Degree Offered

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

Civil Engineering

Civil engineering historically encompassed all engineering endeavors needed to provide the infrastructure for society to function. Because of its origin and history, civil engineering still embraces a wide variety of technological areas. These include:

• Construction
• Environmental and Water Resources
• Geotechnical
• Structures
• Transportation

Civil engineers work with problems that directly impact the health and economic vitality of people and communities. These problems include waste disposal, environmental pollution, transportation systems analysis and design, water resource development, and the design, construction, and rehabilitation of constructed facilities such as dams, bridges, buildings, and highways.

Thus, the challenges and opportunities for a civil engineer lie in combining technical competence with a human concern for the applications of technology. To help students to understand their role in the community, to be effective in working with design teams involving other engineers and other professionals, and to be effective in written and spoken communications, the curriculum attempts to give a meaningful educational experience in the humanities, social studies, English, and economics.

The goal of the undergraduate curriculum in civil engineering is to prepare graduate civil engineers to meet the present and the future infrastructural and environmental needs of society. This requires an education based on scientific and engineering fundamentals as well as one that incorporates experience in engineering design using modern technology. Because the systems they design impact the public directly, civil engineers must be aware of the social and environmental consequences of their designs. Graduates must be prepared to work and communicate with other professionals in a variety of associations and organizations. Ethics and life-long learning are essential components in the education of civil engineers.

During the course of study, civil engineering students are given a solid grounding in mathematics, physics, and chemistry. Added to this is extensive development of the fundamentals of materials science, construction, water and environmental, soils, structural, and transportation systems engineering. This broad base of knowledge is provided to assure that civil engineers are educated in all branches of the profession and to permit continuous learning throughout a professional lifetime. Throughout the program, each student works with an academic advisor in the selection of electives. Specialization in one or more of the branches of civil engineering is possible by selection of a sequence of technical electives during the junior and senior years.

Program Educational Objectives

• The graduates will be successful in their professional careers as civil engineers in industry, public agencies, and/or post-graduate education.
• The graduates will continue to develop professionally and serve in leadership roles.
• The graduates will be successful in demonstrating their obligations to the profession, to their employer, and to society.

Student Outcomes

Upon graduation, all Bachelor of Science students in Civil Engineering will have:

• 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.
• The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
• A recognition of the need for, and an ability to engage in life-long learning.
• A knowledge of contemporary issues.
• An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

FACULTY

CHAIR
• Hema J. Siriwardane - Ph.D. (Virginia Polytechnic Institute and State University)
  Geomechanics/geotechnical engineering, Finite element method, Computer applications

PROFESSORS
• Hung-Liang (Roger) Chen - Ph.D. (Northwestern University)
  Structural dynamics, Structural experimentation, Dynamic soil-structure interaction, Damage in reinforced concrete structures, Nondestructive evaluation, Concrete
• Hota GangaRao - Ph.D., P.E. (North Carolina State University)
  Maurice A. and Jo Ann Wadsworth Distinguished Professor, Director, Constructed Facilities Center. Director, NSF Center for Integration of Composites into Infrastructure, Mathematical modeling of engineering systems, Bridge engineering, Composite material characterization and implementation
• Udaya B. Halabe - Ph.D. (Massachusetts Institute of Technology)
  Nondestructive evaluation and in-situ condition assessment of structures and materials, Elastic and electromagnetic (radar) wave propagation, Structural analysis and design, Structural dynamics and wind/earthquake resistant design
• Lian-Shin Lin - Ph.D. (Purdue University)
  Physicochemical and biological treatment, Innovative wastewater technologies, Emerging contaminants, sustainable development, Watershed pollution
• David R. Martinelli - Ph.D. (University of Maryland)
  Transportation engineering, Traffic operations, Systems analysis, Infrastructure management
• Radhey Sharma - Ph.D. (Oxford)
  Sustainable infrastructure, Geotechnical engineering & geoenvironmental, Energy engineering
• Hema J. Siriwardane - Ph.D. (Virginia Polytechnic Institute and State University)
  Geomechanics/geotechnical engineering, Finite element method, Computer applications
• John P. Zaniewski - Ph.D. (University of Texas)
  Asphalt Technology Professor, Pavement materials, Design, Construction, Maintenance, Infrastructure management

