be covered by the department. The department encourages professional development of students through participation in meetings of relevant professional societies and organizations.

Student Aid

Graduate assistantships and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

SOIL SCIENCE (SOILS) course list

DATE LAST REVIEWED: 5/11/04

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-06-185F

Review Date: 4/15/08

Last updated by Publications: 1/22/10 (link check)

Spanish (SPAN)

Program Home Page (Opens New Window)

HENRY J. GERFEN, *Head of the Department of Spanish, Italian, and Portuguese*
237 Burrowes Building
814-865-4252

Degrees Conferred:

Ph.D., M.A.

The Graduate Faculty

- Mary E. Barnard, Ph.D. (Michigan) Associate Professor of Spanish and Comparative Literature
- William R. Blue, Ph.D. (Penn State) Professor of Spanish
- Paola G. Dussias, Ph.D. (Arizona) Associate Professor of Spanish, Linguistics, and Psychology
- Nicolas Fernandez-Medina, Ph.D. (Stanford) Assistant Professor of Spanish
- Henry J. Gerfen, Ph.D. (Arizona) Associate Professor of Linguistics and Spanish Linguistics
- Marie Speicher, Ph.D. (Penn State) Senior Lecturer in Spanish
- Julia Cuervo Hewitt, Ph.D. (Vanderbilt) Associate Professor of Spanish and Portuguese
- James P. Lantolf, Ph.D. (Penn State) Professor of Spanish and Applied Linguistics
- John M. Lipski, Ph.D. (Alberta) Edwin Erle Sparks Professor of Spanish
- Matthew Marr, Ph.D. (Virginia) Assistant Professor of Spanish
- Guadalupe Martí-Peña, Ph.D. (Washington) Assistant Professor of Spanish
- Sophia McClennen, Ph.D. (Duke) Associate Professor of Comparative Literature, Spanish, and Women's Studies
- John Ochoa, Ph.D. (Yale) Associate Professor of Spanish and Comparative Literature
- Laurence E. Prescott, Ph.D. (Indiana) Associate Professor of Spanish and African/African American Studies
- Sherry Roush, Ph.D. (Yale) Associate Professor of Italian
- Nuria Sagarra, Ph.D. (Illinois) Assistant Professor of Spanish and Applied Linguistics
- Maria R. Truglio, Ph.D. (Yale) Associate Professor of Italian

The program offers M.A. options in literature and linguistics, as well as doctoral emphasis in either of these two areas.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required of all students educated (high school and college) in the continental United States. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Graduate Bulletin*.

The minimum requirement for admission normally will be 24 credits of postintermediate work in Spanish language and literature.

Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests.

Degree Requirements

A candidate for the M.A. degree must take a minimum of 30 credits at the graduate level including 6 credits in a related minor field. An M.A. essay and a comprehensive written examination also are required. The M.A. degree (or equivalent) is normally a prerequisite to doctoral candidacy.

For the Ph.D. degree, a student must complete at least 60 credits (including M.A. credits) of graduate-level work, including a 15-credit minor. Other requirements include (1) a doctoral candidacy examination and written area examinations; (2) reading knowledge of two foreign languages or a comprehensive knowledge of one foreign language; and (3) a doctoral dissertation.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

The department awards annually an Edwin Erle Sparks Fellowship in the Humanities. In the past several years, graduate students have received external NSF fellowships and awards such as Doctoral Dissertation Research Improvement grants.

Courses

*SPAN 001G. ELEMENTARY SPANISH FOR GRADUATE STUDENTS (3)
*SPAN 002G. ELEMENTARY SPANISH FOR GRADUATE STUDENTS (3)

*No graduate credit given for this course.

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

SPANISH (SPAN) course list

Last Revised by the Department: Fall Semester 2005

Blue Sheet Item #: 33-07-120

Review Date: 06/14/05

Date last updated by Publications: 9/15/09

Special Education (SPLED)

Program Home Page (Opens New Window)

KATHY L. RUHL, *Head of the Department of Educational and School Psychology, and Special Education*
125 CEDAR Building

CHARLES HUGHES, *Professor-in-Charge of Graduate Programs in Special Education*
207 CEDAR Building
814-863-1699
spled@psu.edu

Degrees Conferred:

Ph.D., M.S., M.Ed. (Penn State University Park) M.S., M.Ed. (Penn State Great Valley)

The Graduate Faculty

- Sean Casey, Ph.D. (Iowa) Assistant Professor of Education
- Thomas Farmer, Ph.D. (North Carolina) Associate Professor of Special Education
- Charles A. Hughes, Ph.D. (Florida) Professor of Special Education
- Richard M. Kubina, Jr., Ph.D. (Ohio State) Associate Professor of Education
- David Lee, Ph.D. (Purdue) Associate Professor of Special Education
- Linda Mason, Ph.D. (Maryland) Associate Professor of Special Education
- James K. McAfee, Ph.D. (Georgia State) Associate Professor of Special Education
- David McNaughton, Ph.D. (Penn State) Professor of Education
- Paul Morgan, Ph.D. (Vanderbilt) Assistant Professor of Education
- Kathy L. Ruhl, Ph.D. (Florida) Professor of Special Education
- Frank Rusch, Ph.D. (Washington U) Professor of Special Education
- Mary Catherine Scheeler, Ph.D. (Penn State) Associate Professor of Education
- Gerald L. Shook, Ph.D. (Western Michigan) Adjunct Associate Professor of Education
- Pamela S. Wolfe, Ph.D. (Virginia) Associate Professor of Special Education

Exceptional children are those who deviate so far from average in physical, intellectual, emotional, or social characteristics that they require highly specialized instruction and related services. The purpose of the M.Ed. program in Special Education is to prepare teachers of exceptional children. M.Ed. students are trained in behavior management and instructional design, implementation, and evaluation appropriate for effective work with children and youth who qualify for services for mental or physical disabilities at all age levels and degrees of severity. The purpose of the M.S. and Ph.D. programs is to prepare researchers and college and university teachers in areas encompassing the education of the children and youth who qualify for services for mental or physical disabilities. The former program is professional in nature; the latter two, academic.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) (verbal and quantitative) are required for admission. At the discretion of a graduate program, a student may be admitted provisionally for graduate study in a program without these scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Highest admission priorities are given to applicants who possess certification in special education or elementary education. Applicants for master's and doctoral programs must present evidence of superior academic achievement, complete a personal statement, present GRE verbal and quantitative test scores, and provide professional references. Minimum GPA for master's and doctoral applicants are, respectively, 3.00 for M.Ed. and M.S., and 3.50 for Ph.D. Minimum GRE test scores of master's and doctoral applicants, respectively, are (verbal and quantitative combined): 800 for M.Ed., 900 for M.S., and 1000 for Ph.D. Applicants for doctoral study must have had at least three years of relevant experience with special-needs children or youth. Applicants from foreign countries whose first language is not English must submit TOEFL (Test of English as a Foreign Language) scores. Exceptions to the admissions criteria may be made only for highly qualified students with special backgrounds, abilities, and interests.

Master's Degree Requirements

Prerequisites for the M.Ed. program include 26 credits basic to the education of exceptional children (courses comparable to SPLED 401, SPLED 425, SPLED 454, and SPLED 495E). Of the 30 credits required for the M.Ed. degree, 6 must be taken from fields outside of special education; at least 18 must be taken in special education; and 18 credits must be taken at the 500 level. SPLED 411, SPLED 412, and SPLED 573 are required along with two practica: SPLED 595A and SPLED 595B. M.Ed. students must submit a master's paper. M.Ed. students must submit a master's paper and meet all of the eligibility criteria for Pennsylvania certification at the completion of their programs.

Of the 30 credits required for the M.S. degree, 6 must be taken from one discipline outside of education; 18 must be taken in special education; and 18 must be taken at the 500 level or above. SPLED 573 and EDPSY 400 are required as are 6 credits of thesis research, SPLED 600. M.S. students must submit a master's thesis and pass a comprehensive examination.

All requirements for either the M.Ed. or the M.S. degree, whether satisfied on the University Park campus or elsewhere, must be met within six years or a period spanning seven consecutive summers.

Doctoral Degree Requirements

The communication and foreign language requirement for the Ph.D. degree is prescribed by each student's committee. The requirements include the successful completion of a philosophy of science course (e.g., PHIL 421) and additional language and communication abilities such as foreign language competence, computer programming skills, expertise with alternative communication systems, research publication, etc. Minimum requirements for the Ph.D. degree include 24 credits of research methods; 18 credits in a cognate area such as psychology, sociology, or child development; and 36 credits in education. The student also must enroll in SPLED 500 each semester prior to successful completion of the comprehensive examinations. A candidacy examination is required no later than the second semester of full-time study; written and oral comprehensive examinations are required following the satisfactory completion of the language

requirement. A student is required to complete the program within seven years from the date of acceptance as a candidate.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following award typically has been available to graduate students in this program:

U.S. OFFICE OF EDUCATION ASSISTANTSHIPS OR TRAINEESHIPS IN SPECIAL EDUCATION. Open to graduate students being prepared as leadership personnel in special education; stipend varies, depending on conditions of existing grants. Other graduate assistantships also may be available. Apply to the Graduate Admissions Committee, 227 CEDAR Building.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

SPECIAL EDUCATION (SPLED) course list

Date last reviewed by Graduate School: 4/30/04

Last updated by Publications: 1/7/10

Statistics (STAT)

Program Home Page (Opens New Window)

BRUCE G. LINDSAY, *Head of the Department*
326 Thomas Building
814-865-1348

Degrees Conferred:

- M.A.S.
- M.S., M.A.
- Ph.D.
- Integrated B.S. in Statistics and Master of Applied Statistics (M.A.S.)

The Graduate Faculty

- Michael G. Akritas, Ph.D. (Wisconsin) Professor of Statistics
- Naomi S. Altman, Ph.D. (Stanford) Associate Professor of Statistics
- Charles E. Antle, Ph.D. (Oklahoma State) Professor Emeritus of Statistics
- Steven F. Arnold, Ph.D. (Stanford) Professor of Statistics
- Gutti Jogesh Babu, Ph.D. (ISI-Calcutta, India) Professor of Statistics
- Jesse L. Barlow, Ph.D. (Northwestern) Professor of Computer Science and Engineering, and Statistics
- Ottar N. Bjørnstad, Ph.D. (Oslo, Norway) Professor of Biology, Entomology, and Statistics
- Marllyn T. Boswell, Ph.D. (California, Riverside) Associate Professor Emeritus of Statistics
- Francesca Chiaromonte, Ph.D. (Minnesota) Associate Professor of Statistics and Public Health Sciences
- Vernon M. Chinchilli, Ph.D. (North Carolina) Distinguished Professor of Biostatistics and Statistics
- Mosuk Chow, Ph.D. (Cornell) Associate Professor of Statistics; Senior Research Associate
- Linda M. Collins, Ph.D. (USC) Professor of Human Development and Family Studies, and Statistics
- Enrique del Castillo, Ph.D. (Arizona State) Associate Professor of Industrial Engineering and Statistics
- Manfred Denker, Ph.D. (Nürnberg) Professor of Statistics and Mathematics
- Duncan Fong, Ph.D. (Purdue) Professor of Marketing and Statistics
- John Fricks, Ph.D. (North Carolina) Assistant Professor of Statistics
- Debashis Ghosh, Ph.D. (Washington) Associate Professor of Statistics and Public Health Sciences
- Murali Haran, Ph.D. (Minnesota) Assistant Professor of Statistics
- William L. Harkness, Ph.D. (Michigan State) Professor Emeritus of Statistics
- Thomas P. Hettmansperger, Ph.D. (Iowa) Professor Emeritus of Statistics
- Robert A. Hultquist, Ph.D. (Oklahoma State) Professor Emeritus of Statistics
- David R. Hunter, Ph.D. (Michigan) Associate Professor of Statistics
- Bing Li, Ph.D. (Chicago) Professor of Statistics
- Jia Li, Ph.D. (Stanford) Associate Professor of Statistics and Computer Science and Engineering
- Runze Li, Ph.D. (North Carolina) Professor of Statistics
- John C. Liechty, Ph.D. (Cambridge) Associate Professor of Marketing and Statistics
- Dennis K. J. Lin, Ph.D. (Wisconsin) University Distinguished Professor of Statistics and Supply Chain Management
- Bruce G. Lindsay, Ph.D. (Washington) Willaman Professor of Statistics
- David T. Mauger, Ph.D. (Michigan) Associate Professor of Public Health Sciences and Statistics
- Ganapati P. Patil, Ph.D., D.Sc. (Michigan) Distinguished Professor Emeritus of Mathematical Statistics
- Calyampudi R. Rao, Sc.D. (Cambridge) Eberly Professor Emeritus of Statistics
- Donald St. P. Richards, Ph.D. (UWI) Professor of Statistics
- James L. Rosenberger, Ph.D. (Cornell) Professor of Statistics
- Thomas A. Ryan, Jr., Ph.D. (Cornell) Associate Professor Emeritus of Statistics
- Joseph L. Schafer, Ph.D. (Harvard) Associate Professor of Statistics
- Michele L. Shaffer, Ph.D. (Penn State) Associate Professor of Public Health Sciences and Statistics
- Damla Sentürk, Ph.D. (California, Davis) Assistant Professor of Statistics
- Durland L. Shumway, Ph.D. (Penn State) Assistant Professor of Statistics; Research Associate
- Laura B. Simon, Ph.D. (Penn State) Lecturer in Statistics
- Aleksandra B. Slavkovic, Ph.D. (Carnegie Mellon) Assistant Professor of Statistics
- Linda C. Strauss, Ph.D. (Penn State) Assistant Professor of Statistics; Research Associate
- Arkady A. Tempelman, D.Sc. (Vilnius, Lithuania) Professor of Statistics and Mathematics
- Rongling Wu, Ph.D. (U of Washington) Professor of Public Health Sciences and Statistics
- Fuqing Zhang, Ph.D. (North Carolina State) Professor of Meteorology and Statistics
- Yu Zhang, Ph.D. (Southern California) Assistant Professor of Statistics
- Zhibiao Zhao, Ph.D. (Chicago) Assistant Professor of Statistics

Graduate instruction and research opportunities are available in most areas of statistics and probability, including linear models, nonparametric statistics, robustness, statistical computing, analysis of count data, multivariate analysis, experimental design, reliability, stochastic processes and probability (applied and theoretical), distribution theory, statistical ecology, and biometrics.

