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 one of the oldest and most socially-relevant engineering disciplines. Grounded in mathematics and science, civil engineers make a lasting impact as they plan, design, construct, operate, and maintain the everyday, yet critical, infrastructure systems needed in our daily lives. In this challenging and diverse field, civil engineers also find solutions for critical environmental issues, including slowing the progress and mitigating the effects of climate change, eliminating the causes and treating the effects of environmental pollutants, and providing access to clean water. In recent years, the rapid application of new technologies has fostered the development of autonomous vehicles, 3D printing, smart structures, advanced materials, and new forms of renewable energy.

You Might Like This Program If...
- You want to design and build large-scale projects that last a long time.
- You care about the quality of the water that comes out of the faucet.
- You are interested in the operations and safety of future transportation systems.
- You try to find sustainable solutions for every challenge, big or small.
- You would like to use your technical skills in an exciting, people-serving profession.

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: EDSGN 100, 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>
</tbody>
</table>

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.

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 (https://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

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 111</td>
<td>Experimental Chemistry I</td>
<td>1</td>
</tr>
<tr>
<td>GEOSC 1</td>
<td>Physical Geology</td>
<td>3</td>
</tr>
<tr>
<td>MATH 220</td>
<td>Matrices</td>
<td>2</td>
</tr>
<tr>
<td>STAT 401</td>
<td>Experimental Methods</td>
<td>3</td>
</tr>
<tr>
<td>Prescribed Courses: Require a grade of C or better</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE 310</td>
<td>Surveying</td>
<td>3</td>
</tr>
<tr>
<td>CE 321</td>
<td>Highway Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 332</td>
<td>Professionalism, Economics &amp; Construction Project Delivery</td>
<td>3</td>
</tr>
<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 340</td>
<td>Structural Analysis</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>
<tr>
<td>CHEM 110</td>
<td>Chemical Principles I</td>
<td>3</td>
</tr>
<tr>
<td>EDSGN 100</td>
<td>Cornerstone 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>
<tr>
<td>Additional Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE 337</td>
<td>Civil Engineering Materials Laboratory 1</td>
<td>1</td>
</tr>
<tr>
<td>or CE 475</td>
<td>Water Quality Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHE 220</td>
<td>Introduction to Chemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>or ME 201</td>
<td>Thermodynamics 2</td>
<td></td>
</tr>
<tr>
<td>CMPSC 200</td>
<td>Programming for Engineers with MATLAB</td>
<td>3</td>
</tr>
<tr>
<td>or CMPSC 201</td>
<td>Programming for Engineers with C++</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CE 100S</td>
<td>Topics and Contemporary Issues in Civil and Environmental Engineering: First-Year Seminar</td>
<td></td>
</tr>
<tr>
<td>1 credit of First-Year Seminar or Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ECON 14</td>
<td>Principles of Economics</td>
<td></td>
</tr>
<tr>
<td>ECON 102</td>
<td>Introductory Microeconomic Analysis and Policy</td>
<td></td>
</tr>
<tr>
<td>ECON 104</td>
<td>Introductory Macroeconomic Analysis and Policy</td>
<td></td>
</tr>
<tr>
<td>Select 6 credits of the following:</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>CE 341</td>
<td>Design of Concrete Structures</td>
<td></td>
</tr>
<tr>
<td>CE 342</td>
<td>Design of Steel Structures</td>
<td></td>
</tr>
<tr>
<td>CE 371</td>
<td>Water and Wastewater Treatment</td>
<td></td>
</tr>
<tr>
<td>CE 441</td>
<td>Structural Design of Foundations</td>
<td></td>
</tr>
<tr>
<td>CE 447</td>
<td>Structural Analysis by Matrix Methods</td>
<td></td>
</tr>
<tr>
<td>CE 461</td>
<td>Water-resource Engineering</td>
<td></td>
</tr>
<tr>
<td>CE 462</td>
<td>Open Channel Hydraulics</td>
<td></td>
</tr>
<tr>
<td>CE 475</td>
<td>Water Quality Chemistry</td>
<td></td>
</tr>
<tr>
<td>CE 476</td>
<td>Solid and Hazardous Wastes</td>
<td></td>
</tr>
<tr>
<td>CE 479</td>
<td>Environmental Microbiology for Engineers</td>
<td></td>
</tr>
<tr>
<td>Select 3 credits of CE 400 level &quot;W&quot; courses</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Additional Courses: Require a grade of C or better</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAS 100A</td>
<td>Effective Speech</td>
<td>3</td>
</tr>
<tr>
<td>or CAS 100B</td>
<td>Effective Speech</td>
<td></td>
</tr>
<tr>
<td>ENGL 15</td>
<td>Rhetoric and Composition</td>
<td>3</td>
</tr>
<tr>
<td>or ENGL 30H</td>
<td>Honors Rhetoric and Composition</td>
<td></td>
</tr>
<tr>
<td>Supporting Courses and Related Areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select 12 credits of technical elective from CE 300-level courses, CE 400-level courses, or department list</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 If CE 475 is taken, one credit goes toward lab requirement and remaining three go towards CE or general technical electives.
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 and M.Eng. in Environmental Engineering**