ASSOCIATE PROFESSORS
• Karl Barth - Ph.D. (Purdue University)
  Jack H. Samples Distinguished Professor of Structures, Steel structures, Bridge design and rehabilitation, Connections, Stability analysis, Experimental mechanics
• Leslie Clark Hopkinson - Ph.D. (Virginia Polytechnic Institute and State University)
  Surface hydrology, Environmental hydraulics, Ecological engineering, River mechanics
• John D. Quaranta - Ph.D. (West Virginia University)
  Geotechnical/geoenvironmental engineering, Soil testing and characterization, Soil and mine waste dewatering, Geosynthetics, Soil and groundwater remediation

ASSISTANT PROFESSORS
• Omar I. Abdul-Aziz - Ph.D. (University of Minnesota, Twin Cities)
  Ecological-Water Resources Engineering; Scaling of Hydro-Ecological and Biochemical Variables; Modeling of Stream Water Quality and Ecosystem Carbon; Fluid Mechanics; Hydrology.
• Fei Dai - Ph.D. (Hong Kong Polytechnic University)
  Constructions Engineering, Construction Management, Construction Information Technologies
• Kakan Dey - Ph.D. (Clemson University)
  Intelligent Transportation Infrastructure Design and Analysis; Connected and Automated Vehicle Technology; Traffic Operations; Big Data Analytics for Transportation Data Management; Artificial Intelligence in Transportation
• SeungHo Hong - Ph.D. (Georgia Institute of Technology)
  River Engineering, Fluid Mechanics, Sediment Transport, Experimental Techniques in Engineering
• Antarpreet Jutla - Ph.D. (Tufts University)
  Water Resources, Hydrology & human health, Remote sensing, Issues of scales in hydroclimatic processes
• Dimitra Pyrialakou - Ph.D. (Purdue University)
  Transportation Engineering, Transportation Planning and Evaluation, Public and Rail Transportation, Airport Operations, Transportation Econometrics, and Transportation Engineering Education
• P.V. Vijay - Ph.D. (West Virginia University)
Concrete Structures; P Composite Structures for Bridges, Buildings, and Pavements; Aging of Structures and Rehabilitation, Recycled Polymers for Infrastructure, Analytical Modeling

- Yoojung Yoon - Ph.D. (Purdue University)
  Infrastructure Asset Management, Risk Management in Construction, Project Management and Control, Construction Equipment Management

**RESEARCH ASSISTANT PROFESSORS**

- Rufieng Liang - Ph.D. (Chinese Academy of Sciences Institute of Chemistry)
  Fiber Reinforced Polymer Composites, Engineering Plastics, Green Materials, Sustainable Infrastructure

**PROFESSORS EMERITUS**

- Ronald W. Eck - Ph.D. (Clemson University)
- Donald Gray - Ph.D. (Purdue University)
- W. Joseph Head - Ph.D. (Purdue University)
- Charles R. Jenkins - Ph.D. (Oklahoma State University)
- Larry D. Luttrel - Ph.D. (Cornell University)
- William A. Sack - Ph.D. (Michigan State University)

**ASSOCIATE PROFESSORS EMERITUS**

- Robert N. Eli - Ph.D. (University of Iowa)
- Darrell R. Dean Jr. - Ph.D. (Purdue University)

**ADJUNCT ASSOCIATE PROFESSOR**

- Avinash Unnikrishnan - Ph.D. (University of Texas - Austin)
  Network Equilibrium Models, Freight and Logistics, Safety, Traffic Simulation, Operations and control

**LECTURER**

- LiYaning (Maggie) Tang - Ph.D. (The Hong Kong Polytechnic University)
  Public-Private Partnership (PPP), Environmental impact assessment (EIA), Construction sustainability, Carbon emission footprint

Click here to view the Suggested Plan of Study (p. )