Graduate students can gain practical experience in the application of statistical methodology through participation in the department's statistical consulting center and collaborative research activities. In addition, collaborative projects with other departments provide longer term experience and support for selected students. Most students gain valuable teaching experience by assisting in the teaching and grading of courses. In addition, Ph.D. candidates with proper qualifications can receive support for teaching undergraduate courses.

The Master of Applied Statistics (M.A.S.) program is a professional degree designed to provide training in statistics focused on developing data analysis skills, and exploration of all core areas of applied statistics, without going deeply into the mathematical statistics foundations. It aims to provide its graduates with broad knowledge in a wide range of statistical application areas.

The Doctor of Philosophy (Ph.D.), Master of Arts (M.A.), and Master of Science (M.S.) degrees in Statistics are designed for advanced studies in applied and theoretical statistics. Special emphases include biostatistics, statistical ecology, environmental statistics, genometrics, biometrics and statistical computation. The M.S. degree is appropriate preparation for the department's Ph.D. degree.

Admission Requirements

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by a graduate program and authorized by the dean of the Graduate School, are required for admission. Entering graduate students in statistics for whom English is not the first language are required to take the TOEFL (Test of English as a Foreign Language) examination. The results of this examination must be received by the Department of Statistics at least six months prior to the requested date of admission to the Graduate School and must pass the PSU test of spoken English in the first year of the program. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 20 on the speaking section for the Internet-based test (iBT). Applicants with lower scores may be considered for provisional admission.

While applications from all students (including those who already have done graduate work) are reviewed, completion of a standard calculus sequence is regarded as a prerequisite. Students with a 3.00 or better junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. Students hoping to earn a Ph.D. in statistics may apply directly to the Ph.D. program without need for a master's degree.

Degree Requirements

Professional Master of Applied Statistics Requirements

For the M.A.S. degree, a minimum of 30 credits and a minimum grade-point average of 3.0 are required for graduation. Of the 30 credits, 24 must be courses from the Statistics department and 21 must be at the 500 level. The candidate must complete 6 credits in applied statistics (STAT 501, STAT 502), 6 credits in mathematical statistics (STAT 414, STAT 415) and 3 credits in statistical consulting (STAT 580-581). For all M.A.S. students, the Stat 581 course will have a comprehensive written project report required as part of the course, which serves as the culminating experience. To complete the remaining credit requirements, a candidate can select 9-15 credits from the following applied statistics courses: STAT 464, STAT 480, STAT 500, STAT 503, STAT 504, STAT 505, STAT 506, STAT 507, STAT 509, and STAT 510. In addition, students with suitable backgrounds may choose up to 6 credits from a departmental list of additional courses with approval from their adviser.

Master of Arts and Master of Science Degree Requirements

For the M.A. and M.S. degrees, a candidate must complete at least 30 credits, including at least 27 at the 500 or 600 level; 21 of the 27 500-level credits must be formal course work from the department of Statistics. A candidate must complete 6 credits in applied statistics (STAT 511, STAT 512), 6 credits in mathematical statistics (STAT 513, STAT 514), 3 credits in stochastic processes (STAT 515) and 3 credits in statistical consulting (STAT 580-581). The student must also pass a written master's qualifying examination taken at the end of the first year. Finally, an M.A. candidate must submit an acceptable master's paper to the department, and an M.S. candidate must submit a thesis.

Doctoral Degree Requirements

In addition to the course requirements for the M.A. and M.S. degrees given above, a Ph.D. candidate in Statistics must complete further courses in linear models (STAT 551), asymptotic tools (STAT 553), statistical inference (STAT 561), and advanced probability (STAT 517), as well as 15 credits of electives taken from STAT 518, STAT 544, STAT 545, STAT 552, STAT 562, STAT 564, STAT 565, and STAT 572, or other courses suggested by the Ph.D. committee and approved by the Graduate Studies Committee. The student also must pass a written Ph.D. qualifying exam, typically during the second year, and a comprehensive exam given at the end of the third year. The comprehensive exam will have a written component, whose content will be determined and administered by the student's Ph.D. graduate committee, and an oral component, which includes the presentation of a thesis research proposal. The candidate then must submit an acceptable Ph.D. thesis and defend it.

The Ph.D. in Statistics offers options in Biometrics, Biostatistics, Environmental Statistics, and Genometrics. The course and the examination requirements remain the same under these options, however, the candidate must take 15 credits from a list of courses identified by the option.

Minor in Statistics Requirements

The Department of Statistics has three possible options for a Graduate Minor in Statistics:

- **Option 1**: STAT/MATH 414-415 and at least three 500-level courses from the department.
- **Option 2**: Five or more courses totaling 15 credits at the 500-level from the department. Stat 464 may also count toward the 15 credits.
- **Option 3**: Four 500-level courses totaling 12 credits from the department and one additional course of 3 credits approved by the department head or graduate studies chairman.

Please note: STAT 500 will not be counted toward the Graduate Minor in Statistics under any option.

For all options, a 3.5 GPA is required in the courses to be counted toward the minor. Completion of one of the options listed above, with the specified grade-point average, and the signature on the Graduate Minor Program form (www.stat.psu.edu/grad/degrees/Minor/Graduate_Minor_Application_Form.pdf) constitutes approval of the Minor in Statistics. The candidate must indicate the wish to have a Graduate Minor in Statistics when the diploma card is filed and indicate the semester the Ph.D. degree is expected.

Other Relevant Information

Students in the Statistics program may elect the dual-title degree program option in Operations Research for the Ph.D. and M.S. degrees. (*See also* Operations Research.)

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*. GRE scores are required for consideration for assistantships.

Integrated B.S. in Statistics and Master of Applied Statistics (M.A.S.)

The Integrated Undergraduate-Graduate (IUG) degree with B.S. in Statistics and Master of Applied Statistics (M.A.S.) is designed to be completed in five years. This integrated degree will enable a select number of highly qualified and career-oriented students to obtain training in statistics focused on developing data analysis skills and exploration of core areas of applied statistics at the undergraduate and graduate levels. The M.A.S. degree is a professional master's degree that emphasizes applications and does not provide as much training in the mathematical and statistical theory. The degree prepares students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analyst. Research divisions in the pharmaceutical industry, quality control and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and research units, and other data-intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this program will provide.

Application Process

The number of openings in the integrated B.S./M.A.S. program is limited. Admission will be based on specific criteria and the recommendation of faculty. Applicants to the integrated program:

- Must be enrolled in the Statistics B.S. program.
- Must have completed at least 60 credits of the undergraduate degree program, including the two courses: STAT 414 and STAT 415 and the students must apply to the program prior to completing 110 credits.
- Must submit a transcript and a statement of purpose.
- Must present a departmental approved plan of study in the application process in consultation with the M.A.S. program director.
- Must be recommended by the chair of the department's undergraduate program committee.
- Must be accepted into the M.A.S. program in Statistics.

For the IUG B.S./M.A.S. degree, 120 credits are required for the B.S. and 30 credits for the M.A.S. The following twelve graduate-level credits (number of credits in parentheses) can apply to both B.S. and M.A.S. degrees; six of these are at the 500 level:

STATISTICS (STAT)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)

Assuming all requirements for the B.S. are completed, students in the program can complete the B.S. degree and not advance to the M.A.S. Degree if they desire.

Degree Requirements

IUG Statistics B.S. prescribed Statistics courses (25 credits)

STATISTICS (STAT)
220. Basic Statistics (3)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
416. Stochastic Modeling (3)
464. Applied Nonparametric Statistics (3)
470W. Problem Solving and Communication in Applied Statistics (3)
480. Introduction to Statistical Analysis System (SAS) (1)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)

Note that students in IUG Statistics B.S. take STAT 501 and STAT 502 instead of STAT 460 and STAT 462 for the regular Statistics B.S.

IUG Statistics M.A.S. requirement (30 credits)

STATISTICS (STAT)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)
580.** Statistical Consulting Practicum (2)
581.**Stastical Consulting Practicum II (1)

Electives (15 credits)
Select from STAT 503, STAT 504, STAT 505, STAT 506, STAT 507, STAT 509, STAT 510 and the departmental list of additional courses for the M.A.S program with the approval of the adviser.

**For all students in the M.A.S program, the STAT 581 courses will have a comprehensive written project report required as part of the course, which serves as the culminating experience.

Integrated B.A./B.S. in Mathematics and Master of Applied Statistics (M.A.S.)

The Integrated Undergraduate-Graduate (IUG) degree with B.A./B.S. in Mathematics and Master of Applied Statistics (M.A.S.) is designed to be completed in five years. This integrated degree will enable a select number of highly qualified and career oriented students to obtain training in statistics focused on developing data analysis skills, and exploration of core areas of applied statistics at the graduate levels in addition to an undergraduate degree in Mathematics. The M.A.S. degree is a professional masters degree that emphasizes applications. The degree prepares students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analysts. Research divisions in the pharmaceutical industry, quality control, and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and research units, and other data intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this program will provide.

Application Process

The number of openings in the integrated B.A./B.S. in Mathematics and M.A.S. program is limited. Admission will be based on specific criteria and the recommendation of faculty. Applicants to the integrated program:

- Must be enrolled in the Mathematics B.A./B.S. program.
- Must have completed at least 60 credits of the undergraduate degree program including the two courses: STAT 414 and STAT 415 and the students must apply to the integrated program prior to completing 110 credits.
- Must submit a transcript and a statement of purpose.
- Must present a departmental approved plan of study in the application process in consultation with the M.A.S. program director.
- Must be recommended by the chair of Mathematics Department's undergraduate program committee. Two additional recommendation letters must be sent to the M.A.S. admissions committee.
- Must submit the GRE to the M.A.S. admissions committee.
- Must apply to the M.A.S. program in Statistics.

For the IUG B.A./B.S. in Mathematics and M.A.S. degree, 120 credits are required for the B.A./B.S. and 30 credits for the M.A.S. The following twelve graduate level credits (number of credits in parentheses) can apply to both B.A./B.S. and M.A.S. degrees, six of these are at the 500 level:

STATISTICS (STAT)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)

Assuming all requirements for the B.A./B.S. in Mathematics are completed, students in the program can complete the B.A./B.S. degree and not advance to the M.A.S. degree if they desire.

Degree Requirements

IUG Math B.A./B.S. students must fulfill the Math B.A./B.S. requirement while counting these prescribed Statistics courses (15 credits)

STATISTICS (STAT)
220.* Basic Statistics (3)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)

IUG M.A.S. Requirements (30 credits)

STATISTICS (STAT)
414. Introduction to Probability Theory (3)
415. Introduction to Mathematical Statistics (3)
501. Regression Methods (3)
502. Analysis of Variance and Design of Experiments (3)
580. Statistical Consulting Practicum (2)
581.** Statistical Consulting Practicum II (1)

Electives: (15 credits)
Select from STAT 464, STAT 503, STAT 504, STAT 505, STAT 506, STAT 507, STAT 509, STAT 510 and the departmental list of additional courses for the M.A.S. program with the approval of the adviser.

For the IUG B.A./B.S. in Mathematics and M.A.S. degree, the four courses: STAT 414, STAT 415, STAT 501 and STAT 502 can apply to both the B.A./B.S. and M.A.S. degrees.

*Can be waived for students with an equivalent course, e.g., STAT 250 or STAT 301.

** For all students in the M.A.S. program, the STAT 581 course will have a comprehensive written project report required as part of the course, which serves as the culminating experience.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

STATISTICS (STAT) course list

LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

IUG PROGRAM - B.S. in Statistics and Master of Applied Statistics
Last Revised by the Department: Summer Session 2003
Blue Sheet Item #: 31-05-138

IUG PROGRAM - B.A./B.S. in Mathematics and Master of Applied Statistics
Last Revised by the Department: Fall Semester 2006
Blue Sheet Item #: 34-06-361 and 34-06-361A
Review Date: 4/11/06

REVISED BY SENATE: 1/5/06 [course number update]

Last updated by Publications: 8/17/09

Supply Chain Management (SCM)

Department of Supply Chain and Information Systems, via Penn State Online

Program Home Page

JOHN E. TYWORTH, *Chair*
Department of Supply Chain and Information Systems
454B Business Building
814-865-1866
jet@psu.edu

JOHN E. STEVENS, *Director*
Master of Professional Studies in Supply Chain Management Program
427 Business Building
814-867-1989
jes58@psu.edu

Degrees Conferred:

M.P.S., S.C.M.

The Graduate Faculty

- Stephen Brady Ph.D. (Penn State) Assistant Professor of Operations and Supply Chain Management
- Terrance A. Brown D.B.A. (Maryland) Associate Professor of Transportation and Marketing
- Gary L Gittings Ph.D. (Penn State) Instructor of Supply Chain Management
- Daniel Guide Ph.D. (Georgia) Associate Professor of Operations and Supply Chain Management
- Terry P. Harrison Ph.D. (Tennessee) Professor of Supply Chain and Information Systems
- Elena Katok (Penn State) Associate Professor of Supply Chain and Information Systems
- Robert A. Novack Ph.D. (Tennessee) Associate Professor of Supply chain Management
- Alan J. Stenger Ph.D. (Minnesota) Professor of Supply Chain Management
- Peter F. Swan Ph.D. (Penn State) Assistant Professor of Logistics and Operations Management
- Douglas J. Thomas Ph.D. (Georgia Tech) Associate Professor of Supply Chain Management
- Evelyn A. Thomchick Ph.D. (Clemson) Associate Professor of Supply Chain Management
- John E. Tyworth Ph.D. (Oregon) Professor of Supply Chain Management
- Richard Young Ph.D. (Penn State) Associate Professor of Supply Chain Management

The Master of Professional Studies in Supply Chain Management (MPS/SCM) is awarded to students who demonstrate mastery of the knowledge, problem-solving competencies, and leadership skills that are critical to leading business transformation through integrated supply chain planning and execution. The program emphasizes problem-based learning coupled with integrative, collaborative learning experiences to develop the requisite knowledge, skills, and abilities for effective supply chain management. Instruction is delivered on line and in a short course at an on- or off-campus location, so that working professionals will complete the degree as part-time students working largely or entirely, off campus.

