CIVIL ENGINEERING, B.S. (HARRISBURG)

Begin Campus: Any Penn State Campus
End Campus: Harrisburg

Program Description
The program in Civil and Environmental Engineering is designed to provide the basic undergraduate education required for private practice and public service in civil engineering, and/or continue formal education. Emphasis is placed on the fundamentals of civil engineering principles and design techniques. Students utilize basic engineering science concepts in several of the different specialty areas (e.g., construction/management, environmental, materials/pavement design/geotechnical, structures, transportation, and water resources). Finally the students are able to choose an area of specialization for professional practice or graduate studies.

The program is broadened by courses in communication, arts, humanities, social and behavioral sciences, as well as other engineering disciplines. Students gain experience in working as members of a team and using interdisciplinary approaches to solve problems. These experiences, as well as those related to engineering principles and design, are provided through exercises in the classroom, laboratory, and field. The program culminates in a capstone design course wherein the students’ knowledge and skills are applied to actual engineering problems.

Entrance to Major
In addition to the minimum grade point average (GPA) requirements described in the University Policies, all College of Engineering entrance to major course requirements must also be completed with a minimum grade of C: CHEM 110, MATH 140, MATH 141, and PHYS 211. All of these courses must be completed by the end of the semester during which the admission to major process is carried out.

1 In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements
For the Bachelor of Science degree in Civil Engineering, a minimum of 127 credits is required:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>112</td>
</tr>
</tbody>
</table>

General Education
Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (http://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required.)
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Knowledge Domains
- Arts (GA): 6 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 6 credits
- Social and Behavioral Sciences (GS): 6 credits
- Natural Sciences (GN): 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)
- Inter-Domain or Approved Linked Courses: 6 credits

27 of these 45 credits are included in the Requirements for the Major.

University Degree Requirements
First Year Engagement
All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement
6 credits are required and may satisfy other requirements
- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum
3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits
A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work
Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition
The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward
Requirements for the Major

This includes 27 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.S. in Civil Engineering/ M.Eng. in Environmental Engineering Program

The Civil Engineering undergraduate and Environmental Engineering graduate program offers a limited number of academically superior Bachelor of Science candidates the opportunity to enroll in an integrated, continuous program of study leading to both the Bachelor of Science in Civil Engineering and the Master of Engineering in Environmental Engineering. The ability to coordinate as well as concurrently pursue the two degree programs enables the student to earn the two degrees in five years.

Students in the IUG program must satisfy the degree requirements for both Bachelor of Science and Master of Engineering degrees. However, the total course load is reduced due to the maximum of 10 credits that can count towards both degrees. A minimum of 7 credits proposed to count for both degrees must be at the 500 level. Master's paper credits are identical to the first three years of the Bachelor of Science program.

Select 3 credits from the following:

- ECON 102: Introductory Microeconomic Analysis and Policy
- ECON 104: Introductory Macroeconomic Analysis and Policy
- ECON 114: Principles of Economics
- ME 201: Introduction to Thermal Science
- or CHE 220: Introduction to Chemical Engineering Thermodynamics
- CE 337: Civil Engineering Materials Laboratory
  or CE 475: Water Quality Chemistry

Select 9 credits from the following:

- CE 341: Design of Concrete Structures
- CE 342: Design of Steel Structures
- CE 371: Water and Wastewater Treatment
- CE 422: Transportation Planning
- CE 423: Traffic Operations
- CE 432: Construction Project Management
- CE 435: Foundation Engineering
- CE 436: Construction Engineering Materials
- CE 437: Engineering Materials for Sustainability
- CE 441: Structural Design of Foundations
- CE 447: Structural Analysis by Matrix Methods
- CE 461: Water-resource Engineering
- CE 462: Open Channel Hydraulics
- CE 475: Water Quality Chemistry
- CE 476: Solid and Hazardous Wastes
- CE 479: Environmental Microbiology for Engineers

Select 3 credits of CE level "W" courses

Supporting Courses and Related Areas

Select 9 credits of technical elective from CE 300-level courses, CE 400-level courses, or department list

1 Students may substitute 6 credits of ROTC for 3 credits of 400-level CE courses and 3 credits of ME or EE.
2 If CE 475 is taken, one credit goes toward lab requirement and remaining three go towards CE or general technical electives.
3 Those courses must be selected from at least 4 of the 5 technical areas in the Civil Engineering program—transportation (x20), construction (x30), structures (x40), hydrosystems (x60), and environmental (x70).
The fourth year of the IUG program differs from that of the Bachelor of Science program due to the courses that count toward the Master of Science degree requirements.

Students will be admitted on a provisional basis late in their 6th semester so that they may be advised appropriately for the IUG 7th semester courses. Formal acceptance is contingent upon maintaining a 3.0 cumulative GPA through the 6th semester, and a collective GPA of 3.3 or better in courses designated MATH, CHEM, CE, or ENVE.

