

<sup>8</sup>Select from 3000-level or higher CPSC courses or DPA 3070.

No more than three credits of CPSC 3990 or 4810 may be applied to this requirement, and no more than six credits of CPSC 4820 may be applied. Up to three credits of ECE 3000-level or higher courses; or MATH 3650; or MATH 4000-level courses may be substituted.

<sup>9</sup>Select CPSC 3120 or 3500

<sup>10</sup>Select from: ENGL 3040, 3120, 3140 3150, 3330; AS 3090, 3100, 4090, 4100; ML 3010, 3020, 4010, 4020.

Notes:

1. For graduation, a candidate for the BS degree in Computer Science must have earned a grade of C or better in each CPSC course applied to the non-elective requirements of the degree.
2. A grade of C or better must be earned in all prerequisite courses (including CPSC and MATH courses) before enrolling in the next CPSC course.
3. General Education Cross-Cultural Awareness and Science and Technology in Society requirements must be satisfied.

## ELECTRICAL ENGINEERING Bachelor of Science

Electrical engineers are in high demand for a wide range of influential positions. Professional duties range from analytical problem solving to the design of components and systems. The scope of employment requires a unique breadth and depth of knowledge and technical skills, which are reflected in the Electrical Engineering program. This program also offers an excellent preparation for graduate education. Detailed information can be found at [www.clemson.edu/cecas/departments/ece/](http://www.clemson.edu/cecas/departments/ece/).

Building on a foundation of mathematical and physical sciences, students progress into the application of these in the engineering science areas of circuits, electronics, communications, controls, power, and electromagnetics. In these subjects, students also begin to apply the concepts and techniques learned to the design of circuits and systems. Senior technical design courses offer the opportunity to further develop expertise in a selected area.

In addition to these technical skills, students learn to communicate effectively, both orally and with the written word. Because engineers work for the benefit of society, the curriculum includes a strong component of humanities and social science courses. Also, many project design assignments enable the development of interpersonal, teamwork, and management skills, which are necessary for success in a professional engineering career.

### Freshman Year

#### First Semester

- 4 - CH 1010 General Chemistry
  - 3 - ENGL 1030 Composition and Rhetoric
  - 2 - ENGR 1020 Engineering Disciplines and Skills<sup>1</sup>
  - 4 - MATH 1060 Calculus of One Variable I<sup>2</sup>
  - 3 - Arts and Humanities Requirement<sup>3</sup> or  
3 - Social Science Requirement<sup>3</sup>
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#### Second Semester

- 4 - CH 1020 General Chemistry
- 3 - ENGR 1410 Programming and Problem Solving<sup>4</sup>
- 4 - MATH 1080 Calculus of One Variable II<sup>2</sup>
- 3 - PHYS 1220 Physics with Calculus I<sup>2</sup>
- 3 - Arts and Humanities Requirement<sup>3</sup> or  
3 - Social Science Requirement<sup>3</sup>

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## Sophomore Year

### First Semester

- 3 - CPSC 1110 Introduction to Programming in C<sup>2</sup>
  - 2 - ECE 2010 Logic and Computing Devices<sup>2</sup>
  - 3 - ECE 2020 Electric Circuits I<sup>2</sup>
  - 1 - ECE 2090 Logic and Computing Devices Lab.
  - 1 - ECE 2110 Electrical Engineering Lab. I<sup>2</sup>
  - 4 - MATH 2060 Calculus of Several Variables<sup>2</sup>
  - 3 - PHYS 2210 Physics with Calculus II<sup>2</sup>
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### Second Semester

- 1 - ECE 2120 Electrical Engineering Lab. II<sup>2</sup>
  - 3 - ECE 2620 Electric Circuits II<sup>2</sup>
  - 3 - ECE 2720 Computer Organization<sup>2</sup>
  - 1 - ECE 2730 Computer Organization Laboratory
  - 4 - MATH 2080 Intro. to Ordinary Diff. Equations<sup>2</sup>
  - 3 - Arts and Humanities Requirement<sup>3</sup> or  
3 - Social Science Requirement<sup>3</sup>
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## Junior Year

### First Semester

- 1 - ECE 3110 Electrical Engineering Lab. III<sup>2</sup>
  - 3 - ECE 3200 Electronics I<sup>2</sup>
  - 3 - ECE 3300 Signals, Systems, and Transforms<sup>2</sup>
  - 3 - ECE 3600 Electric Power Engineering<sup>2</sup>
  - 3 - ECE 3800 Electromagnetics<sup>2</sup>
  - 3 - Advanced Mathematics Requirement<sup>5</sup>
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### Second Semester