**Curriculum in Civil Engineering**

**GENERAL EDUCATION FOUNDATIONS**

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

<table>
<thead>
<tr>
<th>GEF</th>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 - C/R</td>
<td>ENGL 101, ENGL 102, or ENGL 103</td>
<td>3-6</td>
</tr>
<tr>
<td>F2A/F2B</td>
<td>Science &amp; Technology</td>
<td>4-6</td>
</tr>
<tr>
<td>F3</td>
<td>Math &amp; Quantitative Skills</td>
<td>3-4</td>
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<tr>
<td>F4</td>
<td>Society &amp; Connections</td>
<td>3</td>
</tr>
<tr>
<td>F5</td>
<td>Human Inquiry &amp; The Past</td>
<td>3</td>
</tr>
<tr>
<td>F6</td>
<td>The Arts &amp; Creativity</td>
<td>3</td>
</tr>
<tr>
<td>F7</td>
<td>Global Studies &amp; Diversity</td>
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</tr>
<tr>
<td>F8</td>
<td>Focus (may be satisfied by completion of a minor, double major, or dual degree)</td>
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</tr>
<tr>
<td>Total</td>
<td></td>
<td>31-37</td>
</tr>
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</table>

**Curriculum Requirements**

To receive a degree of bachelor of science in civil engineering, a student must meet the University's undergraduate degree requirements, take all the courses indicated below, and attain a GPA of 2.0 or better in all civil engineering courses. If a civil engineering course is repeated, only the last grade received is used to compute the major GPA, and the course credit hours are counted only once. This requirement assures that the student has demonstrated overall competence in the major.
Undergraduate Student Minimum Performance Policy

All civil and environmental engineering students at WVU, including transfer students and second degree students, must complete each tracking course with a grade of C- or better, with the exception that one D- in a course taken at WVU is permitted. Any tracking course transferred from outside of WVU must be a C- or better. Only the following civil engineering courses may be taken prior to completion of the minimum performance policy: CE 201, CE 210, CE 305, CE 332, CE 347.

### Freshman Engineering Requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENGR 101</td>
<td>Engineering Problem Solving 1</td>
<td>2</td>
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<tr>
<td></td>
<td>Engineering Problem Solving:</td>
<td></td>
</tr>
<tr>
<td>CHE 102</td>
<td>Introduction to Chemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 102</td>
<td>Engineering Problem-Solving 2</td>
<td></td>
</tr>
<tr>
<td>ENGR 103</td>
<td>Introduction to Nanotechnology Design</td>
<td></td>
</tr>
<tr>
<td>MAE 102</td>
<td>Orientation to Mechanical and Aerospace Engineering Design</td>
<td>1</td>
</tr>
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</table>

### Required Tracking Courses (minimum grade of C- required)

#### Calculus I (GEF 3):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MATH 155</td>
<td>Calculus 1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 153</td>
<td>Calculus 1a with Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 154</td>
<td>Calculus 1b with Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 156</td>
<td>Calculus 2 (GEF 8)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 251</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 261</td>
<td>Elementary Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 115</td>
<td>Fundamentals of Chemistry (GEF 2B)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 111</td>
<td>General Physics (GEF 8)</td>
<td>4</td>
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<tr>
<td>MAE 241</td>
<td>Statics</td>
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<tr>
<td>MAE 242</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MAE 243</td>
<td>Mechanics of Materials</td>
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#### Other Required Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CE 201</td>
<td>Introduction to Civil Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE 210</td>
<td>Introduction to Computer Aided Design and Drafting for Civil Engineers</td>
<td>2</td>
</tr>
<tr>
<td>CE 301</td>
<td>Engineering Professional Development</td>
<td>1</td>
</tr>
<tr>
<td>CE 321</td>
<td>Fluid Mechanics for Civil Engineers</td>
<td>3</td>
</tr>
<tr>
<td>CE 479</td>
<td>Integrated Civil Engineering Design-Capstone</td>
<td>3</td>
</tr>
<tr>
<td>ECON 201</td>
<td>Principles of Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 305</td>
<td>Technical Writing (Fulfills Writing and Communications Skills Requirement)</td>
<td>3</td>
</tr>
<tr>
<td>IENG 377</td>
<td>Engineering Economy</td>
<td>3</td>
</tr>
<tr>
<td>STAT 215</td>
<td>Introduction to Probability and Statistics</td>
<td>3</td>
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</tbody>
</table>

Choose one of the following (GEF 8):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PHYS 112</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 116</td>
<td>Fundamentals of Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 115</td>
<td>Principles of Biology</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Civil Engineering Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 332</td>
<td>Introduction to Transportation Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CE 347</td>
<td>Introduction to Environmental Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CE 351</td>
<td>Introductory Soil Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>CE 361</td>
<td>Structural Analysis 1</td>
<td>4</td>
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</table>

