CIVIL ENGINEERING, B.S.E.

Learning Outcomes
- Graduates of the program will have an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Graduates of the program will have 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.
- Graduates of the program will have an ability to communicate effectively with a range of audiences.
- Graduates of the program will have 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.
- Graduates of the program will have 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.
- Graduates of the program will have an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Graduates of the program will have an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Standards

Entrance Requirements
See College of Engineering and Computing for progression requirements, and special academic opportunities.

Program GPA
Program GPA requirement policies are described in the College of Engineering and Computing section of this bulletin. For the purpose of these policies, the following courses are used to determine the Program GPA for the Civil Engineering B.S.E. program: all Civil Engineering Lower Division courses, all Civil Engineering Major courses and all courses used to satisfy an ECIV Laboratory Elective, ECIV Distribution Elective, and ECIV Elective.

Professional Development Requirement
Communications and Ethics: This requirement is satisfied by completing one or more program-accepted Carolina Core courses for CMS and VSR.

Admissions

Entrance Requirements
Admission requirements and processes for freshman, transfer students, and former students seeking readmission are managed by the Office of Undergraduate Admissions (http://sc.edu/about/offices_and_divisions/undergraduate_admissions/).

Transfer applicants from regionally accredited colleges and universities must have a cumulative 2.75 GPA on a 4.00 scale to enter the College of Engineering and Computing. In addition, transfer applicants for the Aerospace Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, or Mechanical Engineering majors must also have completed a four semester-hour calculus course equivalent to MATH 141 with a grade of “C” or better.

Current University of South Carolina students who wish to enter the College of Engineering and Computing, and former students seeking readmission, must have an institutional GPA of 2.50 or better on at least 15 hours earned at UofSC. In addition, such applicants for the Aerospace Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, or Mechanical Engineering majors must also have completed a four semester-hour calculus course equivalent to MATH 141 with a grade of “C” or better.

Communications and Ethics
This requirement is satisfied by completing one or more program-accepted Carolina Core courses for CMS and VSR.

Degree Requirements (124-142 hours)
See College of Engineering and Computing (https://academicbulletins.sc.edu/undergraduate/engineering-computing/) for progression requirements and special academic opportunities.

Program of Study

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carolina Core</td>
<td>34-46</td>
</tr>
<tr>
<td>2. College Requirements</td>
<td>0</td>
</tr>
<tr>
<td>3. Program Requirements</td>
<td>65-71</td>
</tr>
<tr>
<td>4. Major Requirements</td>
<td>25</td>
</tr>
</tbody>
</table>

Founding Documents Requirement
All undergraduate students must take a 3-credit course or its equivalent with a passing grade in the subject areas of History, Political Science, or African American Studies that covers the founding documents including the United States Constitution, the Declaration of Independence, the Emancipation Proclamation and one or more documents that are foundational to the African American Freedom struggle, and a minimum of five essays from the Federalist papers. This course may count as a requirement in any part of the program of study including the Carolina Core, the major, minor or cognate, or as a general elective. Courses that meet this requirement are listed here (https://academicbulletins.sc.edu/undergraduate/founding-document-courses/).

1. Carolina Core Requirements (34-46 hours)
CMW – Effective, Engaged, and Persuasive Communication: Written (6 hours)
- ENGL 101
- ENGL 102
ARP – Analytical Reasoning and Problem Solving (8 hours)
- MATH 141
- MATH 142

SCI – Scientific Literacy (8 hours)
- CHEM 111 & CHEM 111L
- PHYS 211 & PHYS 211L
GFL – Global Citizenship and Multicultural Understanding: Foreign Language (0-6 hours)
Score two or better on foreign language placement test; or complete the 109 and 110 courses in FREN, GERM, LATN or SPAN; or complete the 121 course in another foreign language.

