

# ARCHITECTURAL ENGINEERING

<b>Graduate Program Head</b>	James Freihaut
<b>Program Code</b>	AE
<b>Campus(es)</b>	University Park (Ph.D., M.S., M.A.E., M.Eng.)
<b>Degrees Conferred</b>	Doctor of Philosophy (Ph.D.) Master of Science (M.S.) Master of Architectural Engineering (M.A.E.) Master of Engineering (M.Eng.) Integrated Bachelor of Architectural Engineering (B.A.E.) and Master of Science (M.S.) in Architectural Engineering Integrated Bachelor of Architectural Engineering (B.A.E.) and Master of Architectural Engineering (M.A.E.)
<b>The Graduate Faculty</b>	View ( <a href="https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=AE">https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=AE</a> )

Students may specialize in building construction, building illumination systems, building mechanical and energy systems, or building structural systems.

## Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (<https://gradschool.psu.edu/graduate-admissions/how-to-apply/>). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions Policies (<https://gradschool.psu.edu/graduate-education-policies/>).

Scores from the Graduate Record Examinations (GRE) are required for admission to the Ph.D. and M.S. programs. GRE scores are not required for admission to the M.Eng. degree program.

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.

## Degree Requirements

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.

### M.Eng. in Architectural Engineering

Requirements listed here are in addition to Graduate Council policies listed under GCAC-700 Professional Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>).

The M.Eng. in Architectural Engineering degree is a non-thesis 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. 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 supervised by a member of the Graduate Faculty, completed while enrolled in AE 596. The capstone project requires students to work individually or within a group on an aspect of architectural engineering of their choosing. The project should demonstrate the ability of the student to integrate and apply concepts and techniques learned in the program courses.

### M.S. in Architectural Engineering

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

A thesis is required for the M.S. degree, which consists of a minimum of 30 credits: 24 credits of course work and a 6-credits of thesis research, either AE 600 or AE 610. A minimum of 12 of the course credits must be completed at the 500 level. A student's program of courses in the M.S. program is developed in cooperation with the student's academic adviser.

### Ph.D. in Architectural Engineering

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

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. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School. Each student accepted into the Ph.D. degree program must pass the Ph.D. Qualifying 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 English Proficiency Examination must be passed before scheduling the Comprehensive Examination. 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 pass 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 dissertation 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.

## Integrated Undergrad-Grad Programs

### Integrated Bachelor of Architectural Engineering (B.A.E.) and Master of Architectural Engineering (M.A.E.) or Master of Science (M.S.) in Architectural Engineering

Requirements listed here are in addition to requirements listed in GCAC-210 Integrated Undergraduate-Graduate (IUG) Degree Programs (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-210-integrated-undergraduate-graduate-degree-programs/>).

#### Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (<https://gradschool.psu.edu/graduate-admissions/how-to-apply/>). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions Policies (<https://gradschool.psu.edu/graduate-education-policies/>).

A limited number of undergraduate students in the B.A.E. program will be considered for admission to one of two integrated undergraduate-graduate degree programs. The first leads to the student earning both the B.A.E. and M.A.E. degrees and involves a graduate-level component in the capstone senior project. The second provides the student with the opportunity to earn both the B.A.E. and M.S. degrees and involves a research-oriented thesis in addition to the capstone undergraduate senior project.

Students must apply to and meet admission requirements of the Graduate School, as well as the graduate program in which they intend to receive their master's degree. Before applying to the Graduate School, students must have completed entrance to their undergraduate major and have completed no less than 60 credits. Students must be admitted no later than the end of the second week of the semester preceding the semester of expected conferral of the undergraduate degree. Transfer students must have completed at least 15 credits at Penn State to enroll in an IUG.

Application materials for both programs are available on the AE Department website. To be considered for admission to either program, students must have attained a GPA of at least 3.0 and a grade of C or better in all classes listed as AE. A commitment from an AE Graduate Faculty member to serve as the student's M.S. thesis adviser is necessary for admission to the B.A.E./M.S. program. In consultation with an adviser, students must prepare a plan of study appropriate to this integrated program. Students must present their plan of study to the head of the graduate program or the appropriate committee overseeing the integrated program prior to being admitted to the program. The plan should cover the entire time period of the integrated program, and it should be reviewed periodically with an adviser as the student advances through the program.