Admission Requirements

Students applying to the professional MPS/SCM degree program must be admitted by both the MPS/SCM program and the Graduate School at The Pennsylvania State University. The Graduate School requires applicants to have earned a baccalaureate degree from a regionally accredited institution earned under residence and credit conditions substantially equivalent to those required by Penn State. Applicants whose first language is not English or who have received a baccalaureate or master's degree from an institution in which the language of instruction is not English must take either the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) module and submit the results of that test with the application for admission. The TOEFL test is offered in different formats depending on location. A score of at least 600 on the paper-based TOEFL or 250 on the computer-based TOEFL must be attained. A minimum total score of 80, along with a minimum score of 23 on the speaking portion, is required for the Internet-based test (iBT). Information about the TOEFL can be obtained by writing to the Educational Testing Service, Box 6155, Princeton, NJ 08541-6155 or visiting their web site at www.toefl.org. Alternatively, a minimum composite score of 6.5 on the IELTS test is required for admission. Information about the IELTS can be obtained by contacting IELTS International, 100 East Corson Street, Suite 200, Pasadena, CA 91103 or visiting its Web site at www.ielts.org (Opens New Window).

Additionally, the graduate program in Supply Chain Management requires:

- A completed application for graduate study, including Graduate School application fee
- A current resume, along with a statement of professional experience and goals. This statement of approximately two pages must describe the applicant's professional goals, experience, and responsibilities. The statement must also indicate why the applicant is applying to the professional MPS/SCM program at Penn State
- One letter of recommendation relevant to the applicant's professional capabilities, such as preferably from the employee's immediate supervisor, which should address the applicant's readiness for graduate study
- Official transcripts from all completed graduate and undergraduate coursework
- An undergraduate GPA of at least 3.0, or grade average of "B": or better in graduate courses completed since the first bachelor's degree, with at least 6 credits of graduate courses completed to qualify under this option
- Official Graduate Management Admission Test scores reported directly from the testing center to Penn State

A committee consisting of three SC&IS Department faculty meet once annually to review applications and identify applicants qualified for admission. Admissions decisions are based on a review of a complete admission portfolio, including an application, the statement of professional experience and goals, a current resume, official transcripts from each undergraduate and graduate institution attended, the letter of recommendation, and GMAT scores. An applicant's credentials are compared to the standards set by other candidates in the current application pool. Approved applicants are admitted in time to enroll for the fall semester offerings that begin in early August.

Degree Requirements

Students earn the professional MPS/SCM degree by successfully completing 30 graduate credits in supply chain management courses and a high-quality professional paper as a culminating experience. All MPS/SCM credits must be earned in courses at the 500 level or above, including at least 6 credits at the 500 level. The professional paper demonstrates the student's ability to apply advanced supply chain management knowledge to a supply chain-related problem or situation in a way that makes a substantial contribution to the student's professional development. The program requires a cumulative grade point average of at least 3.00 and no course grade below a C. All requirements for the professional MPS/SCM degree, including acceptance of the professional paper, must be met within four years of admission to degree status. Students are expected to make continuous progress toward the degree. Leaves of absence, however, may be granted under exceptional circumstances on a case-by-case basis.

A maximum of 10 credits of high quality graduate work completed at other accredited institutions may be applied toward the requirements for the professional MPS/SCM degree. However, credits earned to complete a previously completed professional or academic post baccalaureate degree, whether at Penn State or elsewhere, may not be applied to a second post baccalaureate degree program at Penn State. Approval to apply any transferred credits toward a degree program must be granted by the student's academic adviser or program and the Graduate School. Transferred academic work must have been completed within five years prior to the date of first degree registration at the Graduate School, must be of at least B quality (grades of B- are not transferable), and must appear on an official graduate transcript of an accredited university.

Prescribed Courses

SUPPLY CHAIN MANAGEMENT (SCM)
530. Supply Chain Analysis (3)
594. Research Topics (3)
800. Supply Chain Management (4)
810. Transportation and Distribution (4)
820. Strategic Procurement (4)
840. Supply Chain Project Management (4)
850. Supply Chain Design and Strategy (4)
860. Supply Chain Transformation and Innovation (4)

Student Aid

Fellowships, traineeships, graduate assistantships, and other forms of financial aid are described in the STUDENT AID section of the *Graduate Bulletin.*

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

SUPPLY CHAIN MANAGEMENT (SCM) course list Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-06-541

Review Date: 4/10/07

Last updated by Publications: 3/20/09

Systems Engineering (SYSEN)

Program Home Page (Opens New Window)

JAMES A. NEMES, *Professor and Division Head, Engineering*
School of Graduate Professional Studies
Penn State Great Valley
30 Swedesford Road
Malvern, PA 19355-1443
610-648-3335
gvengin@psu.edu

Degree Conferred:

M.Eng. in Systems Engineering

The Graduate Faculty

- Adrian Barb, Ph.D. (University of Missouri) *Assistant Professor of Information Science*
- Joanna Defranco, Ph.D. (New Jersey Institute of Technology) *Assistant Professor of Information Science*
- Nil H. Ergin, Ph.D. (University of Missouri-Rolla), *Assistant Professor of Systems Engineering*
- Kathryn Jablokow, Ph.D. (Ohio State) *Associate Professor of Mechanical Engineering*
- Phillip A. Laplante, Ph.D. (Stevens Institute of Tech) P.E. *Associate Professor of Software Engineering*
- John I. McCool, Ph.D. (Temple) *Distinguished Professor of Industrial and Manufacturing Engineering*
- Colin J. Neill, Ph.D. (Wales) *Associate Division Head and Professor of Software Engineering*
- James A. Nemes, D.Sc. (George Washington University) *Professor and Division Head*
- Michael J. Piovoso, Ph.D. (Delaware) *Professor of Electrical Engineering*
- Robin G. Qui, Ph.D. (Penn State) *Associate Professor of Information Science*
- David W. Russell, Ph.D. (CNAA, London) *Professor of Electrical Engineering*
- Raghvinder Sangwan, Ph.D. (Temple) *Associate Professor of Software Engineering*
- Kailasam Satyamurthy, Ph.D. (Clemson) *Assistant Professor of Engineering and Management*

This professional master's degree program, available at Penn State Great Valley, deals with the various aspects of systems engineering. The primary goal of the program is to prepare engineers to develop the next generation of engineering products, systems, and services for industry and government.

The curriculum integrates the traditional engineering disciplines in a synergistic manner. Course work includes four 9-credit modules of study with each module designed for in-depth coverage of a specific area of study (e.g., systems and control, robotics). Two of the four modules, the Skill-Based module and the Systems Engineering module, are required and constitute an 18-credit core. To complete the program, students choose an additional 18 credits of electives in two modules of professional interest. As part of the 18-credit core curriculum, students who are nearing the end of their program complete a capstone research experience. Graduate instruction is under the direction of an interdisciplinary faculty committee and the departments participating in the program. The graduate faculty consists of members who have teaching and research interests in the area of systems engineering. Maximum flexibility is maintained by the program in an effort to meet both the professional needs of the individual students and academic quality standards.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

The M.Eng. in Systems Engineering program is designed for students with backgrounds in science or engineering. Admission will be granted if the applicant has the necessary program prerequisites and a faculty member in the student's interest area agrees to serve as adviser. Normal admission requirements include mathematics through differential equations. Scores from the Graduate Record Examinations (GRE) are not an entrance requirement unless the junior/senior grade-point average is below 3.00 (on a 4.00 scale). There is no foreign language requirement.

Students with a 3.00 junior/senior GPA in an appropriate technical degree program will be considered for admission. The best-qualified applicants will be accepted. Exceptions to the minimum 3.00 GPA may be made for students with special backgrounds, abilities, and interests. Entering graduate students for whom English is not their first language are required to have a score of at least 550 (paper) or 213 (computer) on the Test of English as a Foreign Language (TOEFL).

Degree Requirements

All candidates must take two required 9-credit core modules for a total core curriculum of 18 credits and two other 9-credit elective modules. At least 15 credits of selected courses must be at the 500 level.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

SYSTEMS ENGINEERING (SYSEN) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 6/1/04
Last updated by Publications: 8/20/09

Teaching and Curriculum (T & C)

Program Home Page

DENISE G. MEISTER, *Coordinator of the Graduate Program in Teaching and Curriculum*
Penn State Harrisburg
Middletown, PA 17057
717-948-6213

Degree Conferred:

M.Ed.

The Master of Education in Teaching and Curriculum is designed to enhance the skills of teachers for public and private schools. The program focuses on three eseential components--curriculum, instruction, and assessment--that contribute to the organization's philosophy of learning. The Teaching and Curriculum program is unified by its vision of critical thinking, democracy, diversity, lifelong learning, nurturance, and scholarship. Courses are designed to reflect the standards of the National Council for Accreditation of Teacher Education (NCATE) and the National Board for Professional Teaching Standards (NBPTS). The program is offered at Penn State Harrisburg and other selected Penn State campuses.

Specifically, the goals of the program are to develop in students (1) the ability to communicate effectively either with school-age students and their parents or with co-workers and/or clients; (2) the ability to conduct an instructional program that provides a sound intellectual and emotional climate for learning; (3) competence in a variety of teaching methods and in the utilization of materials and content appropriate for an effective instructional program; (4) the ability to interpret and to evaluate educational literature and research; and (5) the ability to describe and to evaluate major issues and current trends in instructional curriculum practice and development.

Certification programs are also available in the areas of early childhood education, English as a second language, and principalship.

Admission Requirements

Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

The M.Ed. Program in Teaching and Curriculum has four important admission requirements.

First, candidates must have achieved an overall junior/senior grade point average of 3.00 or higher. For candidates applying for admission who have completed credits beyond the baccalaureate degree, we will evaluate the last (approximately) 60 credits completed.

Second, candidates must submit two letters of recommendation. These letters must be from former professors who can attest to the academic ability and potential of the candidate.

Third, candidates must submit a 200-300 word personal statement that addresses their career goals and reasons for pursuing a graduate degree.

Fourth, candidates must submit test scores from one of the following: Graduate Record Examination, Miller Analogies Test, or Praxis examinations completed for certification. In addition, the language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. The minimum composite score for the IELTS is 6.5. International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a masters degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States and Wales.

Retention

Candidates must maintain a minimum 3.00 grade point average in courses approved by the program, satisfactorily complete all required key assessments, attain a grade "C" or better in all required core courses. Candidates who do not make satisfactory progress will be notified in writing noting the specific deficiencies and requesting that they meet with the program coordinator to develop a remediation plan. Failure to meet or to satisfactorily complete the remediation plan will result in termination from the program.

In compliance with the National Council for the Accreditation of Teacher Education (NCATE) requirements, all persons enrolled in Teacher Education Programs at Penn State Harrisburg are expected to demonstrate the professional dispositions that are aligned with the unit's vision statement. The faculty shall evaluate the approved dispositions demonstrated by the candidates in class and during field experiences. Candidates may be rated as exemplary, acceptable, or unacceptable. Candidates are expected to attain acceptable or exemplary ratings in order to graduate.

Degree Requirements

The Master of Education degree in Teaching and Curriculum provides students with two alternatives to meet the required culminating or capstone experience : (1) course work with a master's project (EDUC 587) or (2) course work that includes a capstone course (EDUC 591). Students may complete the degree requirements for either of the two alternatives with the approval of their adviser.

A total of 30 credits must be completed: 18 credits in core courses and 12 credits in electives. At least 18 credits must be at the 500 level or higher. A minimum grade-point average of 3.00 for work done at the University and acceptable or higher ratings on the professional dispositions are required for graduation.

Prescribed Core Course Requirements (18 credits)

Learning Theory: EDUC 520(3)

Curriculum Development and Instructional Design: EDUC 506(3) or EDUC 403(3) (Early Childhood only)
Educational Assessment: EDUC 539(3) or EDUC 404(3) (Early Childhood only)
Educational Foundations: EDUC 505(3)
Educational Research Designs: EDUC 586(3)
Culminating Course: EDUC 587 Master's Project or EDUC 591 Education Seminar

Electives

Students are required to take up to 12-15 credits of elective course work. Students may take all of those credits in education or, with the approval of their adviser, select up to 9 credits of electives in a field other than education.

Options

Language Arts Option: The goal of the language arts option is to provide students an in depth understanding of how research in theory in the language arts are related to language acquisition and growth; the knowledge and skills necessary for conducting informal assessments in the language arts and required to implement a variety of instructional procedures for the language arts; and an awareness of the role that literature can have in an effective language arts program at any level.

Mathematics Education Option: The objective of the mathematics education option is to provide courses that will emphasize current research and curriculum shifts related to the teaching of mathematics in K - 12 classrooms. This option requires completion of four EDMTH courses (a total of 12 credits): EDMTH 441, 442, 443, 444 in addition to the other program requirements.

Transfer Credits

Subject to the limitations given below, a maximum of 10 credits of high-quality graduate work done at a regionally accredited institution may be applied toward the requirements for the master's degree. However, credits earned to complete a previous master's degree, whether at Penn State or elsewhere, may not be applied to a second master's degree program at Penn State. The student should distinguish carefully between the transferability of credit and its applicability in a particular degree program. Approval to apply any transferred credits toward a degree program must be granted by the student's academic adviser, the program head or graduate officer, and the Graduate School. Transferred academic work must have been completed within five years prior to the date of the first degree registration at the Graduate School of Penn State, must be of at least B quality (grades of B- are not transferable), and must appear on an official graduate transcript of an accredited university. Pass-fail grades can be substantiated by the former institution as having at least B quality.

A maximum of 15 graduate credits taken as a nondegree student prior to admission to a graduate degree program may be applied to a graduate program, with departmental approval. The credits must have been earned within five years preceding entry into the degree program.

Forms for transfer of credit can be obtained from the Office of Graduate Enrollment Services, 114 Kern Building.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit courses below the 400 level in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

EDUCATION (EDUC) course list

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 37-07-035

Review Date: 06/16/2009

Date last updated by Publications: 8/11/09

Teaching English as a Second Language (TESL)

Program Home Page (Opens New Window)

JOAN KELLY HALL, *Department Head*
305 Sparks Building
814-865-7365

Degree Conferred:

M.A.

