

# Civil Engineering, B.S.C.E.

---

## Degree Offered

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

## Nature of the 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.

Students get a sound basic knowledge of engineering and science as well as intellectual breath through 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 projects.

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 12 courses having design components for a total of 18 credit hours of ABET design content. In addition, 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) are also required. The five civil engineering electives and one technical elective must contain a minimum total of nine credit hours of ABET 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 involving 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 and scheduling. The Integrated Civil Engineering Design course also incorporates cost analysis and estimating principles that are first taught in the prerequisite course CMGT 350 Construction Estimating.

## 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 the careers and, as a result, will possess the 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.

Code	Title	Hours
<b>General Education Foundations</b>		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Reasoning		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

Code	Title	Hours
University Requirements		16
Program Requirements		9
Math and Science Requirements *		34
Civil Engineering Major Engineering		66
Total Hours		125

## University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 5, 6, and 7		15
WVUE 191	First Year Seminar	1
Total Hours		16

## Program Requirements

Code	Title	Hours
CMGT 350	Construction Estimating	3
ECON 401	Managerial Economics (GEF 4)	3
WRIT 305	Technical Writing	3
Total Hours		9

An overall 2.0 Professional GPA is required. Professional GPA includes all Math, Science and Engineering Major courses, excluding DRET 120.

## Math and Science Requirements\*

Code	Title	Hours
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 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory (GEF 8)	4

CHEM 116 & 116L	Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory (GEF 8)	4
GEOL 312	Geology	3
PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory (GEF 2)	4
Total Hours		34

## Civil Engineering Major Requirements

Code	Title	Hours
DRET 120	Drafting 1	2
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
CE 204	Surveying	3
CE 312	Construction Materials	3
CE 331	Transportation Engineering	3
CE 347 & 347L	Introduction to Environmental Engineering and Introduction to Environmental Engineering Laboratory	4
CE 351 & 351L	Introductory Soil Mechanics and Introductory Soil Mechanics Laboratory	4
CE 361	Structural Analysis 1	4
CE 421	Hydraulic Engineering	4
CE 479	Integrated Civil Engineering Design-Capstone	3
<b>CE Electives (select one from each area) **</b>		<b>15</b>
CE 375	Geographic Information Systems (GIS) Applications in Engineering	
CE 461	Structural Analysis 2	
CE 464	Timber Design	
CE 497	Research	
Any other 300 or 400 level CE course		
<b>Environmental/Water Resources</b>		
CE 422	Advanced Hydraulic Engineering	
CE 425	Engineering Hydrology	
CE 444	Advanced Sanitary Engineering	
CE 446	Solid Waste Management	
<b>Geotechnical</b>		
CE 451	Foundations Engineering	
CE 452	Groundwater and Seepage	
CE 453	Earthwork Design	
<b>Structural Design</b>		
CE 462	Reinforced Concrete Design	
CE 463	Steel Design	
<b>Transportation</b>		
CE 411	Pavement Design	
CE 431	Highway Engineering	
CE 432	Traffic Engineering	
<b>Technical Electives (see list below) **</b>		<b>3</b>
Total Hours		66

\*

Students choosing to minor in Mathematics will need to take additional courses to ensure 9 unique Math credits are applied toward the minor.

\*\*

The five CE elective courses and the one Technical Elective course must contain at least 9 hours of combined ABET design content.

## Technical Electives

Code	Title	Hours
Any 300 or 400 level CE course		
BIOL 240	Microbiology	4
CHEM 215	Introductory Analytical Chemistry	3
CHEM 233	Organic Chemistry 1	3
CHEM 234	Organic Chemistry 2	3
EE 221	Introduction to Electrical Engineering	3
MATH 420	Numerical Analysis 1	3
MATH 441	Applied Linear Algebra	3
MAE 320	Thermodynamics	3
MAE 340	Vibrations	3
MAE 445	Computer Applications in Engineering	3
MAE 456	Computer-Aided Design and Finite Element Analysis	2
PHYS 112	General Physics 2	4

## Suggested Plan of Study

### First Year

Fall	Hours	Spring	Hours
ENGL 101 (GEF 1)		3 ENGL 102 (GEF 1)	3
WVUE 191		1 MAE 241	3
CHEM 115 & 115L (GEF 8)		4 ENGR 111	3
DRET 120		2 CHEM 116 & 116L (GEF 8)	4
MATH 155 (GEF 3)		4 MATH 156 (GEF 8)	4
		14	17

### Second Year

Fall	Hours	Spring	Hours
MAE 242		3 MAE 331	3
MAE 243		3 CE 361	4
CE 204		3 MATH 261	4
MATH 251		4 CE 331	3
PHYS 111 & 111L (GEF 2)		4 GEOL 312	3
		17	17

### Third Year

Fall	Hours	Spring	Hours
CE 312		3 CE 347 & 347L	4
CE 421		4 CE 351 & 351L	4
MATH 448		3 WRIT 305	3
CE Structural Design Elective		3 CE Environmental/Water Resources Elective	3
GEF 5		3	
		16	14

**Fourth Year**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>
ECON 401 (GEF 4)		3 CE 479	3
CE Geotechnical Elective		3 ENGR 401	1
CE Elective		3 ENGR 402	2
CMGT 350		3 CE Transportation Elective	3
GEF 6		3 Technical Elective	3
		GEF 7	3
		15	15

Total credit hours: 125

**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.