Student performance will be monitored on an ongoing basis. In addition, a formal evaluation of student academic performance will be performed when the student has completed 114 to 115 credits, the end of the first semester of the senior year for a typical student in the program. Students who have not maintained a collective 3.3 GPA in courses designated MATH, CHEM, CE, or ENVE will be transferred to a probationary status. Students who have not maintained a collective GPA of 3.3 or better in courses designated MATH, CHEM, CE, or ENVE by end of their eighth semester will be dropped from the graduate program but will continue in the Bachelor of Science CE degree program.

If for any reason a student admitted to the IUG program is unable to complete the requirements for the Master of Engineering degree, the student will be permitted to receive the Bachelor of Science degree, assuming all the undergraduate degree requirements have been completed satisfactorily.

Students have the choice of receiving the B.S. degree at the end of the fourth year or waiting until the end of the fifth year to receive both degrees. Students who elect to receive the B.S. degree at the end of the fourth year will pay graduate tuition for courses taken in the fifth year; students opting to receive both degrees at the end of the fifth year will pay undergraduate tuition for all five years. Note that students who are awarded a graduate assistantship must elect to receive the B.S. degree at the end of the fourth year. If for any reason a student admitted to the IUG program is unable to complete the requirements for the Master of Science degree, the student will be permitted to receive the Bachelor of Science degree assuming all the undergraduate degree requirements have been satisfactorily completed. Students who successfully complete the courses listed in the recommended schedule will satisfy the requirements for the Bachelor of Science degree by the end of their fourth year.

Admission Requirements

To apply, students must be enrolled in the PSH Civil Engineering B.S. program. To initiate the application process, students must submit an Integrated Undergraduate-Graduate (IUG) Degree in Civil Engineering Application Form, a transcript, and three faculty recommendations. If the student expresses interest early in their undergraduate career, their faculty adviser will help undergraduate candidates determine a sequence of courses that will prepare the for acceptance into the Integrated Undergraduate-Graduate (IUG) degree program. In order to apply for the IUG program, students must have completed a minimum of 82 credits. At the time of the application, students must have completed or be enrolled in:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 335</td>
<td>Engineering Mechanics of Soils</td>
<td>3</td>
</tr>
<tr>
<td>CE 336</td>
<td>Materials Science for Civil Engineers</td>
<td>3</td>
</tr>
<tr>
<td>CE 360</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CE 370</td>
<td>Introduction to Environmental Engineering</td>
<td>3</td>
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</tbody>
</table>

A typical student would apply by the sixth semester and before the beginning of the seventh semester. For consideration for acceptance into the program, students must have earned a minimum cumulative grade-point average of 3.0, and a collective GPA of 3.3 or better in courses designated MATH, CHEM, CE, or ENVE.

To apply formally, students must submit a completed Graduate School application. The student should mention in the notes section that the application is for the IUG program in Civil Engineering/Environmental Engineering.

Students will be admitted on a provisional basis late in the spring semester of their application year so that they may be advised appropriately for the IUG 7th semester courses. Formal acceptance is contingent upon maintaining the 3.0 cumulative GPA through the 6th semester, and a collective GPA of 3.3 or better in courses designated MATH, CHEM, CE, or ENVE.

Degree Requirements

Students in the IUG program must satisfy the degree requirements for both Bachelor of Science and Master of Engineering degrees. The total course load is reduced due to a maximum of 10 credits that can count towards both degrees. The minimum of 7 credits double-counted must be at the 500 level. Master’s paper credits may not be double counted.

Program Educational Objectives

The objective of the Civil Engineering program is to prepare students for a wide range of career paths that use civil engineering principles and methodologies. A curriculum is provided that prepares our recent graduates to:

- begin and sustain a career in consulting, industry, or state and federal government agencies, such as the departments of transportation and departments of environmental protection;
- lead and work in interdisciplinary teams needed to design sustainable and resilient infrastructure through knowledge and application of environmental, geotechnical, materials, structural, transportation, and water resources engineering;
- engage in life-long learning opportunities, including graduate school; and
- obtain and maintain professional licensure

Program Outcomes (Student Outcomes)

The undergraduate program will provide students with:

- an ability to apply knowledge of mathematics, science, and engineering;
- an ability to design and conduct experiments, as well as to analyze and interpret data;
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
- an ability to function on multidisciplinary teams;
- an ability to identify, formulate, and solve engineering problems;
- an understanding of professional and ethical responsibility;
- an ability to communicate effectively;
- an understanding of the impact of engineering solutions in a global, economic, environmental, and societal context;
i. a recognition of the need for, and an ability to engage in, lifelong learning;

j. knowledge of contemporary issues in civil engineering;

k. an ability to use modern engineering techniques, skills, and tools necessary for engineering practice.