The Graduate Faculty

- Gabriela Appel-Lantolf, Ph.D. (Delaware) Senior Lecturer in German and Applied Linguistics
- Meredith Doran, Ph.D. (Cornell) Assistant Professor of French and Applied Linguistics
- Paula R. Golombek, Ph.D. (Penn State) Senior Lecturer in Applied Linguistics
- Joan Kelly Hall, Ph.D. (SUNY, Albany) Professor of Applied Linguistics and Education
- Karen E. Johnson, Ph.D. (Syracuse) Professor of Applied Linguistics
- Celeste Kinginger, Ph.D. (Illinois, Urbana-Champaign) Associate Professor of French and Applied Linguistics
- James Lantolf, Ph.D. (Penn State) Professor of Applied Linguistics
- Xiaofei Lu, Ph.D. (Ohio State) Assistnat Professor of Applied Linguistics
- Sinfree Makoni, Ph.D. (Edinburgh) Associate Professor of Applied Linguistics and African American Studies
- Elaine Richardson, Ph.D. (Michigan State) Associate Professor of English and Applied Linguistics
- Sandra J. Savignon, Ph.D. (Illinois, Urbana-Champaign) Professor of Applied Linguistics
- Susan G. Strauss, Ph.D. (California, Los Angeles) Associate Professor of Applied Linguistics
- Steve Thorn, Ph.D. (California, Berkeley) Assistant Professor of Applied Linguistics

The master's program in English as a Second Language is designed to provide professional development for teachers and administrators in English as a second or foreign language. The program is problem focused, integrating theory and practice from the fields of applied linguistics and teaching English as a second language to address issues of second language acquisition/teaching and program development, with special focus on English in a wide range of both domestic and international contexts. Requirements include 36 credit hours, a master's paper, and a teaching portfolio.

Completion of this degree program does not automatically provide teacher certification in the Commonwealth of Pennsylvania. Further information on teaching certification is available from the College of Education. Students who desire to continue their studies in ESL at Penn State may be admitted to the Ph.D. program in Applied Linguistics through the program in Linguistics and Applied Language Studies.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Applicants whose native language is not English must take the TOEFL examination and attain a score greater than 600. All applicants are also required to arrange for three letters of reference to be submitted along with a one- to two-page statement of the applicant's goals and professional objectives.

Degree Requirements

The M.A. in TESL requires 36 credits, of which 18 credits must consist of 500-level courses. In lieu of a thesis, students must prepare a master's paper and compile a teaching portfolio. The following courses are required: APLNG 484, APLNG 493, APLNG 591, APLNG 595; 9 credits of electives from the following APLNG courses: APLNG 410, APLNG 482W, APLNG 572, APLNG 573, APLNG 581, APLNG 583, APLNG 593, APLNG 597; and 6 credits of approved electives.

Student Aid

Graduate Assistantships that may be available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

APPLIED LINGUISTICS (APLNG) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/25/04

Last updated by Publications: 10/06/06

Telecommunications Studies (TELEC)

Program Home Page (Opens New Window)

JOHN S. NICHOLS, *Associate Dean for Graduate Studies*
College of Communications
201 Carnegie Building
814-865-3070; commgpo@psu.edu

Degree Conferred:

M.A.

The Graduate Faculty

- Lee Ahern, Ph.D. (Penn State) Assistant Professor of Communications
- Douglas Anderson, Ph.D. (Southern Illinois) Dean; Professor of Communications
- George Anghelcev, Ph.D. (Minnesota) Assistant Professor of Communications
- Robert A. Baukus, Ph.D. (Massachusetts) Associate Professor of Communications
- Ronald Bettig, Ph.D. (Illinois) Associate Professor of Communication
- Barbara Bird, M.F.A. (Northwestern) Associate Professor of Communications
- Denise Bortree, Ph.D. (Florida) Assistant Professor of Communications
- Colleen Connolly-Ahern, Ph.D. (Florida) Assistant Professor of Communications
- Jeremy Cohen, Ph.D. (Washington) Professor of Communications
- Frank Dardis, Ph.D. (South Carolina) Associate Professor of Communications
- Dennis K. Davis, Ph.D. (Minnesota) Professor of Communications
- Marcia DiStaso, Ph.D. (Miami) Assistant Professor of Communications
- Lyn Elliot, Ph.D. (Iowa) Associate Professor of Communications
- Michael Elavsky, Ph.D. (Illinois) Assistant Professor of Communications
- Russell Frank, Ph.D. (Pennsylvania) Associate Professor of Communications
- Robert M. Frieden, J.D. (Virginia) Cable TV Pioneers Chair Professor in Telecommunications Studies and Law
- Jeanne Hall, Ph.D. (Wisconsin) Associate Professor of Media Studies
- Martin E. Halstuk, Ph.D. (Florida) Associate Professor of Communications
- Marie Hardin, Ph.D. (Georgia) Associate Professor of Communications
- R. Dorn Hetzel, M.F.A. (New York) Associate Professor of Film and Video
- Anne Hoag, Ph.D. (Michigan) Associate Professor of Communications
- Matthew Jackson, Ph.D. (Indiana) Associate Professor of Communications
- Krishna Jayakar, Ph.D. (Indiana) Associate Professor of Communications
- Matthew Jordan, Ph.D. (Claremont) Assistant Professor of Communications
- Ann Marie Major, Ph.D. (Southern Illinois) Associate Professor of Communications
- Matthew P. McAllister, Ph.D. (Illinois) Professor of Communications
- John S. Nichols, Ph.D. (Minnesota) Professor of Communications
- Mary Beth Oliver, Ph.D. (Wisconsin) Distinguished Professor of Communications
- Anthony A. Olorunnisola, Ph.D. (Howard) Associate Professor of Communications
- Jeremy S. Packer, Ph.D. (Illinois) Assistant Professor of Communications
- Patrick R. Parsons, Ph.D. (Minnesota) Don Davis Professor in Ethics
- Robert D. Richards, J.D. (American) John and Ann Curley Professor of First Admendment Studies
- Ford Risley, Ph.D. (Florida) Associate Professor of Communications
- Michelle Rodino-Colocino, Ph.D. (Pittsburgh) Assistant Professor of Communications
- Amit M. Schejter, Ph.D. (Rutgers) Associate Professor of Communications
- Jorge Reina Schement, Ph.D. (Stanford) Professor of Communications
- Michael Schmierbach, Ph.D. (Wisconsin) Assistant Professor of Communications
- Fuyuan Shen, Ph.D. (North Carolina, Chapel Hill) Associate Professor of Communications
- Richard Sherman, M.F.A. (Ohio) Assistant Professor of Communications
- Susan M. Strohm, Ph.D. (Minnesota) Assistant Professor of Communications
- S. Shyam Sundar, Ph.D. (Stanford) Distinguished Professor of Communications and Communication Arts and Sciences
- Richard D. Taylor, J.D. (New York) Palmer Chair of Telecommunications Studies and Law
- Bu Zhong, Ph.D. (Maryland) Assistant Professor of Communications

The M.A. in Telecommunications Studies program offers a systematic approach to understanding the globalization of information technologies and the convergence of electronic media and telecommunications. It includes history, technology, policy, economics, industrial structures, and e-commerce issues. The program is for both recent undergraduates in communications and related fields seeking advanced study, as well as for individuals currently associated with the media information and telecommunications industries wishing to advance themselves professionally. Applicants without an undergraduate degree or professional connection to the field may be required to acquire a basic background as a condition of admission, based on a case-by-case evaluation.

Admission Requirements

Scores for the Graduate Record Examinations (GRE) are required for admission. All international applicants whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must take the Test of English as a Foreign Language (TOEFL) and submit the results of that test with the application for admission. The minimum TOEFL admittance score is 600. Applicants with an undergraduate 3.00 junior/senior grade-point average (on a 4.00 scale) are eligible for admission. Also required are three letters of recommendation and an autobiographical statement of 750 to 1,000 words indicating the nature of the applicant's interest in undertaking graduate study in telecommunications.

Program of Study

The M.A. in Telecommunications Studies program is a one-calendar year, 30-credit program that requires a 3-credit master's paper. A student must enter the program in the fall semester.

Degree Requirements

Candidates must complete a minimum of 30 credits (including master's paper preparation): no more than 9 credits at the 400 level and no more than 6 credits in independent study (in addition to 3 credits researching and writing a master's paper). Candidates must complete a 9-credit core. The remaining credits are selected by the student in consultation with the adviser. Course work offered by departments outside the College of Communications may be scheduled as part of the student's program with prior approval of the student's academic committee. A candidate must maintain 3.00 grade-point average and complete a significant research paper (master's paper) under the direction of a faculty adviser. This paper shall be reviewed and approved by a faculty committee of at least three members. Students are required to schedule three separate, formal meetings with their advisers and academic committees for (1) discussion and approval of the general program plan, (2) the paper proposal, and (3) a formal presentation and defense of the paper at the final meeting of the student's advisory committee.

Student Aid

Graduate assistantship and other forms of student aid available to students in the program are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

COMMUNICATIONS (COMM) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/15/04

Last reviewed by Publications: 1/12/10

Theatre (THEA)

Program Home Page (Opens New Window)

BARRY KUR, *Head of the Graduate Program in Theatre*
116C Arts Building
814-863-1453

Degree Conferred:

M.F.A.

The Graduate Faculty

- Dan Carter, M.F.A. (Florida State) Professor of Theatre; Director, School of Theatre
- Travis DeCastro, M.F.A. (Utah) Associate Professor of Theatre
- Suzanne S. Elder, M.F.A. (Texas) Associate Professor of Theatre
- John C. Franceschina, M.F.A. (Catholic U) Distinguished Professor of Theatre
- Barry M. Kur, M.A. (SUNY) Professor of Theatre
- Cary Libkin, M.F.A. (Carnegie Mellon) Professor of Theatre
- Annette K. McGregor, Ph.D. (Oregon) Associate Professor of Theatre
- Richard Nichols, Ph.D. (Washington) Professor of Theatre
- Brant Pope, Ph.D. (Michigan State) Professor of Theatre
- Jane Ridley, M.F.A. (Ohio State) Professor of Theatre
- Daniel Robinson, M.F.A. (Missouri, Kansas City) Associate Professor of Theatre
- James Wise, M.F.A. (Purdue) Professor of Theatre

Faculty Emeriti

- Douglas N. Cook, M.A. (Stanford) Professor Emeritus of Theatre
- Charles Firmin, M.F.A. (Penn State) Associate Professor Emeritus of Theatre
- Anne A. Gibson, M.F.A. (Carnegie Mellon) Professor Emerita of Theatre
- Robert E. Leonard, M.F.A. (Goodman School of Drama) Professor Emeritus of Theatre
- Helen A. Manfull, Ph.D. (Minnesota) Professor Emerita of Theatre
- Douglas R. Marmee, M.F.A. (Brandeis) Associate Professor Emeritus of Theatre

The master of fine arts degree program in Theatre pursues the following objectives: (1) to assist each student in acquiring discriminating taste and critical judgment in theatre; (2) to help each student attain skills and proficiencies in theatre; (3) to provide the training, discipline, and opportunities essential to the development of a professional ability in at least one area of theatre; and (4) to prepare each student for an active career in academic and/or professional theatre or other areas within the entertainment industry.

Facilities include the Playhouse, a 450-seat proscenium theatre; the Pavilion, a 249-seat thrust theatre; a 150-seat proscenium theatre in the heart of downtown State College; theatre production studios for scenic, property, and costume preparation; two computer-assisted design laboratories; a lighting laboratory; a sound and media studio; and rehearsal and dance studios.

Admission Requirements

Graduate Record Examination (GRE) scores, or comparable examination scores, are not required for admission to the School of Theatre. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the *Grad Graduate Bulletin*.

Requirements for admission to the M.F.A. program are (1) a broad undergraduate preparation in theatre, including 3 credits each in acting, directing, stagecraft, and theatre history; and 6 credits of dramatic literature; (2) 12 credits in related subject areas such as communications, oral interpretation, art, business, music, and dance; and (3) submission of a vita and at least three letters of recommendation.

Additional requirements for M.F.A. candidates are (1) submission of evidence of professional potential in the proposed area of specialization-auditions, prompt books, portfolios, manuscripts, and other appropriate presentations-to the applicable study program(s) by arrangement with the department; and (2) a personal interview to be arranged by the student.

Master of Fine Arts Degree Requirements

The program entails specialized professional training in one of the following areas: acting, directing, scene design, costume design, costuming, lighting design, and technical direction. Six semesters in residence are normally required to complete the minimum 60-credit degree.

Students are evaluated on a semester-by-semester basis on academic progress, creative achievement, and professional potential. The M.F.A. is a professional degree and is granted by the Graduate Faculty on the basis of academic and creative excellence over and above the fulfillment of requirements. Satisfactory academic progress does not guarantee continuance in the program, nor does continuance in the program imply the automatic granting of a degree. M.F.A. candidates are required to participate in the School of Theatre productions in positions of responsibility. Additionally, each student must complete a committee-approved monograph project in the area of specialization. An international residency is required and is funded by the school.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

THEATRE (THEA) course list

DATE LAST REVIEWED BY GRADUATE SCHOOL: 5/17/04

Last updated by Publications: 8/28/06

Training and Development (TRDEV)

Program Home Page (Opens New Window)

MARGARET LOHMAN, *Coordinator*
Penn State Harrisburg
777 West Harrisburg Pike
Middletown, PA 17057
717-948-6215

Degree Conferred:

M.Ed.

The Graduate Faculty

- Margaret Lohman, Ph.D. (Ohio State) *Associate Professor of Training and Development*
- Jo Tyler, Ed.D. (Columbia) *Assistant Professor of Adult Learning and Leadership*
- William Milheim, Ph.D. (Kent State) *Professor of Education; Director, School of Behavioral Sciences*

The master of education degree program in Training and Development at Penn State Harrisburg helps students prepare for professional careers in training and development in diverse organizational settings, including business and industry, government, and health care. Graduates of the Training and Development Program frequently assume positions such as trainers, instructional designers, program evaluators, performance analysts, career development specialists, and organization developers.

The overarching goal of the Training and Development Program is to help students develop the ability to assess and improve employee learning and performance. Accordingly, specific goals of the program include developing the ability to: analyze employee performance; design a broad range of performance improvement interventions, with particular emphasis on the design, development, and delivery of training programs; evaluate training and development programs; facilitate work group discussions and group processes; translate training and development theory into practice; and critically evaluate research in training and development.

Admission Requirements

An applicant must hold a baccalaureate degree in any field from a regionally accredited, college-level institution. Admission decisions are based primarily on an applicant's junior/senior cumulative grade-point average and career-goal statement. Additional information pertaining to any post-baccalaureate course work and professional experience are considered. The best-qualified applicants will be accepted up to the number of spaces available for new students.

Applicants with low grade-point averages may be required to take the Graduate Record Examinations (GRE) or take 9 credits of course work recommended by a program faculty member and maintain a GPA of B or higher in order to be reconsidered.

Students are required to submit the following:

- A completed application with the application fee
- Two copies of official transcripts from all colleges/universities attended
- A brief career-goal statement

International Students

All applicants whose first language is not English or who have not received a baccalaureate degree from an institution in which the language of instruction is English must take the Test of English as a Foreign Language (TOEFL; www.toefl.org (Opens New Window)).

