Civil Engineering

Degree Awarded

• Bachelor of Science in Civil Engineering (B.S.C.E.)

Nature of Program

Civil Engineering, the most diverse branch of engineering, is directly related to the planning, design, construction, and maintenance of the infrastructure that directly affects public life. The infrastructure includes bridges, buildings, foundations, dams, sanitary and solid waste disposal systems, highways, airport facilities, transportation systems, waterways, hydroelectric installations, pipelines, coal preparation and loading facilities, and other systems and structures. Civil engineering also involves the understanding of environmental issues and geotechnical principles and how they relate to the design of the infrastructure.

Engineering students get a sound basic knowledge of science and a set of core courses in the humanities and social sciences. The Civil Engineering curriculum has been designed to give the student a broad coverage of all fields of civil engineering with some flexibility to explore a particular field of choice. This approach gives the WVU Tech graduate a well-rounded background to handle civil engineering project.

Design is incorporated across the Civil Engineering curriculum with the design experience beginning early with the Surveying and Mechanics of Materials courses. Design exposure continues in the junior and senior years, with a minimum of 11 courses having design components for a total of 17.5 credit hours of design. Design content is incorporated in the required courses such as Introductory Soil Mechanics, Hydraulic Engineering, Construction Materials, Transportation Engineering, Introduction to Environmental Engineering, the required structural design elective (Steel Design or Reinforced Concrete Design), the required geotechnical elective (Foundation Engineering, Earthwork Design, or Groundwater and Seepage), the required environmental elective (Advanced Sanitary Engineering, Solid Waste Management, Engineering Hydrology, or Advanced Hydraulic Engineering), and the required transportation elective (Highway Engineering, Pavement Design, or Traffic Engineering). Two additional electives (one CE Elective and one Technical Elective) must contain a minimum of two credit hours of design content.

The design component is completed with a capstone design course (Integrated Civil Engineering Design) in which student teams are responsible for the completion of a comprehensive civil engineering project which involves several civil engineering disciplines with oral and written presentations of the project. Discussion and consideration of constraints such as economic factors, safety, reliability, aesthetics, ethics, and environmental impact are incorporated as a normal part of most design courses. Aesthetics and environmental impact are stressed in the Introduction to Environmental Engineering course; and ethics, safety, and professional issues are covered in the Senior Engineering Seminar course. In addition to design, the Integrated Civil Engineering Design course includes principles of project and/or construction management, cost analysis and estimating, and scheduling.

Program Mission/Goals

• To prepare students to be able to apply science and mathematics to the analysis of civil engineering problems and the design of infrastructure systems to increase human welfare and promote sustainable development
• To prepare well-rounded students to practice engineering in a professional environment and to be successful in graduate school should they choose to attend
• To help students recognize the role of the civil engineer in contemporary society, especially with respect to the societal and environmental contexts of civil engineering projects
• To energize students to maximize individual potential, including acquisition of necessary skills and recognition of the need for continuing education and lifelong growth and development

Educational Objectives

• Our graduates will obtain employment in the civil engineering field and will hold positions having significant professional responsibility.
• Our graduates will obtain professional registration.
• Our graduates will be prepared academically and those who choose advanced studies will be successful.
• Our graduates will be equipped to learn new skills as they progress in their careers and, as a result, will possess their capabilities to move to positions having increased leadership, mentoring, and management responsibilities.

General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. (http://registrar.wvu.edu/gef)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

General Education Foundations

F1 - Composition & Rhetoric
ENGL 101 & ENGL 102 Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research or ENGL 103 Accelerated Academic Writing

F2A/F2B - Science & Technology 4-6
F3 - Math & Quantitative Skills 3-4
F4 - Society & Connections 3
F5 - Human Inquiry & the Past 3
F6 - The Arts & Creativity 3
F7 - Global Studies & Diversity 3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree) 9
Total Hours 31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

Curriculum Requirements

GEF Requirements

WVUE 191 First Year Seminar 1-3
DRET 120 Drafting 1 2
ENGL 101 Introduction to Composition and Rhetoric 6
& ENGL 102 and Composition, Rhetoric, and Research (GEF 1) 6
ENGL 305 Technical Writing 3
ECON 401 Managerial Economics (GEF 4) 3
GEOL 312 Geology 3

A minimum overall 2.0 GPA is required.