- 1 - ECE 3120 Electrical Engineering Lab. IV
  - 3 - ECE 3170 Random Signal Analysis<sup>2</sup>
  - 3 - ECE 3210 Electronics II<sup>2</sup>
  - 3 - ECE 3710 Microcontroller Interfacing<sup>2</sup>
  - 1 - ECE 3720 Microcontroller Interfacing Lab.
  - 3 - ECE 3810 Fields, Waves, and Circuits<sup>2</sup>
  - 3 - ENGL 3140 Technical Writing
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## Senior Year

### First Semester

- 3 - COMM 1500 Intro. to Human Comm. or  
3 - COMM 2500 Public Speaking
  - 3 - ECE 4090 Intro. to Linear Control Systems<sup>2</sup>
  - 3 - ECE 4270 Communications Systems
  - 2 - ECE 4950 Integrated Systems Design I<sup>2</sup>
  - 3 - Electrical Engineering Technical Requirement<sup>6</sup>
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### Second Semester

- 2 - ECE 4960 Integrated System Design II
  - 3 - Arts and Humanities Requirement or  
3 - Social Science Requirement
  - 6 - Electrical Engineering Technical Requirement<sup>6</sup>
  - 3 - Special Requirement<sup>7</sup>
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126 Total Semester Hours

<sup>1</sup>ENGR 1050 and 1060 may be substituted for ENGR 1020

<sup>2</sup>This course must be passed with a grade of C or better either to transfer into Electrical Engineering from General Engineering or to satisfy later course prerequisites.

<sup>3</sup>See General Education section of the *Undergraduate Announcements*. Six of these credit hours must also satisfy General Education Cross-Cultural Awareness and Science and Technology in Society Requirements.

<sup>4</sup>ENGR 1070, 1080 and 1090 may be substituted for ENGR 1410

<sup>5</sup>MATH 4190, 4340, 4350, 4530, or 4540

<sup>6</sup>Nine credits selected from BIOE 3700, 4310, 4350, 4710, ECE 2220, 4040, 4050\*, 4060, 4180, 4190, 4200, 4220, 4300, 4320, 4360, 4370, 4380, 4400, 4420, 4460, 4550, 4570, 4600, 4610, 4670, 4680, 4730, 4910\*, 4920\*, 4930\*, 4990\*, or ME 3100. A maximum of three credits of courses marked with an asterisk may be used to satisfy this requirement.

<sup>7</sup>Three additional credits of university or college approved Arts and Humanities or Social Science courses; or ELE 3010 or 4010; or any additional three-credit, 4000-level course selected from footnote 6 above; or a course selected from the following list: ECE 3210, 4270, 4490; or one additional course selected from MATH 3110, 4120, 4190, 4340, 4350, 4400, 4410, 4530, or 4540.

Notes:

1. A student is allowed to enroll in ECE courses (excluding ECE 2070, 2080, 3080) only when all prerequisites have been passed with a grade of C or better.
2. All Electrical Engineering students must have a cumulative engineering grade-point average of 2.0 to enroll in any 3000- or 4000-level ECE courses.
3. No student may exceed a maximum of two attempts, excluding a W, to complete successfully any ECE course.

## ENVIRONMENTAL ENGINEERING

### Bachelor of Science

Our complex world faces many challenges, including contaminated water supplies, hazardous wastes, an increasing population and limited resources. Environmental engineers help to solve many of the environmental problems faced by society using the principles of biology, chemistry, physics, mathematics and earth sciences. An undergraduate degree in Environmental Engineering opens the door to a variety of rewarding career options. Environmental engineers protect water quality by designing water and wastewater treatment systems; ensure public safety by managing solid, hazardous and radioactive wastes; improve air quality by controlling emissions from mobile and stationary sources; reduce human health risks by tracking contaminants as they move through the environment; clean up toxic waste spills and restore historically contaminated sites; and design a more sustainable future by understanding our use of resources.

The curriculum for the Bachelor of Science degree in Environmental Engineering consists of 127 credit hours. All students participate in one professional seminar course and complete a capstone design project.