The test must be passed with a score of 550 (paper-based test) or 213 (computer-based test) or higher.

All students with international credentials must submit transcripts to Educational Credential Evaluators, Inc. (ECE) for a "Course by Course" academic evaluation of transcripts and degree. An ECE application can be obtained at www.ece.org (Opens New Window).

Application Deadlines

Candidates may enter the program at the beginning of fall or spring semester, or the summer session. Application deadline dates for U.S. students and international students are posted on the Training and Development program website. (http://www.hbg.psu.edu/hbg/programs/gradprog/trdev.html)

Please note: Each graduate program reserves the right to set earlier deadlines than those noted above.

Degree Requirements

Students may enter the Training and Development program from a variety of backgrounds and enroll in courses to help them develop competencies in training and development. Coursework includes both required and elective courses in training and development as well as electives from outside the program. Students select one of two areas of professional practice, training or human resource development, as a focus for their electives in the training and development program. Courses are scheduled to accommodate part- and full-time students.

There are two options in the program: the Paper option requires the completion of a master's paper (TRDEV 587) and a total of 36 credits (excluding an internship if one is needed); the Non-Paper option does not require a master's paper, but does require Research Designs Applied to Training (TRDEV 588) and an extra elective in Training and Development for a total of 39 credits (excluding an internship if one is needed). For both the Paper and Non-Paper options, at least half of the total credits must be earned in 500-level courses.

Both options require successful completion of Instructional Methods in Training and Development (TRDEV 418), Foundations in Training and Development (TRDEV 460), Performance Analysis (TRDEV 465), Systematic Instructional Design (TRDEV 518), Technology in Training

(TRDEV 531), and Educational Research Design (EDUC 586).

Prescribed (Required) Courses:

TRDEV 418: Instructional Methods in Training & Development (3 credits)
TRDEV 460: Foundations in Training & Development (3 credits)
TRDEV 465: Performance Analysis (3 credits)
TRDEV 518: Systematic Instructional Design (3 credits)
TRDEV 531: Technology in Training (3 credits)
EDUC 586: Educational Research and Design (3 credits)

Additional Courses

A. From Training and Development courses, select three courses for the Paper option or four courses for the Non-Paper option:

TRDEV 421: Presentation Skills for New Trainers (3 credits)
TRDEV 432: Video Production for Training (3 credits)
TRDEV 470: HRD Tools and Techniques (3 credits)
TRDEV 475: Career and Succession Management (3 credits)
TRDEV 505: Project Management (3 credits)
TRDEV 507: Program Evaluation (3 credits)
TRDEV 520: Learning Styles and Theories for Trainers (3 credits)
TRDEV 532: Web-Based Training (3 credits)
TRDEV 533: Distance Learning in Training (3 credits)
TRDEV 565: Implementing Training and HRD Programs (_ credits)
TRDEV 583: Issues in Training & Development (3 credits)
TRDEV 596: Individual Studies (1-3 credits)
TRDEV 597: Special Topics (3 credits)

B. Select two three-credit courses at the 400/500 level from programs outside Training and Development. The two courses should assist you in preparing for professional roles and responsibilities in training and development. The following courses are highly recommended:

BE SC 408: Group Facilitation and Leadership Skills (3 credits)
BE SC 468: Industrial Psychology (3 credits)
P ADM 510 or MNGMT 510: Organizational Behavior (3 credits)

Required Experience:

One of the following:

A. Holds or has held a position in training and development successfully for six months or more. Submit request for waiver for approval.

B. TRDEV 595 Internship (3 credits which are not counted in the 36 credit or 39 credit requirement)

Capstone Requirement:

Choose one of the following options:

A. TRDEV 588: Research Designs Applied to Training (3 credits - plus one additional 3-credit elective)

B. TRDEV 587: Master's Paper (3 credits)

Transfer Credits and Course Substitutions

A maximum of 10 credits of high-quality graduate work done at a regionally accredited institution may be applied toward the requirements for the master's degree in Training and Development. Approval to apply any transferred credits toward a degree program must be granted by the student's academic adviser and the Graduate School. Transferred academic work must have been completed within five years prior to the date of first degree registration at the Graduate School, must be of at least B quality (grades of B- are not transferable), and must appear on an official graduate transcript. Credits earned toward a previously completed postbaccalaureate professional degree program (law, medicine, etc.) are not transferable. However, up to 10 credits can be transferred from a professional degree program if the degree has not been conferred.

A maximum of 15 credits earned as a special nondegree student at Penn State University may be applied to the Training and Development program, with departmental approval. The credits must have been earned within five years preceding entry into the program.

Grade-point Average and Time Limit

A 3.00 (out of 4.00) minimum grade-point average is required to graduate from the program. All course work must be completed within eight years.

Financial Aid

There are a limited number of scholarships, fellowships, and research grants available, as well as graduate assistantships. Many students work full-time and take classes part-time. In many cases, employers have a tuition-reimbursement plan paying for partial or full tuition. To find other options available to you, contact the Financial Aid Office at 717-948-6307.

Courses

Graduate courses carry numbers from 500 to 599. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not be used to meet graduate degree requirements. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

TRAINING AND DEVELOPMENT (TRDEV) course list

EDUCATION (EDUC) course list

Last Revised by the Department: Fall Semester 2005

Blue Sheet Item #: 33-07-121

Review Date: 06/14/05

Last updated by Publications: 8/26/09

Master of Professional Studies in Turfgrass Management

A. J. TURGEON, *In Charge of Master of Professional Studies in Turfgrass Management Graduate Program*
419 Agricultural Administration Building
814-863-7626, at2@psu.edu

The Graduate Faculty

- David R. Huff, Ph.D. (California, Davis) Professor of Turfgrass Breeding, Department of Crop and Soil Sciences
- Andrew S. McNitt, Ph.D. (Penn State) Assistant Professor of Soil Science, Department of Crop and Soil Sciences
- Maxim J. Schlossberg, Ph.D. (Georgia) Associate Professor of Turfgrass Nutrition and Soil Fertility, Department of Crop and Soil Sciences
- J. Turgeon, Ph.D. (Michigan State) Professor of Turfgrass Management, Department of Crop and Soil Sciences
- Wakar Uddin, Ph.D. (Georgia) Associate Professor of Plant Pathology. Department of Plant Pathology

The Master of Professional Studies in Turfgrass Management (MPS-TM) is a 30-credit terminal master's degree program that emphasizes a systems approach to turfgrass management. The program balances theory and practice. Courses taught in MPS-TM use Web-based lessons, quizzes, exams, and team projects and exercises to provide a balance between individualized study and interactive learning. Individuals who currently work as managers of turfgrass facilities, including golf courses and professional sports complexes, would benefit from this program. The MPS-TM program requires the completion of four core courses in which students learn to apply scientific concepts to fundamental problems encountered in the management of complex turfgrass ecosystems. Additionally, a capstone individual studies in turfgrass management course is a project that integrates theory and practice in addressing real problems encountered in turfgrass facility management.

Degree Requirements

The professional master's degree requires 30 credits including a final integrative project. All students complete the required MPS-TM core program of turfgrass courses. The MPS-TM turfgrass courses consist of TURF 850 (Turfgrass Physiology), AGRO 851 (Applied Plant Population Biology), TURF 852 (Turfgrass Health Management), TURF/PPATH 853 (Turfgrass Science Literature), and AGRO 596 (Individual Studies in Agronomy). An integrative project is required in which the student demonstrates the capability to integrate and apply concepts, principles, analytical techniques, and interpretation skills learned in the program to a real problem faced in turfgrass facility management. In consultation with their advisor, students also take an additional 15 credits of elective coursework to focus on their particular interest within turfgrass facility management. A total of 18 credits must be 500-level or higher, with at least 6 credits of 500-level coursework; this Graduate School requirement is met through the required courses, the project, and at least one 500-level elective course.

List of required courses in proposed program*

AGRO 596 (3) Individual Studies in Agronomy. Used by students to work with an advisor on their capstone project.

AGRO 851 Applied Plant Population Biology (3). Lectures and exercises designed to develop student competency in plant selection to promote ecological diversity and genetically superior plants.

TURF 850 Turfgrass Physiology (3). Lectures, reading assignments, and exercises designed to develop student competency in plant physiology as it relates to turfgrass management strategies.

TURF 852 Turfgrass Health Management (3). Lectures and exercises designed to develop student competency in solving turfgrass pest problems, as well as disease resistance in turfgrasses.

TURF/PPATH 853 (3). Interpreting Turfgrass Science Literature (3). Introduction to turfgrass research publications, interpretation of the data, and discussion of the significance of the results.

*See Appendix B for elective courses

Admissions Requirements

Applicants must submit a letter of professional introduction in which they describe their professional experiences and education, delineate their career goals, and discuss how the MPS-TM program will enable them to meet their objectives. Applicants must also provide three letters of reference and recommendation. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Scores from Graduate Record Examination (GRE), or from a comparable substitute examination accepted by a graduate program are required for admission; however, exceptions may be considered on a case-by-case basis. The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. International applicants are exempt from the TOEFL/ELTS requirement who have received a baccalaureate or a master's degree from a college/university/institution in any of the following: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia, New Zealand, Northern Ireland, Scotland, the United States, and Wales. Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires an institutional test of English proficiency upon first enrollment and, if necessary, remedial course work. The minimum composite score for the IELTS is 6.5. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin* http://www.psu.edu/bulletins/whitebook/$gradregs.htm.

Transfer Credits

If students have successfully completed courses from another institution that are equivalent to the elective turfgrass courses (TURF 425, 434, 435, and 436) with grades of B or better, these can be applied toward satisfying the MPS-TM degree requirements. Transferred academic work must have been completed within five years prior to the date of first degree registration at the Graduate School, must be equivalent to "B" quality (grades of B- are not transferable) on Penn State's grading system, and must appear on an official graduate

transcript.

Student Aid

Students in this program may receive financial assistance from their workplace or bear the cost of the degree personally. Other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin* http://www.psu.edu/bulletins/whitebook/$gradregs.htm. The forms of financial aid noted in the bulletin available to residential graduate students are not available to students studying via the World Campus, e.g., assistantships, fellowships. The other common form of financial aid is loans.

Typical Schedule

Flexibility is a key principle of the design of this program. Each course will be offered once each academic year. Sequencing of courses is determined by the semester the student begins the program. Students and their advisor will develop a plan of study upon completion of the second course taken in the program or the end of the first year, whichever occurs sooner. Many students may take three or four courses per year while others may only take one or two. Because of this, the time to degree will average three years and one semester. The typical schedule for offering the required MPS-TM courses is shown in Table 1.

Table 1. MPS-TM REQUIREMENTS (30 credits)

REQUIRED COURSES (12 credits)

FALL SEMESTER	SPRING SEMESTER
AGRO 851 (3) Applied Plant Population Biology	TURF 852 (3) Turfgrass Health Management
TURF 850 (3) Turfgrass Physiology	TURF/PPATH 853 (3) Turfgrass Science Literature

INTEGRATIVE PROJECT (3 credits)

AGRO 596 (3) Individual Studies

ELECTIVES (15 credits)

See list of approved elective courses available through Penn State. All electives listed are offered online. Must include at least one 500-level (3 credit) course.

Elements of Residency

We propose several strategies to meet the elements of residency in MPS-TM. We describe these strategies and then indicate how each contributes to various elements of residency. Table 2 provides a summary of the program strategies that contribute to each element of residency. These elements will be phased into the program over the first five years the program is in existence. The elements will be evaluated for their effectiveness and modifications made, as necessary, to ensure a quality educational experience. This section is organized by the strategies we plan to use to meet the elements of residency.

Strategy A–Seminars and discussions: CSS offers departmental seminars during Fall and Spring Semesters. Topics that are relevant to MPS-TM students will be made available for students to view using appropriate technology. We then would offer chat-room time and threaded discussion opportunities for the students to interact with each other and with the presenter and/or a faculty facilitator. Faculty and graduate students in the program will be invited to participate in the discussions. We will explore the use of real-time teleconferencing for students to join the seminars, but the geographical (time zone) distribution of our students may make this difficult. Strategy A contributes to residency elements 1, 2, 4 and 7. Strategy A provides opportunity for interaction among students and faculty outside of direct instruction (1); offers students a chance to interact with each other on the topic (2); provides broader exposure to and socialization to the field and to related fields (crop science, soil science, horticulture, plant pathology, entomology) (4); and it increases student identification with Penn State (7) by giving students the opportunity to discuss topics with faculty and graduate students in the other two graduate programs in the department (i.e., Agronomy, Soil Science). It also will increase student awareness of the department and the breadth of its substantive expertise. We expect that at least one seminar per semester will be made available in this way and we expect all students currently enrolled in the program to take part in one of these seminar/discussion opportunities each academic year. Strategy A will be phased in during year 1 of the new program.

Strategy B–Student seminar or discussion of their capstone project in the program: An important part of socialization and sharing of information is student-led seminars and discussions. Each student in the program will be required to offer a seminar and/or to lead a discussion about their capstone project. This is the integrative experience in the program and will be a required element for completion of the program. As part of this, the student will post the presentation and the full project report prior to the seminar/discussion. The student will work with their faculty advisor and the MPS-TM program coordinator to develop the content of the seminar and/or discussion questions. The faculty advisor and the MPS-TM program coordinator will provide support to the student during the seminar and/or discussion. This will give other students an opportunity to become familiar with the requirements of the integrative experience as well as allowing for sharing of the experiences of the student completing the program. We will evaluate the feasibility of video conferencing for those students interested in giving a formal seminar, and recording the presentation for distribution to students and others unable to participate in real-time. Alternatives to video conferencing include a threaded discussion format based on the written document, and/or specific times for students and faculty to visit a chat room for a guided discussion led by the student. Strategy B contributes to residency elements 1, 2, 4, 6 and 7. Strategy B offers an opportunity for interaction between students and faculty outside the course context (1); encourages interaction among students with student led discussions (2); provides students an opportunity to explore substantive or socialization issues in the field (4); allows students to contribute their own insights, knowledge and expertise and to share those with other students and faculty in the program, the department, college and university (6); and increases identification with Penn State through participation in university-sponsored discussions (7). This strategy will be phased in as the first cohorts of students in MPS-TM complete their programs.