ENGR 111 Software Tools for Engineers 3
ENGR 401 Senior Engineering Seminar 1
ENGR 402 Fundamentals of Engineering Review 2
MAE 241 Statics 3
MAE 242 Dynamics 3
MAE 243 Mechanics of Materials 3
MAE 331 Fluid Mechanics 3
MATH 155 Calculus 1 (GEF 3) 4
MATH 156 Calculus 2 (GEF 8) 4
MATH 251 Multivariable Calculus 4
MATH 261 Elementary Differential Equations 4
MATH 448 Probability and Statistics 3
CHEM 115 Fundamentals of Chemistry (GEF 8) 4
CHEM 116 Fundamentals of Chemistry (GEF 8) 4
PHYS 111 General Physics (GEF 2) 4
CE 204 Surveying 3
CE 312 Construction Materials 3
CE 331 Transportation Engineering 3
CE 347 Introduction to Environmental Engineering 4
CE 351 Introductory Soil Mechanics 4
CE 361 Structural Analysis 1 4
CE 421 Hydraulic Engineering 4
CE 479 Integrated Civil Engineering Design-Capstone 3

CE Electives (select one from each area) 15

CE 461 Structural Analysis 2
CE 464 Timber Design
CE 497 Research

Any other 300 or 400 level CE course
## Environmental/Water Resources
- CE 422: Advanced Hydraulic Engineering
- CE 425: Engineering Hydrology
- CE 444: Advanced Sanitary Engineering
- CE 446: Solid Waste Management

## Geotechnical
- CE 451: Foundation Engineering
- CE 452: Groundwater and Seepage
- CE 453: Earthwork Design

## Structural Design
- CE 462: Reinforced Concrete Design
- CE 463: Steel Design

## Transportation
- CE 411: Pavement Design
- CE 431: Highway Engineering
- CE 432: Traffic Engineering

## Technical Electives (see list below)

### Total Hours: 125-127

- Out of these nine hours of electives (3 hours of required CE elective and 6 hours of Technical Electives), there must be at least 2 hours of ABET design content.

## Technical Electives

Any 300 or 400 level CE course

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOL 240</td>
<td>Microbiology</td>
<td>4</td>
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<tr>
<td>CHEM 215</td>
<td>Introductory Analytical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 233</td>
<td>Organic Chemistry</td>
<td>3</td>
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<tr>
<td>CHEM 234</td>
<td>Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>EE 221</td>
<td>Introduction to Electrical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MATH 420</td>
<td>Numerical Analysis 1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 441</td>
<td>Applied Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MAE 320</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>MAE 340</td>
<td>Vibrations</td>
<td>3</td>
</tr>
<tr>
<td>MAE 445</td>
<td>Computer Applications in Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MAE 456</td>
<td>Computer-Aided Design and Finite Element Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 112</td>
<td>General Physics</td>
<td>4</td>
</tr>
</tbody>
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## Suggested Plan of Study

### First Year

#### Fall
- ENGL 101 (GEF 1) 3
- WVUE 191 3
- CHEM 115 (GEF 8) 4
- DRET 120 2
- MATH 155 (GEF 3) 4

**Total Hours:** 14-16

#### Spring
- ENGL 102 (GEF 1) 3
- MATH 261 4

**Total Hours:** 17

### Second Year

#### Fall
- MAE 242 3
- MAE 243 3
- CE 204 3
- MATH 251 4

**Total Hours:** 12

#### Spring
- MAE 331 3
- MATH 261 3
- CE 331 4

**Total Hours:** 13
PHYS 111 (GEF 2) 4 GEOL 312 3

17 17

Third Year

Fall Hours Spring Hours
CE 312 3 CE 351 4
CE 421 4 CE 347 4
MATH 448 3 ENGL 305 3
CE Elective 3 CE Elective 3
GEF 5 3

16 14

Fourth Year

Fall Hours Spring Hours
ECON 401 (GEF 4) 3 CE 479 3
CE Elective 3 ENGR 401 1
CE Elective 3 ENGR 402 2
Technical Elective 3 CE Elective 3
GEF 6 3 Technical Elective 3
GEF 7 3

15 15

Total credit hours: 125-127

Major Learning Outcomes

CIVIL ENGINEERING

Our graduates will demonstrate:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- An ability to communicate effectively with a range of audiences.
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.