ELECTRICAL ENGINEERING - BACHELOR OF SCIENCE (BSEE)

A degree in electrical engineering provides the opportunity to enter the profession of engineering and to engage in work as a design, production, testing, consulting, research, teaching or management professional in a wide variety of careers in the computer industry, embedded systems, telecommunications, instruments, the power and renewable energy industry, the biomedical industry, aerospace and academia. Some graduates also go on to develop careers in other professions like law and medicine.

Examples of career opportunities include development of new electrical or electronic devices, instruments or products; design of equipment or systems; production and quality control of electrical products for private industry or government; sales or management for a private firm or government; and teaching and research in a university.

Requirements

Required courses in engineering, physical science, and mathematics are interwoven throughout the curriculum to provide a balanced education in the fundamentals of the electrical engineering profession. The core courses are complemented by technical electives, humanities and social sciences electives (http://www.colorado.edu/engineering/academics/policies/hss/), free electives, and a writing course (http://www.colorado.edu/engineering/academics/policies/hss/), for a total of 128 credits required for the degree.

Prerequisites and Passing Grades

The Electrical, Computer and Energy Engineering Department reserves the right to drop students enrolled in ECEN courses who have not met the minimum prerequisite requirements. It is the student’s responsibility to communicate with the department if summer coursework and/or transfer credit will be used to meet the prerequisite requirement.

All courses must be taken for a letter grade. The minimum passing grade for a course that is a prerequisite or corequisite for another required course is C-. If a grade of D+ or lower is received in a course which is a prerequisite to another, the student may not register for the subsequent course until the first grade has been raised to a C- or higher. If a grade of D+ or lower is received in a course which is a corequisite to another, the course must be repeated until a grade of C- or higher is achieved. ECEN 4610 Capstone Laboratory Part 1 and ECEN 4620 Capstone Lab, Part 2 both require a grade of C- or better for graduation.

The minimum passing grade for a course that is not specifically a prerequisite or corequisite for another required course is D-.

Required Courses

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td><strong>Humanities, Social Sciences and Writing</strong></td>
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<tr>
<td></td>
<td>Complete the College’s Humanities, Social Sciences and Writing requirements.</td>
<td>18</td>
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<td></td>
<td><strong>Math and Science</strong></td>
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<tr>
<td>APPM 1350</td>
<td>Calculus 1 for Engineers</td>
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<tbody>
<tr>
<td></td>
<td><strong>Electrical Engineering</strong></td>
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<tr>
<td>ECEN 1100</td>
<td>Exploring ECE</td>
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<tr>
<td>or AREN 1316</td>
<td>Introduction to Architectural Engineering</td>
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<tr>
<td>or ASEN 1000</td>
<td>Introduction to Aerospace Engineering Sciences</td>
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<tr>
<td>or BMEN 1000</td>
<td>Exploring Biomedical Engineering</td>
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<tr>
<td>or CHEN 1300</td>
<td>Introduction to Chemical Engineering</td>
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<tr>
<td>or COEN 1500</td>
<td>CEAS Design Lab: Engineering Your Life</td>
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<tr>
<td>or CSCI 1000</td>
<td>Computer Science as a Field of Work and Study</td>
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<tr>
<td>or CVEN 1317</td>
<td>Introduction to Civil and Environmental Engineering</td>
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<tr>
<td>or EVEN 1000</td>
<td>Introduction to Environmental Engineering</td>
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<tr>
<td>ECEN 1400</td>
<td>Introduction to Digital and Analog Electronics</td>
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<tr>
<td>or GEEN 1400</td>
<td>Engineering Projects</td>
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<td>or ASEN 1400</td>
<td>Gateway to Space</td>
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<td>or ASEN 1403</td>
<td>Introduction to Rocket Engineering</td>
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<td>ECEN 1310</td>
<td>C Programming for ECE</td>
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<tr>
<td>or CSCI 1300</td>
<td>Computer Science 1: Starting Computing</td>
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Sample Four-Year Plan of Study: Electrical Engineering

The following information represents a sample 8-semester sequence of study only. Up-to-date curricular information and policies can be found on the ECEE Advising website (https://www.colorado.edu/ecee/undergraduate-program/advising/).