Strategy C: Informal discussions. An online ‘coffee room’ will be set up as a space for informal discussions among students and faculty. Topics may be proposed by students and faculty. A threaded discussion format will be used, although the ‘coffee room’ also will be available for chat rooms for a particular meeting or discussion group. Participation will be voluntary and we expect different students and faculty to take part depending on the topics. Strategy C fulfills residency elements 1, 2, 4, 6 and 7. Informal student interaction with faculty is encouraged (1), as is interaction among students (2). The topics are likely to include issues of socialization in the field and practical application of course content and so will contribute to residency element (4). The discussions and interactions will allow students to contribute their expertise and experiences, shaping faculty knowledge of applications in the field and providing ideas for

applied research. Thus, these discussions will enable students to contribute to the program, college and university (6). Participation will increase identification with Penn State (7). Strategy C will be phased in during year 1 of the program.

Strategy D: Students as experts. The CSS department has an established undergraduate major in Turfgrass Science (TS) that has important conceptual and practice overlap with MPS-TM. We plan to provide opportunities for students in MPS-TM to participate as experts in the field or as video conference presenters on certain topics in the undergraduate classes. Again, the practical, real world experiences of MPS-TM students will be invaluable in helping the undergraduates to understand how the information from classes translates into application. This interaction also will provide undergraduate students opportunities to interact with professionals in the field about the nature of their careers, the kinds of tasks they do on a daily basis, and the relevance of program/course content. Strategy D contributes to residency elements 1, 2, 4, 6 and 7. In developing the undergraduate course presentation, MPS-TM students will work with the faculty member in the course to develop content and instructional strategies thus providing socialization and experience with instruction (1, 4); if a panel is used then MPS-TM students on the panel will need to interact to organize the presentation (2). MPS-TM students would make a clear and strong contribution to the program, college, and university by participating as experts, panel members in undergraduate courses related to their coursework and professional experiences (6). Such participation will increase the identification with Penn State (7). Students will be encouraged to participate in one such activity during their program.

Strategy E: Students as mentors. MPS-TM students will be asked to serve as mentors in two capacities. First, 'senior students' will be asked to serve as mentors to new students in the MPS-TM program. This will include providing advice, responding to questions that new students in the program might have, and helping new students to navigate the somewhat less-structured world of online courses (where there is no formal class meeting time). Since many students are already practitioners, these mentoring relationships should help to build networks among students on which they can draw in their professional careers, not just in the program context. Second, MPS-TM students will be asked if they would be interested in volunteering to mentor one or two undergraduate students in the TS program. This provides MPS-TM students with experience in mentoring and providing leadership to those with less knowledge and experience, and it enhances the experiences of the undergraduate students to have a practitioner to whom they can turn with substantive/career-related questions. Strategy E contributes to residency elements 2, 4, 5, 6 and 7. This strategy encourages interaction among students (2), provides a socialization/professionalization experience guided by faculty (4), it provides a student perspective on the program and courses in terms of advising (5), allows students in MPS-TM to make invaluable contributions to the program, college and university through involvement in undergraduate education (6), and increases student involvement in and identification with Penn State and its programs (7). Strategy E will be phased in during years 2 and 3 of the MPS-TM program and the Turfgrass Science undergraduate program, as feasible.

Strategy F: Annual Turfgrass Management Institute. One element often missing from online programs is face-to-face interaction. We propose to offer an Annual Institute for one week during the fall Penn State Golf Turf Conference to bring faculty and students together at University Park. The Institute would include substantive topics or short courses that would describe recent developments in different areas of turfgrass science and management, and would provide opportunities for informal discussions and socializing among students and faculty. Because of the costs involved, this will not be a required element, but we will strongly encourage students to participate at least once during their program. In addition, we would plan to invite new students to participate in the Institute prior to taking their first course. We also would invite alumni to attend and to participate in organizing/presenting some of the sessions. Student and alumni mentors could then meet those they are mentoring. Opportunities for advising sessions on coursework and an introduction to the program would be included for students new to the program. Times also would be available for students to set up meetings with their academic advisors to discuss their integrative experience. Some sessions in the Institute may be made available to those unable to attend in person. The Annual Institute contributes to all of the elements of residency. The institute provides opportunities for face-to-face interaction among faculty and students (1); among students (2); will increase access to information and instructional resources of the program, department and University (3); offer opportunities for socialization to the field (4); provide face-to-face academic and program advising (5); enable students to contribute by helping to organize sessions and use their expertise (6); and a visit to University Park is generally always a good way to increase identification with Penn State (7). We view the Institute as an important element of the program, and will work to develop funding mechanisms to assist students and alumni in covering the costs of travel to and living expenses while visiting Penn State. We expect to offer the first institute during the second fall following the approval of the MPS-TM program.

Strategy G: Academic advising and support services. Academic advising is provided initially by the Graduate Program Coordinator who is a tenure-line faculty member in the program. Students will be encouraged to identify a permanent faculty advisor as soon as possible in the program and will work through a proposed schedule of courses and a tentative timeline within the first year. This process will be facilitated by the Graduate Program Coordinator. Advising is conducted by email and phone. Once a faculty advisor is identified, the student can seek advice from the faculty advisor, the Graduate Program Coordinator, or from other faculty and students in the program. Advising also will be available through an online advising 'coffee room,' the Annual Institute, and the use of senior students in MPS-TM as mentors/peer advisors. Materials providing specific information on program requirements, the unique aspects and responsibilities of participating in an online program, identifying a faculty advisor and committee, and the integrative experience are being developed and will be available on the program web site. Support for MPS-TM will be provided by a staff assistant in CSS and through initial contact with World Campus personnel/advisors. Students will apply for admission directly to the MPS-TM program in the academic department. Strategy G meets residency elements 1, 3, 4 and 5.

Strategy H: MPS TM program web site. We view the MPS-TM program web site as an essential element in creating a 'home and identity' for the MPS-TM program. The web site will contain the typical elements of an educational program with information on application guidelines, course offerings, requirements for the degree, information on faculty in the program, and links to broader Penn State resources. We also propose to develop elements of the web site that will provide opportunities for interaction (formal and informal), program and course review and evaluation, professional networking, and building program identity. Interaction linked through the web site would be the opportunities to participate in organized chat rooms or threaded discussions related to the departmental or student seminars or discussion (Strategies A and B) informal discussion chat-rooms and threaded discussions (Strategy C), and the 'coffee room' (Strategy C, E and F). The 'coffee room' also can be used for course review and evaluation where access would be restricted to students in a particular course and the faculty peer evaluator of the course. One page on the web site would include links to professional organizations, nationally and within states, that provide training and conferences for practitioners and researchers in topics related to community and economic development. We plan to identify these through searches, but also by the organizations in which our students and alumni participate. This site also will include a link to a discussion area about insights obtained from student/faculty/alumni participation in particular conferences. Another element would be a restricted access site that includes information on former and current students in MPS-TM. This would include information on current positions, locations, and areas of expertise of the students and alumni; lists of the capstone projects completed by the students with links to electronic copies, and a map showing locations of current and former students. We see this information as building identity with the program and Penn State and encouraging continued participation in the program by alumni. This alumni/student/faculty space would include access to chat rooms, threaded discussions, and coffee rooms on organized topics and informal discussion topics introduced by members. The web site contributes to all elements of residency. It offers opportunities for interaction among faculty and students (1), interaction among students and among students and alumni (2), provides access to information and instructional resources (3), increases exposure to substantive issues in the field and to professional networks and experiences (4), provides access to advising information and support services (5), offers a means for students and alums to stay connected with the program and contribute substantively both formally and informally (6), and creates a location and reason for continuing active participation in and identification with the Penn State community. We plan to develop a new website for the MPS-TM program and to phase in various elements within the first three years of the program.

Ultimately, we would like to employ all of the above strategies to increase participation and interaction available to alumni of the MPS-TM

program. The alumni of this program are practitioners in the field or work in related areas and can provide an invaluable resource to current graduate and future undergraduate students, the program, and Penn State. We would hope to use the 'friends of Penn State' accounts to provide access to the web sites and associated activities. Recent efforts by the Penn State Alumni Association and University Libraries to offer some restricted access to library resources to members of the Alumni Association also will increase the benefits to alumni of retaining their contact and interaction with the program and with Penn State. The special interaction elements related to community and economic development offered to alumni and students should increase the attractiveness to alumni of staying involved. Another element would be a virtual coffee room for informal discussions with and among students. We will maintain alumni and former student lists. As we develop the program website, we will consider an electronic newsletter for alums and a special alums page on the web site.

Last Revised by the Department: Summer Session 2010

Blue Sheet Item #: 38-04-099

Review Date: 01/12/2010

Wildlife and Fisheries Science (W F S)

Program Home Page (Opens New Window)

MICHAEL G. MESSINA, *Director of the School of Forest Resources and Professor of Forest Resources*
121 Ferguson Building
814-863-7093

Degrees Conferred:

Ph.D., M.S., M.Agr., M.F.R.

The Graduate Faculty

- Margaret C. Brittingham, Ph.D. (Wisconsin) Professor of Wildlife Resources
- Hunter Carrick, Ph.D. (Michigan) Assistant Professor of Wildlife and Fisheries Science
- Charles Andrew Cole, Ph.D. (Southern Illinois) Associate Director, Center for Watershed Stewardship
- Duane R. Diefenbach, Ph.D. (Georgia, Athens) Adjunct Assistant Professor; Assistant Leader-Wildlife, PaCFWRU
- C. Paola Ferreri, Ph.D. (Michigan State) Associate Professor of Fisheries Management
- Gary J. San Julian, Ph.D. (Colorado State) Professor of Wildlife Resources
- Jay R. Stauffer, Jr., Ph.D. (Virginia Polytech) Professor of Ichthyology
- Walter M. Tzilkowski, Ph.D. (Massachusetts) Associate Professor of Wildlife Science
- Richard H. Yahner, Ph.D. (Ohio) Professor of Wildlife Conservation

Programs are designed to give students an understanding of the biology and management of terrestrial or aquatic wildlife species and their environments, and include training in fish and wildlife ecology, nutrition, physiology, behavior, and pathology of wildlife species; study of successional stages, land use, and management of various habitats and their impact on fish and wildlife populations; population dynamics and manipulation of animal numbers; and studies of recreational, aesthetic, and socioeconomic values of fish and wildlife. Most programs of study are strengthened by including appropriate courses offered by related departments.

Admission Requirements

Scores from the Graduate Record Examinations (GRE) are required for admission. A student may be admitted provisionally without GRE scores. Requirements listed here are in addition to general Graduate School requirements stated in the GENERAL INFORMATION section of the*Graduate Bulletin*.

Application materials should be submitted before February by those who want to begin in summer or fall. For admission, an applicant should have at least a 2.75 grade-point average, a 3.00 junior/senior average, and courses that are basic to the individual's field of specialization. Ordinarily these include 12 credits in communication, 12 credits in social sciences and humanities, 10 credits in quantification including calculus and statistics, 8 credits in chemistry and/or physics, 8 credits in biological sciences, and 18 credits in fish, wildlife, forestry, or related courses. Three reference reports (forms supplied on request), and a brief statement describing the applicant's academic goals, career interests, and special qualifications are required. The best-qualified applicants will be accepted up to the number of spaces available. Exceptions to admission requirements may be made for students with special backgrounds, abilities, and interests.

Admission to the Ph.D. program in Wildlife and Fisheries Science requires a master's degree in wildlife and fisheries science or a closely related field, or a bachelor's degree with a minimum grade-point average of 3.30 and demonstrated research ability.

Master's Degree Requirements

M.S.: In addition to Graduate School requirements, 6 credits of statistics and 2 credits of colloquium are required.

M.F.R.: A minimum of 30 graduate credits (400- to 500-level courses) is required, of which at least 20 must be earned at an established graduate campus of the University. At least 12 credits must be formal courses at the 500 level related to forest resources. A paper (3-6 credits of FOR 596/FP 596/W F S 596) is included as part of the 30 credits, demonstrating an ability to apply the knowledge gained during the program to the specialized field of interest; the paper will be evaluated by the student's committee. Two credits of colloquium and 3 credits of statistics (400- or 500-level) are required.

M.Agr.: Candidates select a minimum of 15 credits of graduate-level communications courses in majors such as Agricultural and Extension Education, Instructional Media, Journalism, Recreation and Parks, Speech Communication, English, and Theatre Arts. Any deficiencies in a student's resource specialty, as judged by his or her advisory committee, must be remedied. An acceptable paper on a selected professional problem or a report on internship training worth 3 credits or more also is required.

Doctoral Degree Requirements

Doctoral students would normally emphasize either wildlife or fisheries in their course selection. Course work shall include at least 15 graduate credits beyond those required for an M.S. in Wildlife and Fisheries Science. At least 9 of these credits must include courses at the 500 level with a Wildlife and Fisheries Science designation.

An international communications or cultural requirement is required for the Ph.D. degree. This requirement may be satisfied by demonstrating competence in one foreign language equivalent to passing two or three college-level courses. It also may be met by two courses in one or two contemporary foreign cultures. With approval of the doctoral committee, a student may petition the Graduate Faculty of the school for waiver of the international communications or culture requirement.

Students must pass the candidacy examination during their first year of residence and a comprehensive examination which is given after all course requirements have been completed. The final examination is oral; all doctoral students are required to present a public seminar on their dissertation prior to the final examination.

Watershed Stewardship Option

The Graduate Option in Watershed Stewardship is intended to provide enhanced educational opportunities for students with an interest in

water resources management who are enrolled in a graduate degree program within Wildlife and Fisheries Science. The objective of the Graduate Option in Watershed Stewardship is to educate students to facilitate team-oriented, community-based watershed management planning directed at water resources problems encountered in Pennsylvania communities, especially nonpoint source water pollution. The Graduate Option in Watershed Stewardship requires 22 credits of graduate course work: 12 credits of breadth courses, 2 credits of Watershed Stewardship Seminar courses (FOR 591A and 591B or LARCH 510.2), and 8 credits of Watershed Stewardship Practicum I and II courses (FOR 570 and FOR 571 or LARCH 540.2 and LARCH 550.2). One credit of FOR 591 would count as a colloquium course toward degree requirements, but at least 1 additional credit of FOR 590 is required. Breadth courses will consist of three graduate credits of course work from each of four subject matter areas: (1) water resources science, (2) social science, public policy and economics, (3) humanities, and (4) communications and design. In the watershed stewardship practicum courses students work in teams with community, government and business leaders to analyze and understand natural resources problems and creatively synthesize appropriate solutions in the form of a written watershed management plan.