#### CE Design Electives

Choose two of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CE 411</td>
<td>Pavement Design</td>
<td>6</td>
</tr>
<tr>
<td>CE 415</td>
<td>Flexible Pavements</td>
<td>6</td>
</tr>
<tr>
<td>CE 431</td>
<td>Highway Engineering</td>
<td>6</td>
</tr>
<tr>
<td>CE 439</td>
<td>Traffic Engineering and Operations</td>
<td>6</td>
</tr>
<tr>
<td>CE 447</td>
<td>Environmental Engineering Design</td>
<td>6</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------</td>
<td></td>
</tr>
<tr>
<td>CE 451</td>
<td>Foundation Engineering</td>
<td></td>
</tr>
<tr>
<td>CE 453</td>
<td>Earthwork Design</td>
<td></td>
</tr>
<tr>
<td>CE 462</td>
<td>Reinforced Concrete Design</td>
<td></td>
</tr>
<tr>
<td>CE 463</td>
<td>Steel Design</td>
<td></td>
</tr>
<tr>
<td>CE 464</td>
<td>Timber Design</td>
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**CE Open Electives:**

Choose five of the following: 15

<table>
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<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>CE 305</td>
<td>Introduction to Geomatics</td>
</tr>
<tr>
<td>CE 310</td>
<td>Civil Engineering Materials</td>
</tr>
<tr>
<td>CE 322</td>
<td>Hydrotechnical Engineering</td>
</tr>
<tr>
<td>CE 413</td>
<td>Construction Methods</td>
</tr>
<tr>
<td>CE 414</td>
<td>Construction Engineering</td>
</tr>
<tr>
<td>CE 416</td>
<td>Advanced Concrete Materials</td>
</tr>
<tr>
<td>CE 420</td>
<td>Computational Fluid Mechanics</td>
</tr>
<tr>
<td>CE 425</td>
<td>Engineering Hydology</td>
</tr>
<tr>
<td>CE 427</td>
<td>Water Resources Engineering</td>
</tr>
<tr>
<td>CE 433</td>
<td>Urban Transportation Planning and Design</td>
</tr>
<tr>
<td>CE 435</td>
<td>Railway Engineering</td>
</tr>
<tr>
<td>CE 436</td>
<td>Pedestrian/Bike Transportation</td>
</tr>
<tr>
<td>CE 443</td>
<td>Environmental Science and Technology</td>
</tr>
<tr>
<td>CE 445</td>
<td>Properties of Air Pollutants</td>
</tr>
<tr>
<td>CE 461</td>
<td>Structural Analysis 2</td>
</tr>
<tr>
<td>CE 495</td>
<td>Independent Study</td>
</tr>
<tr>
<td>CE 497</td>
<td>Research</td>
</tr>
<tr>
<td>SAFM 470</td>
<td>Managing Construction Safety</td>
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</table>

**Engineering/Math/Science Electives***

Choose three of the following: 9

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CHEM 215</td>
<td>Introductory Analytical Chemistry</td>
</tr>
<tr>
<td>CHEM 231</td>
<td>Organic Chemistry: Brief Course</td>
</tr>
<tr>
<td>AEM 341</td>
<td>General Microbiology</td>
</tr>
<tr>
<td>AEM 401</td>
<td>Environmental Microbiology</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Geographic Information Systems and Science</td>
</tr>
<tr>
<td>GEOL 342</td>
<td>Structural Geology for Engineers</td>
</tr>
<tr>
<td>GEOL 488</td>
<td>Environmental Geochemistry</td>
</tr>
<tr>
<td>IENG 331</td>
<td>Computer Applications in Industrial Engineering</td>
</tr>
<tr>
<td>IENG 350</td>
<td>Introduction to Operations Research</td>
</tr>
<tr>
<td>IENG 360</td>
<td>Human Factors Engineering</td>
</tr>
<tr>
<td>IENG 455</td>
<td>Simulation by Digital Methods</td>
</tr>
<tr>
<td>MAE 316</td>
<td>Analysis-Engineering Systems</td>
</tr>
<tr>
<td>MAE 320</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>MAE 335</td>
<td>Incompressible Aerodynamics</td>
</tr>
<tr>
<td>MAE 423</td>
<td>Heat Transfer</td>
</tr>
<tr>
<td>MAE 432</td>
<td>Engineering Acoustics</td>
</tr>
<tr>
<td>MAE 446</td>
<td>Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MAE 473</td>
<td>Bioengineering</td>
</tr>
<tr>
<td>MATH 343</td>
<td>Introduction to Linear Algebra</td>
</tr>
<tr>
<td>MATH 375</td>
<td>Applied Modern Algebra</td>
</tr>
<tr>
<td>MATH 420</td>
<td>Numerical Analysis 1</td>
</tr>
<tr>
<td>MATH 441</td>
<td>Applied Linear Algebra</td>
</tr>
<tr>
<td>MATH 456</td>
<td>Complex Variables</td>
</tr>
<tr>
<td>MATH 465</td>
<td>Partial Differential Equations</td>
</tr>
<tr>
<td>MINE 305</td>
<td>Coal Mining</td>
</tr>
</tbody>
</table>
MINE 306  Mineral Property Evaluation  
PHYS 331  Theoretical Mechanics 1  
STAT 312  Intermediate Statistical Methods  
STAT 313  Introductory Design and Analysis  
STAT 331  Sampling Methods  