### Freshman Year

#### First Semester

- 4 - CH 1010 General Chemistry
  - 3 - ENGL 1030 Composition and Rhetoric
  - 2 - ENGR 1020 Engineering Disciplines and Skills<sup>1</sup>
  - 4 - MATH 1060 Calculus of One Variable I
  - 3 - Arts and Humanities Requirement<sup>2</sup> or  
3 - Social Science Requirement<sup>2</sup>
- 16

#### Second Semester

- 4 - CH 1020 General Chemistry
- 3 - ENGR 1410 Programming and Problem Solving<sup>3</sup>
- 3 - HIST 1240 Environmental History Survey<sup>4</sup>
- 4 - MATH 1080 Calculus of One Variable II
- 3 - PHYS 1220 Physics with Calculus I

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**Sophomore Year****First Semester**

- 3 - BIOL 1030 General Biology<sup>5</sup>
  - 1 - BIOL 1050 General Biology Lab<sup>5</sup>
  - 3 - CE 2010 Statics
  - 3 - EES 2010 Environmental Engineering Fund. I
  - 4 - MATH 2060 Calculus of Several Variables
  - 3 - PHYS 2210 Physics with Calculus II
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**Second Semester**

- 2 - CE 2080 Dynamics
  - 3 - CH 2010 Survey of Organic Chemistry<sup>6</sup>
  - 4 - EES 2020 Environmental Engineering Fund. II
  - 2 - ENGR 2100 Computer-Aided Design and Engineering Applications<sup>7</sup>
  - 4 - MATH 2080 Intro. to Ordinary Diff. Equations
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**Junior Year****First Semester**

- 2 - EES 3030 Water Treatment
  - 2 - EES 3040 Wastewater Treatment
  - 1 - EES 3050 Water and Wastewater Treatment Lab
  - 3 - MATH 3020 Statistics for Science and Engineering
  - 4 - MICR 3050 General Microbiology
  - 3 - Arts and Humanities Requirement<sup>2</sup> or
  - 3 - Social Science Requirement<sup>2</sup>
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**Second Semester**

- 4 - CE 3410 Introduction to Fluid Mechanics
  - 3 - EES 4840 Municipal Solid Waste Mgt.
  - 3 - EES 4850 Hazardous Waste Management
  - 3 - GEOL 1010 Physical Geology<sup>8</sup>
  - 1 - GEOL 1030 Physical Geology Lab<sup>8</sup>
  - 3 - ME 3100 Thermodynamics and Heat Transfer
- 

**Senior Year****First Semester**

- 3 - EES 4300 Air Pollution Engineering
  - 1 - EES 4500 Environ. Engr. Senior Seminar
  - 3 - EES 4800 Environmental Risk Assessment
  - 3 - EES 4860 Environmental Sustainability
  - 2 - Engineering Economics Requirement<sup>9</sup>
  - 3 - Engineering or Science Requirement<sup>10</sup>
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**Second Semester**

- 3 - EES 4750 Capstone Design Project
  - 6 - Engineering or Science Requirement<sup>10</sup>
  - 6 - Arts and Humanities Requirement<sup>2</sup> or
  - 6 - Social Science Requirement<sup>2</sup>
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127 Total Semester Hours

<sup>5</sup>ENGR 1050 and 1060 may be substituted for ENGR 1020<sup>6</sup>See Policy on Humanities and Social Sciences for Engineering Curricula. Three of these credit hours must also satisfy the Cross-Cultural Awareness General Education requirement. Students are encouraged (but not required) to take PHIL 3450 (Environmental Ethics) to fulfill the non-literature humanities requirement.<sup>7</sup>ENGR 1070, 1080 and 1090 may be substituted for ENGR 1410<sup>8</sup>HIST 1240 satisfies three credit hours of the social science requirement and the Science and Technology in Society General Education requirement. If a student is unable to enroll in the second semester of the freshman year, this course may be taken at another time.<sup>9</sup>May substitute BIOL 1100 for BIOL 1030 and BIOL 1050; BIOL 1100 is five hours.<sup>6</sup>CH 2230 may be substituted.<sup>7</sup>ENGR 2080 may be substituted.<sup>8</sup>May substitute PES 2020 for GEOL 1010 and GEOL 1030.<sup>9</sup>Select CE 3520 or IE 3840.<sup>10</sup>Select from BCHM 3050, 3060, BE 3220, 4150, 4220, 4240, 4400, 4640, BIOL 2110, 4100, 4430, 4440, CE 2060, 2550, 3210, 3310, 3420, 4430, 4470, 4820, CH 3300, 3310, 4130, ECE 2070, 2080, EES 3000, 3010, 4000, 4100, 4110, 4120, 4370, 4910, 4950, ENSP 4000, GEOL 2700, 3000, 3180, 4210, 4820, ME 4260, MICR 3050, 4100, MATH 3110, 3650, 4340, PES 4850, PHYS 2400, 2450, 4200**Notes:**

1. The following courses must be completed with a C or better: CE 2010, CE 2080, CE 3410, MATH 2060, MATH 2080, PHYS 2210.