#### Degree Requirements

Students admitted to an integrated program (B.A.E./M.A.E. or B.A.E./M.S.) must maintain a GPA in all classes used toward the M.A.E. or M.S. degree of at least 3.0. For both the integrated B.A.E./M.A.E. and B.A.E./M.S. degree programs, 30 credits of the 172 total credits required to receive both degrees are applied toward the master's degree (up to 12 credits count toward both degrees). For the B.A.E./M.S. a minimum of 18 credits is required at the 500 and 600 level combined. For the B.A.E./

M.A.E., a minimum of 18 credits is required at the 500 or 800 levels, with at least 6 credits at the 500 level. For the B.A.E./M.A.E. degree program, all of graduate credits are course credits. For the B.A.E./M.S. degree program, a thesis is required and six credits of thesis research (AE 600 or AE 610) must be included in the candidate's academic course plan. Approved integrated program course sequences are available for each of the four undergraduate option areas. These sequences specifically identify the 12 credits of courses that count toward both degrees. The courses that can double-count for the B.A.E./M.A.E. are as follows:

Code	Title	Credits
<b>Courses Eligible to Double Count for Both Degrees: B.A.E./M.A.E.</b>		
AE 457	HVAC Control Systems	3
AE 461	Architectural Illumination Systems & Design	3
AE 467	Advanced Building Electrical System Design	3
AE 475	Building Construction Engineering I	3
AE 476	Building Construction Engineering II	3
AE 570	Production Management in Construction	3
AE 557	Centralized Cooling Production and Distribution Systems	3
AE 565	Daylighting	3

The courses that can be double-counted for the B.A.E./M.S. are as follows:

Code	Title	Credits
<b>Courses Eligible to Double Count for Both Degrees: B.A.E./M.S.</b>		
AE 430	Indeterminate Structures	3
AE 457	HVAC Control Systems	3
AE 461	Architectural Illumination Systems & Design	3
AE 467	Advanced Building Electrical System Design	3
AE 475	Building Construction Engineering I	3
AE 476	Building Construction Engineering II	3
AE 530	Computer Modeling of Building Structures	3
AE 557	Centralized Cooling Production and Distribution Systems	3
AE 558	Centralized Heating Production and Distribution Systems	3
AE 562	Advanced Lighting System Modeling	3
AE 565	Daylighting	3
AE 570	Production Management in Construction	3

At least 6 of the double-counted credits must be at the 500- or 800-level. Independent study courses and credits associated with the culminating experience for the graduate degree cannot be double-counted.

Each student must submit a course plan detailing the graduate component for approval when applying to this program and must request approval from the Graduate Program Officer for any proposed modifications to this plan following admission to the program. Students must sequence their courses so all undergraduate degree requirements are fulfilled before taking courses to count solely towards the graduate degree. Students are expected to complete the undergraduate degree requirements within the typical time to degree for the undergraduate major. In the semester in which the undergraduate degree requirements will be completed, IUG students must apply to graduate, and the undergraduate degree should be conferred at the next appropriate Commencement. If students accepted into the IUG program are unable to complete the M.A.E. or the M.S. degree, they are still eligible to receive

their undergraduate degree if all the undergraduate degree requirements have been satisfied.

## Minor

A graduate minor is available in any approved graduate major or dual-title program. The default requirements for a graduate minor are stated in Graduate Council policies listed under GCAC-600 Research Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>) and GCAC-700 Professional Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>), depending on the type of degree the student is pursuing:

- GCAC-611 Minor - Research Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-611-minor-research-doctorate/>)
- GCAC-641 Minor - Research Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-641-minor-research-masters/>)
- GCAC-709 Minor - Professional Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-709-professional-doctoral-minor/>)
- GCAC-741 Minor - Professional Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-741-masters-minor-professional/>)

## Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (<https://gradschool.psu.edu/graduate-funding/>) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (<https://gradschool.psu.edu/graduate-education-policies/gsad/gsad-900/gsad-901-graduate-assistants/>) set by The Graduate School.

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 699 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 (AE) Course List (<https://bulletins.psu.edu/university-course-descriptions/graduate/ae/>)

## Contact

<b>Campus</b>	University Park
<b>Graduate Program Head</b>	James Freihaut
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