- CC-GFL courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

GHS – Global Citizenship and Multicultural Understanding: Historical Thinking (3 hours)
- any CC-GHS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

GSS – Global Citizenship and Multicultural Understanding: Social Sciences (3 hours)
- any CC-GSS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

AIU – Aesthetic and Interpretive Understanding (3 hours)
- any CC-AIU course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

CMS – Effective, Engaged, and Persuasive Communication: Spoken Component 1 (0-3 hours)
Select from the following:

- PHIL 325 (CMS/VSR overlay)
- SPCH 140
- any overlay or stand-alone CC-CMS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

INF – Information Literacy 1 (0-3 hours)
- any overlay or stand-alone CC-INF course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

VSR – Values, Ethics, and Social Responsibility 1 (0-3 hours)
Select from the following:

- PHIL 325 (CMS/VSR overlay)
- PHIL 322
- any overlay or stand-alone CC-VSR course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

1 Carolina Core Stand Alone or Overlay Eligible Requirements – Overlay-approved courses offer students the option of meeting two Carolina Core components in a single course. A maximum of two overlays is allowed. The total Carolina Core credit hours for this program must add up to a minimum of 34 hours.

2. College Requirements (0 hours)
No college-required courses for this program.

3. Program Requirements (65-71 hours)

Supporting Courses (65-71 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 242</td>
<td>Elementary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>STAT 509</td>
<td>Statistics for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 511</td>
<td>Probability</td>
<td></td>
</tr>
</tbody>
</table>

Foundational Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 241</td>
<td>Vector Calculus</td>
<td>3</td>
</tr>
<tr>
<td>MATH 300</td>
<td>Transition to Advanced Mathematics</td>
<td></td>
</tr>
<tr>
<td>MATH 344</td>
<td>Applied Linear Algebra</td>
<td></td>
</tr>
</tbody>
</table>

Foundational Math Elective

Select one of the following:

- MATH 241 Vector Calculus
- MATH 300 Transition to Advanced Mathematics
- MATH 344 Applied Linear Algebra

Foundational Math/Science Elective (3-4 credits)

Select one of the following:

- CHEM 112 General Chemistry II and General Chemistry II Lab
- PHYS 212 Essentials of Physics II and Essentials of Physics II Lab
- MATH 241 Vector Calculus
- MATH 300 Transition to Advanced Mathematics
- MATH 344 Applied Linear Algebra

Lower Division Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 101</td>
<td>Introduction to Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 101</td>
<td>Introduction to Engineering I</td>
<td></td>
</tr>
<tr>
<td>ECIV 111</td>
<td>Introduction to Engineering Graphics and Visualization</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 102</td>
<td>Introduction to Engineering II</td>
<td></td>
</tr>
<tr>
<td>ECIV 200</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 200</td>
<td>Statics</td>
<td></td>
</tr>
<tr>
<td>ECIV 201</td>
<td>Computational Methods for Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 201</td>
<td>Introduction to Applied Numerical Methods</td>
<td></td>
</tr>
<tr>
<td>ECIV 220</td>
<td>Mechanics of Solids</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 260</td>
<td>Introduction to the Mechanics of Solids</td>
<td></td>
</tr>
<tr>
<td>ECIV 360</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 360</td>
<td>Fluid Mechanics</td>
<td></td>
</tr>
</tbody>
</table>

ECIV Laboratory Courses

Select two of the following:

- ECIV 303L Civil Engineering Materials Laboratory
- ECIV 330L Geotechnical Laboratory
- ECIV 340L Transportation Engineering Laboratory
- ECIV 350L Introduction to Environmental Engineering Laboratory
- ECIV 362L Introduction to Water Resources Engineering Laboratory

ECIV Distribution Courses

Select one course from four of the following five areas: 12 credits

- Environmental Engineering
- ECIV 551 Elements of Water and Wastewater Treatment
- ECIV 555 Principles of Municipal Solid Waste Engineering
- ECIV 556 Air Pollution Control Engineering
- ECIV 557 Sustainable Construction for Engineers
- ECIV 558 Environmental Engineering Process Modeling
### Structural Engineering
- ECIV 325: Structural Steel Design
- ECIV 327: Reinforced Concrete Design

### Transportation Engineering
- ECIV 540: Transportation Systems Planning
- ECIV 541: Highway Design
- ECIV 542: Traffic Engineering
- ECIV 580: Railway Engineering I