**GEOLOGY****Bachelor of Science**

Geology is the study of the Earth. It is an applied science that integrates principles from physics, chemistry, biology, engineering, and other disciplines to better understand the natural processes and human influences that shape our planet. Geology helps people deduce Earth's natural history, locate natural resources needed to support society, develop sustainable approaches to energy and resource management, and predict, assess, and manage global change and natural disasters.

Employment opportunities for geologists are numerous and varied. Examples include environmental and engineering consulting firms, energy exploration and production firms, mineral and metal industries, municipal, state, and federal governments, natural resource conservation organizations, and water authorities. Many students go on to graduate school in the geosciences, environmental sciences, or related fields. Geology is a professional degree and state certification as a Registered Professional Geologist is obtainable. Given the various career options that are possible, students are provided the opportunity to develop a broad range of skills and knowledge within the Geology program.

The Geology curriculum provides students with a well-rounded background in geology and related fields and is built around three critical themes: (1) appreciation for spatial and temporal scales, (2) knowledge of earth materials and compositions of environmental systems, and (3) understanding of geological and environmental processes. While providing solid fundamentals within science and engineering, the Geology program is also flexible, allowing students to choose among many electives to tailor their education to specific interests and career goals. The program has been carefully designed to help students develop quantitative and other critical skills, while familiarizing them with the topics, technologies, and resources needed for a variety of career paths in the geosciences. As students progress through the program they have multiple opportunities to enhance their skills of observation, computation, synthesis, communication and problem solving. Because Geology is inherently a field-based discipline, all students are required to take one or more courses that provide them with field experience. All Geology majors also participate in a multi-semester research program that provides them with hands-on experiences conducting geologic research and solving real-world problems in their chosen area of interest. It is also possible for Geology

majors to pursue the Engineering Cluster Minor; students interested in this pathway should consult with their advisor early in their program of study.

Within the Geology curriculum, students who are particularly interested in environmental or water resources issues may choose to specialize in the Environmental Science Concentration or the Hydrogeology Concentration. These two concentrations provide more structured course pathways through the curriculum and help prepare students for careers in these specific areas. The Environmental Science Concentration in Geology focuses on environmental aspects of geoscience and is well suited for students interested in topics such as environmental policy, natural hazard assessment and remediation, evaluation of land use impacts, understanding geochemical cycles, and environmental systems analysis. This concentration provides a rigorous background in the sciences so that students can scientifically address environmental issues and integrate material from several fields to solve complex environmental problems. The Hydrogeology Concentration in Geology is designed for students who want to specialize in areas such as surface- and ground-water systems, treatment of water and cleanup of contaminated sites, contaminant flow and fluid transport, and water resource sustainability.

**Freshman Year****First Semester**

- 4 - CH 1010 General Chemistry
  - 3 - ENGL 1030 Composition and Rhetoric
  - 3 - GEOL 1010 Physical Geology
  - 1 - GEOL 1030 Physical Geology Lab.
  - 4 - MATH 1060 Calculus of One Variable I
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**Second Semester**

- 4 - CH 1020 General Chemistry
  - 3 - GEOL 1120 Earth Resources
  - 4 - MATH 1080 Calculus of One Variable II
  - 3 - Arts and Humanities (Non-Lit.) Requirement<sup>1</sup>
  - 3 - Social Science Requirement<sup>1</sup>
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**Sophomore Year****First Semester**

- 3 - GEOL 2050 Mineralogy and Intro. Petrology
  - 1 - GEOL 2070 Mineralogy and Intro. Petrology Lab.
  - 1 - GEOL 2910 Introduction to Research I
  - 3 - PHYS 1220 Physics with Calculus I
  - 3 - Arts and Humanities (Literature) Requirement<sup>1</sup>
  - 3 - Social Science Requirement<sup>1</sup>
  - 3 - STEM Requirement<sup>2</sup>
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**Second Semester**

- 4 - GEOL 2020 Earth History
  - 1 - GEOL 2920 Introduction to Research II
  - 3 - Quantitative Science Requirement<sup>3</sup>
  - 7 - STEM Requirement<sup>2</sup>
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**Junior Year****First Semester**

- 4 - GEOL 3020 Structural Geology
  - 2 - GEOL 3910 Research Methods I
  - 3 - Quantitative Science Requirement<sup>3</sup>
  - 3 - STEM Requirement<sup>2</sup>
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