CIVIL ENGINEERING, B.S.
(CAPITAL)

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 culmination is a capstone design course wherein the students’ knowledge and skills are applied to actual engineering problems.

What is Civil Engineering?
Civil Engineering is the application of mathematics and physical science principles to solve the design, construction, and maintenance concerns of the natural and physically built environment. Civil engineering deals with public works including highways, railroads, bridges, buildings, and water and energy systems. Civil engineers work in the public sector for government agencies or in the private sector at consulting or construction firms. Some civil engineers hold supervisory or administrative positions, while others pursue careers in design, construction, or education. Civil engineers may also aim to develop solutions to environmental problems. They are involved in efforts to improve recycling, waste disposal, public health, and water and air pollution control.

You Might Like This Program If...
- You enjoy math and creative problem-solving.
- You like to build and create projects or models.
- You prefer to use analysis and the scientific method to understand things.
- You enjoy working on multidisciplinary teams on complex problems.

Entrance to Major
In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out.

- Completed 29-55 cumulative credits (credits completed at Penn State for which a quality letter grade was earned)
- Completed with a C or better the following courses: CHEM 110, MATH 140, MATH 141, and PHYS 211
- Attained at least a 2.6 cumulative grade point average

- 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>109</td>
</tr>
<tr>
<td>27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.</td>
<td></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 (GWH): 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

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 degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80)). For more information, check the Suggested Academic Plan for your intended program.

**Requirements for the Major**

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).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
<td>Chemical Principles I</td>
<td>3</td>
</tr>
<tr>
<td>EDSGN 100</td>
<td>Introduction to Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 211</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 212</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 213</td>
<td>Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 202C</td>
<td>Effective Writing: Technical Writing</td>
<td>3</td>
</tr>
<tr>
<td>MATH 140</td>
<td>Calculus With Analytic Geometry I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus With Analytic Geometry II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 251</td>
<td>Ordinary and Partial Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>General Physics: Electricity and Magnetism</td>
<td>4</td>
</tr>
</tbody>
</table>

**Additional Courses**

- CE 377: Civil Engineering Materials Laboratory 1
- CHE 220: Introduction to Chemical Engineering Thermodynamics 2
- or ME 201: Introduction to Thermal Science
- CMPSC 200: Programming for Engineers with MATLAB
- or CMPSC 201: Programming for Engineers with C++

Select one of the following:

- 1 credit of First-Year Seminar or Elective

Select one of the following:

- ECON 14: Principles of Economics
- ECON 102: Introductory Microeconomic Analysis and Policy
- ECON 104: Introductory Macroeconomic Analysis and Policy

Select 6 credits of the following:

- CE 341: Design of Concrete Structures
- CE 342: Design of Steel Structures
- CE 371: Water and Wastewater Treatment
- 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 400 level ‘W’ courses

**Additional Courses: Require a grade of C or better**

- CAS 100A: Effective Speech
- or CAS 100B: Effective Speech
- ENGL 15: Rhetoric and Composition
- or ENGL 30: Honors Freshman Composition

**Supporting Courses and Related Areas**

Select 12 credits of technical elective from CE 300-level courses, CE 400-level courses, or department list

1 If CE 475 is taken, one credit goes toward lab requirement and remaining three go towards CE or general technical electives.

2 Students may substitute 6 credits of ROTC for 3 credits of GHW courses and 3 credits of ME.
Two of those courses must be selected from at least 2 of the 3 remaining technical areas in the Civil Engineering program—structures (x40), hydrosystems (x60), and environmental (x70).

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

*Available at the following campuses: Harrisburg*

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 may not be double counted. The first three years of the IUG program are identical to the first three years of the Bachelor of Science program. 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 on-going 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 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>
</tr>
</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
Program Outcomes (Student Outcomes)
The undergraduate program will provide students with:

a. an ability to apply knowledge of mathematics, science, and engineering;
b. an ability to design and conduct experiments, as well as to analyze and interpret data;
c. 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;
d. an ability to function on multidisciplinary teams;
e. an ability to identify, formulate, and solve engineering problems;
f. an understanding of professional and ethical responsibility;
g. an ability to communicate effectively;
h. 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, life-long 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 needed 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/)

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environmental, geotechnical, materials, structural, transportation, and water resources engineering;
• engage in life-long learning opportunities, including graduate school; and
• obtain and maintain professional licensure

Suggested Academic Plan
The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2020-21 academic year. To access previous years’ suggested academic plans, please visit the archive (http://bulletins.psu.edu/undergraduate/archive/) to view the appropriate Undergraduate Bulletin edition (Note: the archive only contain suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin).

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.

First Year
Fall Credits Spring Credits
ENGL 15 or 30‡ 3 General Education Course 3
EDSGN 100 or 100S 3 ECON 102 or 104‡ 3
CHEM 110∗† 3 CAS 100‡ 3
CHEM 111 † 1 MATH 141∗† 4
MATH 140∗† 4 PHYS 211∗† 4
CE 100S 1
15 17

Second Year
Fall Credits Spring Credits
General Education Course 3 General Education Course 3
GEOSC 1 3 CMPSC 121, 200, or 201 3
EMCH 211* 3 EMCH 212* 3
PHYS 212* 4 EMCH 213* 3
MATH 251* 4 MATH 220 2
ENGL 202C‡ 3
17 17

Third Year
Fall Credits Spring Credits
CE 310∗ 3 (C)(S)(G)(T) CE 341 3
CE 336∗ 3 CE 321∗ 3
(C)(S)(G)(T)(E) CE 337 1 CE 360∗ 3
CE 340∗ 3 CE 370∗ 3
STAT 401 3 CE 335∗ 3
CE 332∗ 3 General Education Course (GHW) 1.5
General Education Course (GHW) 1.5
17.5 16.5

Fourth Year
Fall Credits Spring Credits
General Education Course 3 General Education Course 3
check their degree audit and seek advice from their academic adviser. Including course prerequisites and semester offerings. Students should carefully plan their program of study with the program coordinator. Students must carefully plan their program of study with CE 337 (E): 1 credit of CE 475 meets the lab requirement and 3 credits satisfies a Techniical elective; lab requirement may also be met with CE 337. CE 3XX/CE 4XX list of acceptable courses available below and 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 may 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, and PHYS 211 (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

### Career Paths

Our graduates work in a variety of fields to develop solutions for challenges in design, construction, research, and education. Civil engineering graduates work in the public sector for government agencies or in the private sector at consulting or construction firms. Some civil engineers hold supervisory or administrative positions, while others pursue careers in design, construction, or education.

### Opportunities for Graduate Studies

Our graduate degree programs give students a stronger foundation in civil or environmental engineering that helps prepare them to apply their skills across a broad range of disciplines in both academia and industry. If you wish to develop and expand your expertise, you will have ample opportunity to do so here. Our first-rate faculty collectively possess a deep and broad range of knowledge that provides an ideal environment for interdisciplinary work. Whether your passion calls you to start your own business, pursue the next ground-breaking innovation, or help solve a humanitarian crisis, our graduate degree programs can take you closer to your goals.

### Professional Resources

- American Concrete Institute (https://www.concrete.org/)
- American Society of Civil Engineers (https://www.asce.org)

### 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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https://harrisburg.psu.edu/science-engineering-technology/civil-structural-engineering/bachelor-science-civil-engineering (https://harrisburg.psu.edu/science-engineering-technology/civil-structural-engineering/bachelor-science-civil-engineering/)

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