Year One
Fall Semester
APPM 1350 Calculus 1 for Engineers 4
ECEN 1100 Exploring ECE 1
ECEN 1400 Introduction to Digital and Analog Electronics 3
PHYS 1110 General Physics 1 4
Humanities/Social Sciences Elective 1 3

Credit Hours 15

Spring Semester
APPM 1360 Calculus 2 for Engineers 4
CSCI 1300 Computer Science 1: Starting Computing 4
ECEN 2250 Introduction to Circuits and Electronics 3
ECEN 2330 Linear Systems 3
ECEN 3400 Electromagnetic Fields and Waves 3
ECEN 4610 Capstone Laboratory Part 1 3
ECEN 4620 Capstone Lab, Part 2 3

Elective 6

Credit Hours 16

Year Two
Fall Semester
APPM 2360 Introduction to Differential Equations with Linear Algebra 4
ECEN 2250 Introduction to Circuits and Electronics 3
ECEN 24XX Sophomore Elective #1 3
General Science Elective 4
Humanities/Social Sciences Elective 1

Credit Hours 16

Spring Semester
APPM 2350 Calculus 3 for Engineers 4
ECEN 2260 Circuits as Systems 3
ECEN 2270 Electronics Design Lab 3
ECEN 2360 Programming Digital Systems 3
ECEN 24XX Sophomore Elective #2 3

Credit Hours 16

Year Three
Fall Semester
ECEN 2370 Embedded Software Engineering 3
ECEN 3810 Introduction to Probability Theory 3
ECEN 3XXX Advanced Analog Core #1 5
ECEN 3XXX Advanced Analog Core #2 5
Humanities/Social Sciences Elective 1

Credit Hours 15

Spring Semester
ECEN 3XXX Advanced Analog Core #3 5
Technical Elective 6
Technical Elective 6
Technical Elective 6
College-approved writing course 2
Free elective

Credit Hours 18

Year Four
Fall Semester
ECEN 4610 Capstone Laboratory Part 1 3
Advanced Concentration Elective #1 6
Advanced Concentration Elective #2 6
Humanities/Social Science Elective (Upper Division) 1
Free Elective

Credit Hours 17

Spring Semester
ECEN 4620 Capstone Lab, Part 2 3
Advanced Concentration Elective #3 6
Advanced Concentration Elective #4 6
Technical Elective 6

Credit Hours 3

Total Credit Hours 128

1 View the College's Humanities, Social Sciences and Writing requirements (https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/) webpage for more information.
Humanities/Social Sciences Elective (Upper Division)  

<table>
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<tr>
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<tr>
<td>3</td>
<td>128</td>
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</table>

1 Students may choose courses from the list of college-approved humanities and social sciences (HSS) electives (https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/).
2 Students may choose a course from the list of college-approved writing courses (https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/).
3 Students may choose from ECEN 2410, ECEN 2420, or ECEN 2440. Additional Special Topics courses may also be approved at the department’s discretion. Please check the ECEE Advising Sophomore Electives (https://www.colorado.edu/ecee/students/undergraduate-students/advising/sophomore-electives/) page for more information.
4 Students may choose from the following: PHYS 2130, EBBIO 1210, MCDB 1150, IPHY 3410, GEEN 3852, or CHEM 1211 with or without CHEM 1221.
5 The three options for Advanced Analog Core courses are ECEN 3250, ECEN 3300 and ECEN 3400.
6 See the ECEE Advising website (https://www.colorado.edu/ecee/undergraduate-program/advising/) for additional information on course options.

**Learning Outcomes**

During the first several years after completion of their baccalaureate studies:

- Graduates will be situated in growing careers involving the design, development or support of electrical or electronic systems, devices, instruments, or products, or will be successfully pursuing an advanced degree.
- Graduates will have advanced in professional standing based on their technical accomplishments and will have accumulated additional technical expertise to remain globally competitive.
- Graduates will have demonstrated professional and personal leadership and growth.

The electrical engineering curriculum is designed to prepare graduates to meet these objectives as follows:

- Graduates will be situated in growing careers involving the design, development or support of electrical or electronic systems, devices, instruments, or products, or will be successfully pursuing an advanced degree.
  - Graduates attaining the electrical engineering degree will have comprehensive knowledge and experience in the concepts and design of electrical and electronic devices, circuits and systems. This is achieved through a sequence of required courses in these areas, culminating in a major design project incorporating realistic engineering constraints. Moreover, graduates will have advanced, specialized knowledge and skills in elective areas such as communications and digital signal processing, control systems, analog and digital integrated circuit design, semiconductor devices and optoelectronics, electromagnetics and wireless systems, power electronics and renewable energy, bioelectronics and digital systems.