### Geotechnical Engineering
- ECIV 530: Foundation Analysis and Design
- ECIV 531: Design of Earth Structures

### Water Resources Engineering
- ECIV 560: Open Channel Hydraulics
- ECIV 562: Engineering Hydrology
- ECIV 563: Subsurface Hydrology

### Basic Science Elective
Select one of the following: 3-4 credits
- BIOL 110: General Biology
- BIOL 270: Introduction to Environmental Biology
- ENVR 101: Introduction to the Environment
- ENVR 321: Environmental Pollution and Health
- GEOL 101: Introduction to the Earth
- GEOL 103: Environment of the Earth
- MSCI 210: Oceans and Society
- MSCI 215: Coastal Environments of the Southeastern US

### Engineering, Science, or Mathematics (ESM) Electives
Select four of the following: 12-14 credits
- BIOL 101: Biological Principles I
- BIOL 102: Biological Principles II
- BIOL 110: General Biology
- BIOL 250: Microbiology
- BIOL 211 and above
- BMEN 211 or above
- CHEM 112 or above
- CSCE 145: Algorithmic Design I
- or CSCE 146: Algorithmic Design II
- or CSCE 201: Introduction to Computer Security
- or CSCE 206: Scientific Applications Programming
- or CSCE 211: Digital Logic Design
- ECHE 310: Introductory Chemical Engineering Thermodynamics (or above)
- ECIV 210: Dynamics
- Additional ECIV courses 300-level and above
- ELCT 220: Electrical Engineering for Non-Majors
- ELCT 221: Circuits (or above)
- EMCH 290: Thermodynamics (or above)
- ENCP 210: Dynamics
- ENCP 290: Thermodynamic Fundamentals (or above)
- ENVR 501: Special Topics in the Environment
- ENVR 533: Sustainability Projects Course
- GEOG 347: Water as a Resource
- GEOG 563: Advanced Geographic Information Systems
- GEOL 302: Rocks and Minerals (or above)
- ITEC 233: Introduction to Computer Hardware and Software (or above)
- MATH 241: Vector Calculus
- MATH 300: Transition to Advanced Mathematics
- MATH 344: Applied Linear Algebra
- MATH 520: Ordinary Differential Equations
- MATH 521: Boundary Value Problems and Partial Differential Equations
- MATH 544: Linear Algebra
- MATH 550: Vector Analysis
- MSCI 305: Ocean Data Analysis (and above)
- NAVY 201: Naval Ships Systems I
- NAVY 202: Naval Ships Systems II
- NAVY 301: Navigation/Naval Operations I
- PHYS 212: Essentials of Physics II (or above)
- STAT 511: Probability
- STAT 512: Mathematical Statistics
- STAT 513: Theory of Statistical Inference
- STAT 516: Statistical Methods II
- STAT 520: Forecasting and Time Series
- STAT 587: Big Data Analytics

### Other Electives
Select two of the following: 6-8 credits
- Additional courses from the ESM Elective category
- ACCT 222: Survey of Accounting
- ECON 224: Introduction to Economics
- FINA 333: Finance and Markets
- MGMT 371: Principles of Management
- MGSC 290: Computer Information Systems in Business
- MKTG 350: Principles of Marketing
- OR any courses from the ESM Elective category

### Total Credit Hours
65-71

### 4. Major Requirements (25 hours)

#### Major Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 303</td>
<td>Civil Engineering Materials</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 307</td>
<td>Professional Development for Civil Engineers</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 320</td>
<td>Structural Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 330</td>
<td>Introduction to Geotechnical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 340</td>
<td>Introduction to Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 350</td>
<td>Introduction to Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 362</td>
<td>Introduction to Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 470</td>
<td>Civil Engineering Design</td>
<td>4</td>
</tr>
</tbody>
</table>

### Total Credit Hours
25
Major Map

A major map is a layout of required courses in a given program of study, including critical courses and suggested course sequences to ensure a clear path to graduation.

Major maps are only a suggested or recommended sequence of courses required in a program of study. Please contact your academic advisor for assistance in the application of specific coursework to a program of study and course selection and planning for upcoming semesters.

Civil Engineering, B.S.E.