Academic Advising
The objectives of the university’s academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of-class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee’s unit of enrollment will provide each advisee with a primary academic adviser, the information need to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy)

Harrisburg
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Suggested Academic Plan
Harrisburg Campus
The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

<table>
<thead>
<tr>
<th>First Year</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
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<td>ENGL 15 or 30†</td>
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<td>EDSGN 100</td>
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<td>ECON 102 or 104†</td>
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<td>CHEM 110†</td>
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<td>CAS 100†</td>
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<td>CHEM 111†</td>
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<td>MATH 141†</td>
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<td>MATH 140†</td>
<td>4</td>
<td>PHYS 211†</td>
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<td>CE 100S</td>
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<table>
<thead>
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<th>Second Year</th>
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<tr>
<td>GEOSC 1</td>
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<td>CMPSC 121, 200, 201, or 202</td>
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<td>EMCH 211†</td>
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<td>EMCH 212†</td>
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<tr>
<td>PHYS 212†</td>
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<td>EMCH 213†</td>
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<td>MATH 251†</td>
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<td>MATH 220</td>
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<thead>
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<th>Third Year</th>
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<th>Credits</th>
<th>Spring</th>
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<tr>
<td>CE 310*</td>
<td>3</td>
<td>(C)(S)(G)(T) CE 341</td>
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</tr>
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<td>CE 336†</td>
<td>3</td>
<td>CE 321†</td>
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<tr>
<td>(C)(S)(G)(T)(E) CE 337</td>
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<td>CE 360†</td>
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<tr>
<td>CE 340†</td>
<td>3</td>
<td>CE 370†</td>
<td>3</td>
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<td>STAT 401</td>
<td>3</td>
<td>CE 335†</td>
<td>3</td>
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<td>CE 332†</td>
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<th>Spring</th>
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<td>General Education Course</td>
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<tr>
<td>(C)(S)(T)(G) CE 342; (E) CE 475</td>
<td>3-4</td>
<td>ME 201</td>
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<td>ENVE 417</td>
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<td>CE 4XXW</td>
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<tr>
<td>CE 3XX/CE 4XX - CE Elective</td>
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<td>Technical Elective</td>
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<td>Technical Elective</td>
<td>3</td>
<td>(E)(G) ENVE 415; (O)(T) CE 436</td>
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<tr>
<td><strong>Technical Elective, select One from Concentration list below</strong></td>
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<td><strong>Total</strong></td>
<td><strong>15-16</strong></td>
<td><strong>15</strong></td>
<td></td>
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</tbody>
</table>

* Course requires a grade of C or better for the major

† Course requires a grade of C or better for General Education

‡ Course satisfies General Education and degree requirement

1 CE 100S - First Year Seminar Course
2 CE 337 (E): 1 credit of CE 475 meets the lab requirement and 3 credits satisfies a Technical elective; lab requirement may also be met with CE 337
3 CE 3XX/CE 4XX list of acceptable courses available below
4 Technical Elective, select one from Concentration list below

University Requirements and General Education Notes:
US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).
W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.
GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of ‘C’ or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate
an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

Program Notes

• Students should select a concentration in one of the following areas: Construction (C), Structural (S), Environmental (E), Transportation (T), or General (G).

• Entrance to Major Requirements:
  • CHEM 110, MATH 140, MATH 141, PHYS 211, and PHYS 212 (with a grade of "C" or better)
  • Completed minimum of 29.1 credits
  • Minimum GPA: 2.00

• Graduation in this major requires a minimum of 127 total credits with a cumulative GPA of 2.0 or better.

Concentration List

Technical elective and elective courses can be selected from the following lists or from any other 300/400 Civil Engineering courses. Other 400-level engineering courses may be accepted with permission of the program coordinator. Students must carefully plan their program of study including course prerequisites and semester offerings. Students should check their degree audit and seek advice from their academic adviser.

• CE 341 - Design of Concrete Structures
• CE 342 - Design of Steel Structures
• CE 422 - Transportation Planning
• CE 423 - Traffic Operations
• CE 424 - Project Information Modeling
• CE 435 - Foundation Engineering
• CE 436 - Construction Engineering Materials
• CE 441 - Structural Design of Foundations
• CE 445 - Advanced Structural Analysis
• CE 447 - Structural Analysis by Matrix Methods
• CE 449 - Advanced Structural Design
• CE 462 - Open Channel Hydraulics
• CE 475 - Water Quality Chemistry
• CE 497 - Special Topics
• EMCH 400 - Advanced Strength of Materials and Design
• EMCH 461 - Finite Elements in Engineering
• ENVE 411 - Water Supply and Pollution Control
• ENVE 415 - Hydrology
• ENVE 430 - Sustainable Engineering
• ENVE 470 - Air Quality

Accreditation

The baccalaureate program in Civil Engineering at Harrisburg is accredited by the Engineering Accreditation Commission of ABET, Inc., www.abet.org (http://www.abet.org).

Contact

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