*Available at the following campuses: Harrisburg*

Requirements for the Integrated B.S. in Civil Engineering and M.Eng. in Environmental Engineering can be found in the Graduate Bulletin (https://bulletins.psu.edu/graduate/).

**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:

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 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/)

### Harrisburg

Seroj Mackertich, Ph.D.
Program Chair
Olmsted Building, W236
Middletown, PA 17057
717-948-6131
oct@psu.edu

### University Park

Brenton Hockenberry
Undergraduate Administrative Support Assistant
218 Sackett Building
University Park, PA 16802
814-867-0470
blh5621@psu.edu

**Suggested Academic Plan**

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2021-22 academic year. To access previous years’ suggested academic plans, please visit the archive (https://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).

**Civil Engineering, B.S. at 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>Credits</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td><strong>Credits</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>ENGL 15 or 30H†</td>
<td>3</td>
<td>General Education Course</td>
<td>3</td>
</tr>
<tr>
<td>EDSGN 100 or 100S</td>
<td>3</td>
<td>ECON 102 or 104†</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 110*†</td>
<td>3</td>
<td>CAS 100†</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 111†</td>
<td>1</td>
<td>MATH 141*†</td>
<td>4</td>
</tr>
<tr>
<td>MATH 140*†</td>
<td>4</td>
<td>PHYS 211*†</td>
<td>4</td>
</tr>
<tr>
<td>CE 100S</td>
<td>1</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

15 17
Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, General Education program courses. General Education includes GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify requirement.

Designate courses that satisfy University Writing Across the Curriculum. W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Requirements and General Education Notes:

- **US and IL** are abbreviations used to designate courses that satisfy University Requirements and General Education.

- **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

Civil engineers are responsible for designing, building, and maintaining the critical systems that support society and protect the environment. Graduates of the civil engineering program are prepared to be innovative leaders in a diverse range of industries. Students are routinely recruited for positions in the public sector with government agencies or in the private sector at consulting firms or construction companies. Students
may also choose to continue their formal education by pursuing advanced degrees, and many remain in academia upon graduation.

**Careers**

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.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE CIVIL ENGINEERING PROGRAM (https://www.asce.org/careers/)

CAREER RESOURCES FOR CIVIL ENGINEERING STUDENTS (https://www.cee.psu.edu/academics/resources/career-resources.aspx)

**Opportunities for Graduate Studies**

In our graduate programs, students learn in the classroom and the laboratory, finding a broad network of mentors and collaborators. After graduation, many career options await.

- The one-year Master of Engineering (M.Eng.) (https://www.cee.psu.edu/academics/graduate/degrees-and-requirements.aspx#MEng) program gives you a strong foundation and leads to advanced professional practice.
- The Master of Science (M.S.) (https://www.cee.psu.edu/academics/graduate/degrees-and-requirements.aspx#MS) program blends advanced coursework and research, producing highly sought-after graduates.
- The Doctor of Philosophy (Ph.D.) (https://www.cee.psu.edu/academics/graduate/degrees-and-requirements.aspx#PhD) program provides a comprehensive educational and research opportunity, challenging students to be leaders of their fields.

What could you achieve with an advanced degree from the Department of Civil and Environmental Engineering at Penn State?

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (https://www.cee.psu.edu/academics/graduate/)

GRADUATE DEGREES AND REQUIREMENTS (https://www.cee.psu.edu/academics/graduate/degrees-and-requirements.aspx)

**Professional Resources**

- American Concrete Institute (https://www.concrete.org/)
- American Society of Civil Engineers (https://www.asce.org)
- PSU Civil and Environmental Engineering Professional Organization Student Chapter List (https://www.cee.psu.edu/academics/resources/student-organizations.aspx)

**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).

**Professional Licensure/Certification**

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (https://psu.edu/state-licensure-disclosures/) interactive map.

**Contact**

**Harrisburg**

SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY

Olmsted Building, W236

Middletown, PA 17057

717-948-6124

mab56@psu.edu

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

**University Park**

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

212 Sackett Building

University Park, PA 16802

814-867-0470

blh5621@psu.edu

https://www.cee.psu.edu/