**Additional Requirements**

**General Science Elective (Select One)**  
AGRN 202  Principles of Soil Science  
& AGRN 203  and Principles of Soil Science Laboratory  
BIOL 101  General Biology  
& BIOL 103  and General Biology Laboratory  
BIOL 102  General Biology  
& BIOL 104  and General Biology Laboratory  
CHEM 233  Organic Chemistry  
& CHEM 235  and Organic Chemistry Laboratory  
BIOL 105  Environmental Biology  
BIOL 115  Principles of Biology  
BIOL 302  Biometry  
BIOL 446  Freshwater Ecology  
CHEM 116  Fundamentals of Chemistry  
CS 110  Introduction to Computer Science  
AEM 341  General Microbiology  
AEM 401  Environmental Microbiology  
GEOG 350  Geographic Information Systems and Science  
GEOG 415  Global Environmental Change  
GEOG 455  Introduction to Remote Sensing  
GEOL 110  Environmental Geoscience  
GEOL 203  Physical Oceanography  
GEOL 342  Structural Geology for Engineers  
PHYS 112  General Physics  
PHYS 211  Introduction to Mathematical Physics  
PHYS 313  Introductory Electronics  
PHYS 314  Introductory Modern Physics  
PHYS 321  Optics  
PHYS 331  Theoretical Mechanics 1  
PHYS 333  Electricity and Magnetism 1  

* Any CE Design Electives that are not otherwise used can also be used.
** Any CE 400 level course not otherwise used can also be used.

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**Suggested Plan of Study**

**First Year**

**Fall**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MATH 155 (GEF 3)</td>
<td>4</td>
<td>MATH 156 (GEF 8)</td>
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<tr>
<td>ENGR 101</td>
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<td>ENGR 102</td>
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<td>ENGR 199</td>
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<td>PHYS 111 (GEF 8)</td>
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<td>CHEM 115 (GEF 2)</td>
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<td>GEF 6</td>
<td>3</td>
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* One D- is permitted. Any tracking course transferred from outside of WVU must be a C- or better. When a course is repeated, the last grade earned in that course will be used for determining compliance with this minimum grade standard.

** Any CE Design Electives that are not otherwise used can also be used.
*** Any CE 400 level course not otherwise used can also be used.
ENGL 101 (GEF 1) 3  GEF 7 3  
GEF 5 3  

17 17

**Second Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall Hours</th>
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<tbody>
<tr>
<td>MAE 241</td>
<td>3</td>
<td>3 Mae 243</td>
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<tr>
<td>MATH 251</td>
<td>4</td>
<td>3 Mae 242</td>
</tr>
<tr>
<td>CE 210</td>
<td>2</td>
<td>2 MATH 261</td>
</tr>
<tr>
<td>CE 201 (GEF 1)</td>
<td>1</td>
<td>1 ENGL 305</td>
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<tr>
<td>ENGL 102 (GEF 1)</td>
<td>3 Select one of the following: 4</td>
<td>4 CE 332</td>
</tr>
<tr>
<td>Select one of the following (GEF 8): 4</td>
<td>4 CE 347</td>
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<tr>
<td>PHYS 112</td>
<td></td>
<td></td>
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<tr>
<td>CHEM 116</td>
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<td>BIOL 115</td>
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17 17