- Electrical engineering graduates will have attained other professional skills that will be useful throughout their careers, including verbal and written communication and the ability to function on multi-disciplinary teams.
- The electrical engineering curriculum is rich in laboratory work. Graduates will have achieved extensive practical experience in the laboratory techniques, tools and skills that provide a bridge between theory and practice.
- Graduates will have advanced in professional standing based on their technical accomplishments and will have accumulated additional technical expertise to remain globally competitive.
- Electrical engineering graduates experience a curriculum that contains a broad core of classes focused on mathematical and physical principles that are fundamental to the field of electrical engineering. Hence, they understand the physical and mathematical principles underlying electrical and electronic technology, and are able to analyze and solve electrical engineering problems using this knowledge. In addition to basic classes in mathematics, science and computing, the electrical engineering curriculum includes a sequence of courses in analog and digital electronic circuits and systems and electromagnetic fields.
- Graduates will have demonstrated professional and personal leadership and growth.
  - To lay the foundation for a long career in a rapidly changing field, a broad background of fundamental knowledge is required. This is achieved in the electrical engineering curriculum through a sequence of required classes in mathematics, physics, chemistry and the electrical engineering core. In addition, the graduate must be capable of lifelong learning; this is taught through assignments and projects that require independent research and study.
  - The curriculum includes a significant component of electives in the humanities and social sciences. EE graduates will have knowledge of the broader contemporary issues that impact engineering solutions in a global and societal context. They will have the verbal and written communications skills necessary for a successful career in industry or academia. Graduates also understand the meaning and importance of professional and ethical responsibility.

**Student Outcomes**

Upon graduation, students are expected to be able to:

- Identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics.
- 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.
- Communicate effectively with a range of audiences.
- 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.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives.
- Develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions.
Acquire and apply new knowledge as needed, using appropriate learning strategies.

**Bachelor’s–Accelerated Master’s Degree Program(s)**

The bachelor’s–accelerated master’s (BAM) degree program options offer currently enrolled CU Boulder undergraduate students the opportunity to receive a bachelor’s and master’s degree in a shorter period of time. Students receive the bachelor’s degree first, but begin taking graduate coursework as undergraduates (typically in their senior year).

Because some courses are allowed to double count for both the bachelor’s and the master’s degrees, students receive a master’s degree in less time and at a lower cost than if they were to enroll in a stand-alone master’s degree program after completion of their baccalaureate degree. In addition, staying at CU Boulder to pursue a bachelor’s–accelerated master’s program enables students to continue working with their established faculty mentors.

**Admissions Requirements**

**BS and MS in Electrical Engineering**

In order to gain admission to the BAM program named above, a student must meet the following criteria:

- Have a cumulative GPA of 3.000 or higher
- Complete all prerequisite courses with a minimum grade of solid B for 500-level coursework taken as an undergraduate student; minimum of solid C for undergraduate coursework
- Have completed 9–10 core ECEN courses (for more information, see the BAM degree (https://www.colorado.edu/ecee/undergraduate-program/degrees/bs-ms-degrees/) website)
- Have at least junior class standing
- Completion of all MAPS requirements and no deficiencies remaining
- Transfer students must have completed a minimum of 24 credit hours at CU Boulder

**BS in Electrical Engineering, MS in Technology, Cybersecurity and Policy**

In order to gain admission to the BAM program named above, a student must meet the following criteria:

- Have a cumulative GPA of 3.000 or higher
- Minimum grade of B in pre-requisite courses
- Have at least junior class standing
- Completion of all MAPS requirements and no deficiencies remaining

**Program Requirements (for both programs above)**

Students may take up to and including 12 hours while in the undergraduate program which can later be used toward the master’s degree. However, only six credits of coursework may be double counted toward the bachelor’s degree and the master’s degree. Students must apply to graduate with the bachelor’s degree, and apply to continue with the master’s degree, early in the semester in which the undergraduate requirements will be completed.

Please see the Electrical Engineering/Electrical Engineering BAM degree program (https://www.colorado.edu/ecee/undergraduate-program/degrees/bs-ms-degrees/) or Electrical Engineering/TCP BAM degree program (https://www.colorado.edu/itp/current-students/undergraduate/bsms-degree/) webpages for more information.