A representative pattern of scheduling for the Graduate Option in Watershed Stewardship in addition to a student's other degree requirements might be:

First Year:

Fall Semester
Breadth electives--6 credits
FOR 591A or LARCH 510.2,
Watershed Stewardship
Issues Colloquium--1 credit

Spring Semester
Breadth electives--6 credits
FOR 591B or LARCH 510.2,
Watershed Colloquium--1 credit

Second Year:

Fall Semester
FOR 570 or LARCH 540.2,
3 credits
Keystone Project

Spring Semester
FOR 571 or LARCH 550.2,
5 credits
Keystone Project

A list of acceptable breadth courses from each discipline is provided in the Graduate Option in Watershed Stewardship Handbook. Students will be allowed to petition to the Center for Watershed Stewardship to substitute higher level or equivalent courses in a major field to suit their specific backgrounds and goals. Courses taken for the Graduate Option in Watershed Stewardship may be used to satisfy other equivalent (400- or 500-level) degree requirements with concurrence of their adviser and graduate committee. The graduate committee for a student enrolled in the Option in Watershed Stewardship must include a faculty representative from the Center for Watershed Stewardship.

Students enrolled in M.F.R., M.Agr., M.S. or Ph.D. degree programs within Wildlife and Fisheries Sciences may apply to participate in the Graduate Option in Watershed Stewardship. Watershed Stewardship Option students enrolled in an M.F.R. or M.Agr. degree program, which requires a professional paper rather than a thesis, could write their professional paper on a topic which directly contributes to their overall watershed management plan prepared as part of FOR 570 and FOR 571 or LARCH 540.2 and LARCH 550.2 classes.

Other Relevant Information

Each entering student receives individual guidance from an adviser, and later from his or her committee, in designing a program of studies and research based on his or her own interests. The student is responsible for conforming to all requirements summarized in the "Graduate Studies Handbook" of the School of Forest Resources, and for completing the degree program within a reasonable time, i.e., two years for a master's degree and three years for a Ph.D.

Student Aid

In addition to the fellowships, traineeships, graduate assistantships, and other forms of financial aid described in the STUDENT AID section of the *Graduate Bulletin*, the following awards typically have been available to graduate students in this program:

Forest Resources: Jesse Rossiter Rapp Memorial Scholarship
Available to graduate students in the School of Forest Resources who are not holding assistantships as graduate students. Apply to the School of Forest Resources' Scholarships, Loans, and Awards Committee.

Roger M. Latham Memorial Award
Awarded to outstanding graduate students specializing in wildlife or fisheries after at least one semester in residence.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

WILDLIFE AND FISHERIES SCIENCE (W F S) course list

See also Forest Resources.

DATE LAST REVIEWED BY GRADUATE SCHOOL: 4/15/04

Last updated by Publications (director): 10/2/09

Dual-Title Graduate Degrees in Women's Studies (WMNST)

Program Home Page (Opens New Window)

LORRAINE DOWLER, *Program Director*
LORI GINZBERG, *Graduate Officer*

133 Willard Building
814-863-4025; fax: 814-863-3578

Degrees Conferred

Students electing this program through participating departments will earn a degree with a dual title at both the Ph.D. and M.A./M.S. levels, i.e., Ph.D. in (graduate program name) and Women's Studies, or M.A./M.S. in (graduate program name) and Women's Studies.

The following graduate programs offer dual degrees in Women's Studies: Adult Education, Curriculum and Instruction, English, French, Geography, History, Philosophy, Political Science, Psychology, and Rural Sociology.

The Graduate Faculty

Women's Studies-affiliated faculty include individuals with budgeted appointments in Women's Studies and individuals with courtesy joint appointments. The following faculty members have budgeted and courtesy joint appointments in Women's Studies:

- Micaela Amato, M.F.A. (Colorado) Professor of Art and Women's Studies
- Lee Ann Banaszak, Ph.D. (Washington U) Associate Professor of Political Science and Women's Studies
- Wenda Bauchspies, Ph.D. (Rensselaer) Assistant Professor of Science, Technology, and Society, and Women's Studies
- Robin Becker, Ph.D. (Boston) Associate Professor of English and Women's Studies
- John P. Christman, Ph.D. (Illinois) Associate Professor of Philosophy and Women's Studies
- Christine Clark-Evans, Ph.D. (Bryn Mawr) Associate Professor of French, Women's Studies and African and African American Studies
- Deborah Clarke, Ph.D. (Yale) Associate Professor of English and Women's Studies
- Mary De Jong, Ph.D. (S. Carolina) Associate Professor of English and Women's Studies
- Lorraine Dowler, Ph.D. (Syracuse) Associate Professor of Geography and Women's Studies
- Robert Drago, Ph.D. (UMass) Professor of Labor Studies and Industrial Relations and Women's Studies
- Yvonne Gaudelius, Ph.D. (Penn State) Associate Professor of Art Education and Women's Studies
- Lori Ginzberg, Ph.D. (Yale) Associate Professor of History and Women's Studies
- Cheryl Glenn, Ph.D. (Ohio) Associate Professor of English and Women's Studies
- Marnina Gonick, Ph.D. (Toronto) Assistant Professor of Curriculum and Instruction, and Women's Studies
- Amy Greenberg, Ph.D. (Harvard) Associate Professor of History and Women's Studies
- Irene Harvey, Ph.D. (York) Associate Professor of Philosophy and Women's Studies
- Lisa Hogan, Ph.D. (Indiana) Senior Lecturer in Communication Arts and Sciences, and Women's Studies
- Charlotte Holmes, M.F.A. (Columbia) Associate Professor of English and Women's Studies
- Kathryn E. Hood, Ph.D. (Temple) Associate Professor of Human Development and Women's Studies
- Patricia Johnson, Ph.D. (Michigan) Associate Professor of Anthropology and Women's Studies
- Jane Juffer, Ph.D. (Illinois, Urbana-Champaign) Assistant Professor of English and Women's Studies
- Julie Kasdorf, Ph.D. (NYU) Associate Professor of English and Women's Studies
- Claire Katz, Ph.D. (Memphis) Associate Professor of Philosophy, Jewish Studies, and Women's Studies
- Karen Keifer-Boyd, Ph.D. (Oregon) Associate Professor of Art Eduation and Women's Studies
- Patricia Koch, Ph.D. (Penn State) Associate Professor of Biobehavioral Health, Health Education, and Women's Studies
- Joan Landes, Ph.D. (NYU) Ferree Professor of Early Modern History and Women's Studies
- Margaret Lyday, Ph.D. Catholic U of America) Associate Professor of English and Women's Studies
- Janet Lyon, Ph.D. (Virginia) Associate Professor of English and Women's Studies
- Christiane Makward, Ph.D. Docteur es Lettres (Sorbonne) Professor of French and Women's Studies
- Phyllis Mansfield, Ph.D. (Penn State) Professor of Women's Studies
- Sophia McClennen, Ph.D. (Duke) Associate Professor of Comparative Literature, Spanish, and Women's Studies
- Sallie McCorkle, M.F.A. (Rutgers) Associate Professor of Art and Women's Studies
- Sally McMurry, Ph.D. (Cornell) Professor of American History and Women's Studies
- Jennifer Mittelstadt, Ph.D. (Michigan) Assistant Professor of History and Women's Studies
- Benedicte Monicat, Ph.D. (Maryland) Associate Professor of French and Women's Studies
- Cecelia Novero, Ph.D. (Chicago) Assistant Professor of German, Comparative Literature, and Women's Studies
- Stacy Rogers, Ph.D. (Ohio State) Associate Professor of Sociology, Crime, Law, and Justice, and Women's Studies
- Carolyn Sachs, Ph.D. (Kentucky) Professor of Rural Sociology and Women's Studies
- David Shapiro, Ph.D. (Princeton) Professor of Economics, Demography, and Women's Studies
- Stephanie Shields, Ph.D. (Penn State) Professor of Psychology and Women's Studies
- Mrinalini Sinha, Ph.D. (SUNY, Stony Brook) Associate Professor of History and Women's Studies
- Sandra Spanier, Ph.D. (Penn State) Associate Professor of English and Women's Studies
- Stephanie Springgay, Ph.D. (U of British Columbia) Assistant Professor of Art Education and Women's Studies
- Susan Squier, Ph.D. (Stanford) Julia Gregg Brill Professor of English and Women's Studies
- Shannon Sullivan, Ph.D. Assistant Professor of Philosophy and Women's Studies
- Nancy Tuana, Ph.D. (California) DuPont/Class of 1949 Professor in Ethics; Professor of
- Philosophy and Women's Studies; Director, Rock Ethics Institute; Interim Head, Department of Philosophy
- Cassandra Veney, Ph.D. (Missouri) Assistant Professor of Women's Studies, and African and African American Studies
- Theresa K. Vescio, Ph.D. (Kansas) Assistant Professor of Psychology and Women's Studies
- Aaronette M. White, Ph.D. (Washington U) Assistant Professor of Women's Studies, and African and African American Studies
- Linda Woodbridge, Ph.D. (UCLA) Professor of English and Women's Studies
- Linda Wray, Ph.D. (Southern California) Assistant Professor of Biobehavioral Health and Women's Studies
- Melissa Wright, Ph.D. (Johns Hopkins) Assistant Professor of Geography and Women's Studies

Dual-title degrees grounded both in Women's Studies and a given discipline will acknowledge and foster scholarly work across disciplines. A dual-title degree program will increase the intellectual rigor and breadth of graduate work through immersion of candidates in Women's Studies and their discipline. The dual-title degree will also provide a context in which students can learn to synthesize knowledge within and across disciplinary boundaries. In addition, a dual-title degree program provides students with an opportunity for increased work within a pedagogical framework that also encourages an interdisciplinary approach to teaching.

The primary advantages of dual-title degrees include the intellectual and academic advantages of interdisciplinary, strengthening the reputation of individual programs/departments through innovative degree programs, increased recruitment of quality graduate students, and improved placement of doctoral graduates.

The dual-title degree programs do not duplicate other degree programs in the University.

Admission Requirements

In addition to the admission requirements set forth by the Graduate School and the cooperating department, students will be admitted to graduate study in Women's Studies by an admissions committee of Women's Studies-affiliated faculty. The Women's Studies program will follow the timetable and admission requirements of the cooperating department. Applicants should have a junior/senior cumulative average of at least 3.00 (on a 4.00 scale) and appropriate course background should be considered for study. It is required that prospective students seeking admission to a dual-title degree program will write a statement of purpose that addresses the ways in which their research and professional goals will reflect an interest in interdisciplinary and feminist research.

Degree Requirements

The dual-title degree will have requirements above those for the graduate minor, which currently requires 9 credit hours for the M.A./M.S. and 15 credit hours for the Ph.D. The requirements for the dual-title degree include increased course work, additional components to the comprehensive exams at the doctoral level, and the completion of women's studies related theses at both the master's and doctoral level. Degree requirements for dual-title degrees in Political Science, French, History, English, Education, Geography, Curriculum and Instruction, and Philosophy will be added to the Women's Studies Graduate Handbook.

Master's Degree

9 required credits (WMNST 501, WMNST 502, WMNST 507)
3 additional credits of Women's Studies course work
Thesis on a Women's Studies-related topic, or another 3 additional credits of Women's Studies course work and a master's essay will be approved by the student's committee

Ph.D. Degree

9 required credits (WMNST 501, WMNST 502, WMNST 507)
9 additional credits of Women's Studies course work (at least 6 of these should be at the 500 level)
Comprehensive examination in Women's Studies and the disciplinary field
Dissertation on a Women's Studies-related topic will be approved by the student's committee

Foreign Language and English Competency Requirements

The student will fulfill the language requirement specified by the cooperating department through which the student is admitted to the dual-title degree program.

Candidacy

In order to be admitted to doctoral candidacy in the dual-title degree program, students must meet the Ph.D. candidacy requirements specified by the cooperating department. In addition, the student will be required to present a portfolio of work in Women's Studies to their committee. Such a portfolio would include a statement of the student's interdisciplinary research interests, a program plan, and samples of writing that indicate the student's work in Women's Studies.

Committee Composition

For a dual-title M.A./M.S., the recommended student's committee will include at least one Women's Studies-affiliated faculty member.

For a dual-title Ph.D., 2 out of 4 members of the committee will be Women's Studies-affiliated faculty members.

Comprehensive Exams

The Women's Studies affiliated faculty members on the student's committee are responsible for administering a comprehensive examination in Women's Studies that constitutes a portion of the student's comprehensive exams. The women's studies portion of the exam will focus on the following areas: feminist theory, feminist methodology, global feminism, and feminist studies in the student's discipline.

Dissertation

A dissertation on a women's studies topic is required of students in the dual-title degree program. The women's studies-related topic of the dissertation will be approved by the student's committee.

Women's Studies Minor

An interdisciplinary dual-degree graduate minor is available, administered by the Women's Studies program. Each student's major and minor is planned by the student and the Women's Studies graduate adviser in consultation with the student's graduate adviser in his or her major field.

Master's Minor Requirements: Master's-level dual-title degree students are required to take 9 credits of course work in Women's Studies: WMNST 501 Feminist Perspectives on Research and Teaching (3 credits); WMNST 502 Global Feminism (3 credits); and WMNST 507 Feminist Theory (3 credits). Students also must complete 3 additional credits in Women's Studies, chosen in consultation with the Women's Studies graduate adviser.

Doctoral Minor Requirements: Doctoral-level dual-title degree students are required to take 9 credits of course work in Women's Studies: WMNST 501 Feminist Perspectives on Research and Teaching (3 credits); WMNST 502 Global Feminism (3 credits); and WMNST 507 Feminist Theory (3 credits). Students also must complete 9 additional credits of Women's Studies course work (at least 6 of which should be at the 500 level), chosen in consultation with the Women's Studies graduate adviser.

9 credits required credits of Women's Studies courses for master's level
15 credits required credits of Women's Studies courses for doctoral level

The above credits are in addition to the requirements for the student's major. Six credits consist of required courses in feminist theory (3) and feminist methodology (3). The remaining credits may include a combination of WMNST 400- and 500-level courses, as well as special topics courses (numbered 497 and 597) and independent/individual studies (496 and 596).

Prescribed courses (6 credits): WMNST 507 Feminist Theory; WMNST 501 Feminist Perspectives on Research and Teaching

Additional courses (a minimum of 3 credits at the 500 level)

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the Graduate *Bulletin.*

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Review Date: 9/2/03

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3/28/08 (moved minor description into program description, per Graduate School)

Workforce Education and Development (WF ED)

Program Home Page (Opens New Window)

RICHARD A. WALTER, *Professor-In-Charge of Graduate Programs in Workforce Education and Development*
301 Keller Building
814-865-2133

Degrees Conferred:

Ph.D., D.Ed., M.S., M.Ed.