**Third Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall Hours</th>
<th>Spring Hours</th>
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<tbody>
<tr>
<td>CE 321</td>
<td>3</td>
<td>4 CE Core Class</td>
</tr>
<tr>
<td>Two CE Core Classes</td>
<td>8</td>
<td>1 CE 301</td>
</tr>
<tr>
<td>STAT 215</td>
<td>3</td>
<td>6 Two CE Open Electives</td>
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<tr>
<td>ECON 201 (GEF 4)</td>
<td>3</td>
<td>3 CE Design Elective</td>
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<td></td>
<td></td>
<td>ENGR/MATH/Science Elective</td>
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17 17

**Fourth Year**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CE Design Elective</td>
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<td>3 CE Open Elective</td>
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<tr>
<td>Two CE Open Electives</td>
<td>6</td>
<td>3 CE 479</td>
</tr>
<tr>
<td>General Science Elective</td>
<td>3</td>
<td>6 Two ENGR/MATH/Science Electives</td>
</tr>
<tr>
<td>IENG 377</td>
<td>3</td>
<td>3 ENGR Elective (outside CEE Dept.)</td>
</tr>
</tbody>
</table>

15 15

Total credit hours: 132

**Major Learning Goals**

**CIVIL ENGINEERING**

**Program Educational Objectives**

- The graduates will be successful in their professional careers as civil engineers in industry, public agencies, and/or post-graduate education.
- The graduates will continue to develop professionally and serve in leadership roles.
- The graduates will be successful in demonstrating their obligations to the profession, to their employer, and to society.

**Student Outcomes**

Upon graduation, all Bachelor of Science students in Civil Engineering will have:

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. The broad education necessary to understand 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. A knowledge of contemporary issues.

K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Curriculum for a Dual Degree in Mining Engineering and Civil Engineering**

This curriculum allows students to simultaneously pursue B.S. degrees in mining engineering and civil engineering by completing additional courses. A suggested schedule for the dual curriculum in mining engineering and civil engineering is shown below.

To receive the degrees of bachelor of science in mining engineering and bachelor of science in civil engineering, a student must take all of the courses indicated below and achieve a grade point average of 2.0 or better for all civil engineering courses attempted and a grade point average of 2.25 in all mining engineering courses attempted, except for those courses in which a grade of W was received. If a course is repeated, only the last grade received is counted in computing the grade point average, and the course credit hours are counted only once. This requirement assures that the student has demonstrated overall competence in the chosen major.

**Undergraduate Student Minimum Performance Policy**

All civil engineering students at WVU, including transfer students, second-degree students, and dual degree students must complete each tracking course with a grade of C or better, with the exception that one D among them is permitted (a transfer course(s) with a grade of D does not satisfy the minimum performance requirement). When a course is repeated, the last grade earned in that course will be used for determining compliance with this minimum performance policy. Only the following Civil Engineering courses may be taken prior to completion of the minimum performance policy: CE 201, CE 210, CE 305, CE 332, and CE 347.

Any tracking course transferred from outside of WVU must be a C or better.

All tracking courses must be completed collectively before taking any 300-level or higher civil engineering course. However, as an exception to the collective prerequisite requirement, geomatics (CE 305), environmental engineering (CE 347), and transportation engineering (CE 332) may be taken before completing all tracking courses.

Second-degree students may petition for a waiver to the collective prerequisite requirement for 300-level or higher civil engineering courses but must meet individual course prerequisites. The petition must include a plan for completing the tracking courses and be approved by the student's academic advisor and the department chairman.

It is important for the students take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical dual B.S.Min.E and B.S.C.E. degree program that completes degree requirements in five years is as follows.

**Mining/Civil Engineering Curriculum Requirements**

Students must complete a minimum of 152 credit hours to graduate - the total at the bottom reflects all possible course combinations.

<table>
<thead>
<tr>
<th>Tracking Courses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115</td>
<td>Fundamentals of Chemistry (GEF 2)</td>
</tr>
<tr>
<td>MAE 241</td>
<td>Statics</td>
</tr>
<tr>
<td>MAE 242</td>
<td>Dynamics</td>
</tr>
<tr>
<td>MAE 243</td>
<td>Mechanics of Materials</td>
</tr>
<tr>
<td>Select one of the following (GEF 3):</td>
<td>4</td>
</tr>
<tr>
<td>MATH 155</td>
<td>Calculus 1</td>
</tr>
<tr>
<td>MATH 153 &amp; MATH 154</td>
<td>Calculus 1a with Precalculus and Calculus 1b with Precalculus</td>
</tr>
<tr>
<td>MATH 156</td>
<td>Calculus 2 (GEF 8)</td>
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<tr>
<td>MATH 251</td>
<td>Multivariable Calculus</td>
</tr>
<tr>
<td>MATH 261</td>
<td>Elementary Differential Equations</td>
</tr>
<tr>
<td>PHYS 111</td>
<td>General Physics (GEF 8)</td>
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<table>
<thead>
<tr>
<th>Required Courses</th>
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<tbody>
<tr>
<td>CE 201</td>
<td>Introduction to Civil Engineering</td>
</tr>
<tr>
<td>CE 301</td>
<td>Engineering Professional Development</td>
</tr>
<tr>
<td>CE 321</td>
<td>Fluid Mechanics for Civil Engineers</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>CE 322</td>
<td>Hydrotechnical Engineering</td>
</tr>
<tr>
<td>CE 479</td>
<td>Integrated Civil Engineering Design-Capstone</td>
</tr>
<tr>
<td>ECON 201</td>
<td>Principles of Microeconomics (GEF 4)</td>
</tr>
<tr>
<td>ENGR 101</td>
<td>Engineering Problem Solving 1</td>
</tr>
<tr>
<td>ENGR 102</td>
<td>Engineering Problem-Solving 2</td>
</tr>
<tr>
<td>ENGR 199</td>
<td>Orientation to Engineering</td>
</tr>
<tr>
<td>GEOL 101</td>
<td>Planet Earth</td>
</tr>
<tr>
<td>GEOL 102</td>
<td>Planet Earth Laboratory</td>
</tr>
<tr>
<td>GEOL 342</td>
<td>Structural Geology for Engineers</td>
</tr>
<tr>
<td>IENG 377</td>
<td>Engineering Economy</td>
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<tr>
<td>MAE 320</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>MINE 201</td>
<td>Mine Surveying</td>
</tr>
<tr>
<td>MINE 205</td>
<td>Underground Mining Systems</td>
</tr>
<tr>
<td>MINE 206</td>
<td>Surface Mining Systems</td>
</tr>
<tr>
<td>MINE 261</td>
<td>Engineering Computer Aided Design</td>
</tr>
<tr>
<td>MINE 306</td>
<td>Mineral Property Evaluation</td>
</tr>
<tr>
<td>MINE 331</td>
<td>Mine Ventilation</td>
</tr>
<tr>
<td>MINE 382</td>
<td>Mine Power Systems</td>
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<tr>
<td>MINE 411</td>
<td>Rock Mechanics/Ground Control</td>
</tr>
<tr>
<td>MINE 427</td>
<td>Coal Preparation</td>
</tr>
<tr>
<td>MINE 471</td>
<td>Mine and Safety Management</td>
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<tr>
<td>MINE 480</td>
<td>Multidisciplinary Team Project</td>
</tr>
<tr>
<td>MINE 483</td>
<td>Mine Design-Exploration Mapping</td>
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<tr>
<td>MINE 484</td>
<td>Mine Design-Report Capstone</td>
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<tr>
<td>PHYS 112</td>
<td>General Physics (GEF 8)</td>
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<tr>
<td>STAT 215</td>
<td>Introduction to Probability and Statistics</td>
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**Civil Engineering Core Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CE 332</td>
<td>Introduction to Transportation Engineering</td>
<td>4</td>
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<tr>
<td>CE 347</td>
<td>Introduction to Environmental Engineering</td>
<td>4</td>
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<tr>
<td>CE 351</td>
<td>Introductory Soil Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>CE 361</td>
<td>Structural Analysis 1</td>
<td>4</td>
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</tbody>
</table>

**Civil Engineering Design Electives**

Select from the following: 6

- CE 411 Pavement Design
- CE 415 Flexible Pavements
- CE 447 Environmental Engineering Design
- CE 451 Foundation Engineering
- CE 453 Earthwork Design
- CE 462 Reinforced Concrete Design
- CE 463 Steel Design
- CE 464 Timber Design