The Graduate Faculty

- Wesley E. Donahue, Ph.D. (Penn State) Associate Professor of Management Development
- Edgar I. Farmer, D.Ed. (Penn State) Professor of Education
- Kenneth C. Gray, Ed.D. (Virginia Tech) Professor of Education
- Judith A. Kolb, Ph.D. (U of Denver) Associate Professor of Education
- David L. Passmore, Ph.D. (Minnesota) Professor of Education
- Cynthia Pellock, Ph.D. (Penn State) Assistant Professor of Education
- William J. Rothwell, Ph.D. (Illinois) Professor of Education
- Richard A. Walter, Ph.D. (Penn State) Associate Professor of Education

The general focus of the program is preparation for entry into professional positions within the broadly conceived field of workforce education and development, including human resource development in industry, secondary and postsecondary technical education, and employability programs for special populations. Emphases within the program include: training and development/human resources, leadership/administration, school-to-work, and postsecondary technical and community college leadership.

Admission Requirements

Admission to graduate programs in Workforce Education and Development (WF ED) is based on the faculty's evaluation of a candidate's prior undergraduate and graduate work, relevant prior work experience including military service, and career goals. A minimum undergraduate GPA of 2.50 is required for admission to the master's degree program. A GPA of 3.00 in prior graduate course work is required for admission to the doctoral program.

Degree Requirements

Master's Degrees Requirements

M.Ed. and M.S. degrees are offered in Workforce Education and Development, both of which require a minimum of 30 credits beyond the baccalaureate degree. M.S. candidates must complete a master's thesis or paper. Candidates for the M.Ed. degree must complete a written comprehensive examination.

Doctoral Degrees Requirements

Both the Ph.D. and D.Ed. degrees are offered in Workforce Education and Development. Two or more years of prior full-time work experience that is relevant to WF ED is an important consideration in evaluating applications for the doctoral program. Students are admitted only for the fall semester. Beginning students are not formally granted candidate status for a doctoral degree until successfully completing the candidacy exam given in the spring semester. Please see WF ED Web site for further details.

Student Aid

A limited number of graduate assistantships available to students in this program and other forms of student aid are described in the STUDENT AID section of the *Graduate Bulletin*.

Courses

Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

WORKFORCE EDUCATION AND DEVELOPMENT (WF ED) course list

Date last reviewed by the Graduate School: 4/15/04

Date last updated by Publications: 9/2/09

Graduate Minors

A graduate minor normally may be taken in only one of the approved graduate degree programs offered at Penn State. However, some formal graduate minors have been approved by the Graduate Council, such as the minors listed on this page. A minor at the graduate level should represent curriculum and study that reflect graduate-level concepts and scholarship, with a preponderance of courses at the 500 level. A doctoral minor consists of no fewer than 15 graduate credits of integrated or articulated work in one field related to, but different from, that of the major with a preponderance of courses at the 500 level; however, at a minimum, 6 credits must be at the 500 level. A master's minor consists of no fewer than 6 credits of integrated or articulated work in one field related to, but different from, that of the major; however, at a minimum, 3 credits must be at the 500 level.

Bioinformatics

The interdisciplinary graduate minor in Bioinformatics is administered by the Engineering Division at Penn State Great Valley and requires 15 graduate credits. The minor offers an opportunity for graduate students in all Penn State colleges and majors to pursue a focused set of graduate courses and gain core competency and experience in informatics, statistics, and ethics as they relate to the field of biotechnology.

Students complete a 9-credit core curriculum of SYSEN 509 Biostatistics, SWENG 552 Bioinformatics, and S T S 589 Ethics and Values in Science and Technology. Students then build upon the core by selecting 6 credits of electives focusing on database design concepts, data mining, and genetic algorithms.

Nine of the 15 credits in this minor may be applied toward the student's major program of graduate study. Students seeking admission to the Bioinformatics minor without appropriate prerequisite courses may be required to complete preparatory courses that are not applicable to either their major or minor program of study.

Additional information and application materials maybe found at www.gv.psu.edu/b www.gv.psu.edu/bioinformatics.

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Second Language Acquisition

This interdepartmental doctoral minor draws upon the opportunities that various departments offer to study the processes of language acquisition and pedagogy, and to conduct research in these fields. Developments in the theories of language acquisition, the practices in language instruction, and the technical innovations provide a wide range of resources for secondary specializations in second language acquisition theory. The minor provides an official credential for doctoral students who complete an organized program of study.

The minor requires a minimum of 15 credits at the 400, 500, or 600 levels (beyond credits used for degree requirements in the student's field of study), consisting of one or two methodology courses totaling 3 credits and 12 additional credits selected from an interdepartmental list of eligible courses, with approval both by the student's doctoral committee in his or her major field, and by the person in charge of the minor. A maximum of 6 credits may be taken at the 400 level, and no more than 3 credits of 602 may count toward the minor. Courses in at least two departments must be included. Further, students must complete at least two semesters' experience in supervised teaching of either a foreign language or ESL, or alternative equivalent practicum if approved by the doctoral committee and the person in charge of the Minor.

In general, students whose major field of study in the Ph.D. is a concentration in foreign language acquisition or ESL are not eligible for this minor, as their field of specialization already includes this area. However, students in English as a Second Language may do the minor with a focus on foreign language acquisition or a student with a specialty area in forced language acquisition may complete the minor with a specialty area in English as a Second Language.

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Social Thought

The purpose of the Social Thought minor is to enable graduate students in a variety of fields to study theories of society across conventional disciplinary boundaries. The minor enables qualified students to enrich their own chosen fields of study with readings and discoveries from other, contiguous fields. The minor requires at least 15 credits of courses with social thought content. These are courses taught by STP Affiliated Faculty or those approved by the STP Advisory Committee. Those 15 credits must include the following: at least 9 credits of courses from outside the student's major discipline and SOCTH 501 -- Introduction to Social Thought. In addition, at least one member of the student's dissertation committee must be an STP Affiliated Faculty and preferably be from outside the student's major discipline.

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Women's Studies

This interdisciplinary dual degree graduate minor is administered by the Women's Studies program. Each student's major and minor is planned by the student and the Women's Studies graduate adviser in consultation with the student's graduate adviser in his or her major field.

MASTER'S REQUIREMENTS: Master's-level dual-title degree students are required to take 9 credits of course work in Women's Studies: WMNST 501 Feminist Perspectives on Research and Teaching (3 credits); WMNST 502 Global Feminism (3 credits); and WMNST 507 Feminist Theory (3 credits). Students also must complete 3 additional credits in Women's Studies, chosen in consultation with the Women's Studies graduate adviser.

DOCTORAL REQUIREMENTS: Doctoral-level dual-title degree students are required to take 9 credits of course work in Women's Studies: WMNST 501 Feminist Perspectives on Research and Teaching (3 credits); WMNST 502 Global Feminism (3 credits); and WMNST 507 Feminist Theory (3 credits). Students also must complete 9 additional credits of Women's Studies course work (at least 6 of which should be at the 500 level), chosen in consultation with the Women's Studies graduate adviser.

The minor requires a minimum of 9 credits of Women's Studies courses for a master's degree and 15 credits for a doctorate. These credits are in addition to the requirements for the student's major. Six credits consist of required course in feminist theory (3) and feminist methodology (3). The remaining credits may include a combination of WMNST 400- and 500-level courses, as well as special topics courses (numbered 497 and 597) and independent/individual studies (496 and 596).

Prescribed courses (6 credits): WMNST 507 Feminist Theory; WMNST 501 Feminist Perspectives on Research and Teaching. Additional courses (a minimum of 3 credits at the 500 level).

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Computational Science

The Department of Aerospace Engineering administers this interdisciplinary minor. Each student's program is planned by the student and a designated computational science adviser, in consultation with the graduate adviser in the student's major field.

The minor offers an opportunity for students in all colleges and majors to pursue a focused set of courses that emphasize computational science. The minor requires 9 credits in computational science courses for a master's degree and 15 credits for a doctoral minor. All students are required to take the two-semester (3 credits total) computational science colloquium (AERSP 590). Six additional credits will be taken from AERSP 424, NUC E 530 or CSE 557 or MATH 523. For the Ph.D. minor, 6 additional credits will be chosen from a list of approved courses on the Computational Science Web site (see below). Each of the core courses will be offered every year. In addition, the course prerequisites can be met readily by students in science and engineering and many other disciplines.

More information can be found on the Computational Science Web site: http://www.csci.psu.edu.

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Gerontology

The interdisciplinary graduate minor in Gerontology is administered by a committee of faculty appointed by the Gerontology Center Advisory Board. The committee members represent diverse programs within the University. Students admitted to the minor will develop a course of study that includes both prescribed course work and additional course work suited to the student's interests. The minor course of study will be developed jointly by the student, the student's academic adviser, and one member of the graduate minor gerontology committee. Contact the Gerontology Center (S-105 Henderson) for information regarding the committee membership.

The minor requires a minimum of 10 credits of the master's level and 15 credits at the doctoral level, 10 of which are prescribed. The prescribed courses are: BIOL 409 Biology of Aging (3); HD FS/PSYCH 445 Development throughout Adulthood (3); HD FS 590 Gerontology Colloquium (1); and SOC 435/HD FS 434 or SOC 535 (3). Doctoral students must select a minimum of 5 additional credits from among the following courses: ADTED 460, 505, CN ED 415, EDPSY 527, HD FS 446, 447, 579, H P A 442, KINES 481, 482, NURS 464, 500, NUTR 512, SOC 535, and gerontology-related special topics courses (SUBJ 497, 597) or independent studies (SUBJ 496, 596).

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Latina and Latino Studies

The Latina and Latino Studies graduate minor is an interdisciplinary minor that will be administered by a faculty committee appointed by the dean of Liberal Arts and made up of faculty in English, Comparative Literature, Spanish, and other appropriate disciplines. Graduate students from across the university are encouraged to participate. Students who are admitted to the minor will develop courses of study suited to their special interests. The minor for each student will be planned jointly by the student, the student's doctoral adviser, and an adviser designated by the Latina and Latino Studies committee. Any change in the plan must be approved by both advisers.

A minimum of 15 credits must be completed. Per graduate school regulations for the minor, a representative of the minor will participate on the student's doctoral committee. This representative may be a member of the Latina and Latino Studies committee or any other faculty member approved by that committee.

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Linguistics

The doctoral minor provides interested students with an opportunity to complete a program of scientific study focused on the nature, structure, and use of human language. The minor is designed to cover the foundations of the discipline of linguistics by reviewing fundamental core areas such as phonology and syntax. Course work is also available in many additional areas of linguistics such as semantics, morphology, language variation, historical linguistics, and discourse analysis.

The minor requires a minimum of 15 credits, 6 of which must be at the 500 level. Nine credits are prescribed in syntax (LING 400), phonology (LING 404), and a general introduction to linguistics (LING 401), although a linguistics course at the 500 level may be substituted for LING 401 with the approval of the director of the program in Linguistics.

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Literary Theory, Criticism, and Aesthetics

This is an interdisciplinary doctoral minor that is administered by two designated advisers, one from the Department of Comparative Literature and one from the Department of Philosophy. Students who are admitted to the minor will develop courses of study suited to their special interests. The minor for each student will be planned jointly by the student and the two advisers, in consultation with the student's doctoral adviser in his or her major field. Any change in the plan must be approved by all of the advisers. A minimum of 15 credits must be selected from among the following courses (including at least 3 credits each in comparative literature and philosophy, chosen from the asterisked courses): ART H 410, CMLIT 502*, 503*, 580, ENGL 581, 582, 583, FR 571, GER 591, PHIL 413, 414*, 516*, 581, 582, SPAN 587, SPCOM 503, 505, 507, or THEA 503, 504. Note 1: 3 credits of SUBJ 596 in one of the nine subject areas indicated may be substituted for one of the non-asterisked 3-credit courses. Note 2: A student majoring in one of the nine subject areas may not include any courses in that field as part of the minor. Appropriate courses may be substituted.

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Medieval Studies

The graduate minor in Medieval Studies offers graduate students in the humanities an interdisciplinary field of study in an important era in European development. The minor provides students with a broader historical and cultural background for their major discipline. Graduate status is required for admission to the minor.

The graduate minor in Medieval Studies requires 9 credits of course work (of which 3 credits are at the 500 level) for a master's candidate and 15 credits of course work (of which 6 credits are at the 500 level) for a doctoral candidate; the courses will be selected in consultation with an adviser for the minor, who will normally be a member of the Liberal Arts Medieval Studies Committee; and with the chair of the student's graduate committee. The courses for the minor will be chosen from at least two of the following areas outside the students' area of specialization: arts; history; literature and language; medieval studies; philosophy and religious studies; and other areas as available. The sequence of the courses will be determined by the student's major department.

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Religious Studies

This is a graduate minor administered by the Religious Studies program leading to a minor at the master's or doctoral level. Each student's course of study would be planned jointly by the student and an adviser selected from the Religious Studies faculty, in consultation with the student's adviser in his or her major field.

The minor requires a minimum of 9 credits of Religious Studies courses for a master's degree and 15 credits for a doctorate. These credits are in addition to the requirements for a student's major. Three credits consist of a required course, Research in Religious Studies (RL ST/HIST 565). Students would select among 500-level Religious Studies course to fulfill the remaining requirements. These include: RL ST 532, 536, 539, 596, RL ST/HIST 510, 560, 561, 562, 563, 564.

With the consent of a student's adviser, the student may elect to take a 500-level course in a field closely related to Religious Studies that may help to satisfy the minor's requirements. This may not be in the student's major field.

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Science, Technology, and Society

This interdisciplinary graduate minor is administered by the Science, Technology, and Society Program. Each student's program will be planned by the student and designated S T S graduate adviser, in consultation with the graduate adviser in the student's major field.

The goal of the graduate minor in Science, Technology, and Society is to complement graduate and professional students' major programs through study of the interactions among science, technology, and society. More specific objectives are to promote scholarship in the humanities and social sciences concerning the social and ethical dimensions of science and technology; to inform those training in the scientific and technical professions about the social and ethical dimensions of their professional practice; and to develop research and rhetorical skills used in shaping public discourses about, and public policies regulating, science and technology.

The minor requires 9 credits in S T S courses for a master's and 15 credits for a doctoral minor. Six credits consist of S T S 589 Ethics and Values in Science and Technology and S T S 591 Research and Writing in S T S. The remaining credits may include 400- and 500-level, special topics (S T S 497 and 597), and independent study (S T S 496 and 596) courses.

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