**Civil Engineering Electives**

Select from the following: 3

- CE 305 Introduction to Geomatics
- CE 310 Civil Engineering Materials
- CE 413 Construction Methods
- CE 414 Construction Engineering
- CE 416 Advanced Concrete Materials
- CE 420 Computational Fluid Mechanics
- CE 425 Engineering Hydology
- CE 427 Water Resources Engineering
- CE 433 Urban Transportation Planning and Design
CE 435  | Railway Engineering  
CE 436  | Pedestrian/Bike Transportation  
CE 443  | Environmental Science and Technology  
CE 445  | Properties of Air Pollutants  
CE 461  | Structural Analysis 2  
CE 493 course (approved by Advisor)  
CE 495  | Independent Study  
SAFM 470  | Managing Construction Safety  

GEF Electives 1, 5, 6, 7  | 15  
Total Hours  | 152  

**MINE and CE Suggested Plan of Study**

### First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115 (GEF 2)</td>
<td>4 ENGR 102</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 101 (GEF 1)</td>
<td>3 GEOL 101</td>
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<td>ENGR 101</td>
<td>2 GEOL 102</td>
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<tr>
<td>ENGR 199</td>
<td>1 MATH 156 (GEF 8)</td>
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<tr>
<td>MATH 155 (GEF 3)</td>
<td>4 PHYS 111 (GEF 8)</td>
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### Second Year

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<tbody>
<tr>
<td>CE 201</td>
<td>1 ENGL 102 (GEF 1)</td>
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<tr>
<td>MAE 241</td>
<td>3 MAE 242</td>
<td>3</td>
</tr>
<tr>
<td>MATH 251</td>
<td>4 MATH 261</td>
<td>4</td>
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<tr>
<td>MINE 201</td>
<td>3 MINE 206</td>
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<td>MINE 205</td>
<td>3 PHYS 112 (GEF 8)</td>
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### Third Year

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<tr>
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<tbody>
<tr>
<td>CE 321</td>
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<tr>
<td>GEOL 342</td>
<td>3 MINE 331</td>
<td>3</td>
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<tr>
<td>MAE 243</td>
<td>3 MINE 427</td>
<td>4</td>
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<tr>
<td>MAE 320</td>
<td>3 MINE 480</td>
<td>1</td>
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### Fourth Year

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<tr>
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<th>Hours Spring</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Two CE Core Courses</td>
<td>8 CE 301</td>
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<tr>
<td>MINE 306</td>
<td>3 Two CE Design Electives</td>
<td>6</td>
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<tr>
<td>MINE 382</td>
<td>3 CE 322</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>GEF Elective 6</td>
<td>3</td>
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<td></td>
<td>IENG 377</td>
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### Fifth Year

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<th>Hours</th>
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<tbody>
<tr>
<td>GEF Elective 5</td>
<td>3 CE Open Elective</td>
<td>3</td>
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<td>ECON 201 (GEF 4)</td>
<td>3 CE 479</td>
<td>3</td>
</tr>
<tr>
<td>MINE 411</td>
<td>4 GEF Elective 7</td>
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<tr>
<td>MINE 471</td>
<td>3 MINE 484</td>
<td>4</td>
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</tbody>
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* CE Elective

** CE Design Elective

*** GEF Elective
Total credit hours: 152

* CE Core Classes: CE 332, CE 347, CE 351, CE 361

** CE Design Electives—any approved CE 400-level design course. See advisor for approved list

*** CE Open Electives—any approved CE 300 or CE 400-level course. See advisor for approved list.

Notes: Discipline substitutions:

• MINE 306 fulfills requirement of CE Engr/Math/Sci Elective 1.
• MINE 411 fulfills requirement of CE Engr/Math/Sci Elective 2.
• MINE requirement for is fulfilled through CE 322 and CE 351.
• MINE 382 fulfills requirement of CE engineering elective outside CE.
• MINE 461 is fulfilled by CE 322.
• MINE 484 fulfills CE requirement of ENGL 305.
• MINE requirement for STAT 211 is fulfilled by CE requirement of STAT 215.
• CE 321 fulfills MINE requirement for MAE 331.
• MINE technical elective and MINE Eng/Sci technical elective requirements are fulfilled by any two of the following: CE 332, CE 347, or CE 361.
• GEOL 342 fulfills requirement of CE basic science elective.
• MINE 261 substitutes for CE 210.