ELECTRICAL ENGINEERING - BACHELOR OF SCIENCE (BSEE)

A degree in electrical engineering provides graduates 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.

A Bachelor's of Science in Electrical Engineering cannot be earned in combination with a BS in Electrical & Computer Engineering or Integrated Design Engineering-Electrical Emphasis. A BS in Electrical Engineering also cannot be completed alongside any of the following minors: electrical engineering, computer engineering and signals & systems engineering.

Prerequisites and Passing Grades

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 higher for graduation.

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

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.

Required Courses

Code	Title	Credit Hours
Humanities, Social Sciences and Writing		
Writing [1]		3
Humanities & Social Sciences - at least 6 credits must be upper-division (3000-level or higher) [1]		15
Math and Science		
APPM 1350	Calculus 1 for Engineers	4
or MATH 1300	Calculus 1	
or APPM 1345	Calculus 1 with Algebra, Part B	
APPM 1360	Calculus 2 for Engineers	4
or MATH 2300	Calculus 2	
APPM 2350	Calculus 3 for Engineers	4
or MATH 2400	Calculus 3	
APPM 2360	Introduction to Differential Equations with Linear Algebra	4
or MATH 2130 & MATH 3430	Introduction to Linear Algebra for Non-Mathematics Majors and Ordinary Differential Equations	
or MATH 2135 & MATH 3430	Introduction to Linear Algebra for Mathematics Majors and Ordinary Differential Equations	
ECEN 3810	Introduction to Probability Theory	3
or APPM 3570	Applied Probability	
or STAT 3100	Applied Probability	
or MATH 4510	Introduction to Probability Theory	
PHYS 1110	General Physics 1	4
or PHYS 1115	General Physics 1 for Majors	
PHYS 1120	General Physics 2	4
or PHYS 1125	General Physics 2 for Majors	
PHYS 1140	Experimental Physics 1	1
General Science Elective [2]		3
Electrical Engineering		
ECEN 1100	Exploring ECE	1
or AREN 1316	Introduction to Architectural Engineering	
or BMEN 1000	Exploring Biomedical Engineering	
or CHEN 1300	Introduction to Chemical and Biological Engineering	
or CSCI 1000	Computer Science as a Field of Work and Study	
or CVEN 1317	Introduction to Civil and Environmental Engineering	
or EVEN 1000	Introduction to Environmental Engineering	
ECEN 1400	Introduction to Digital and Analog Electronics	3
or GEEN 1400	Engineering Projects	
or ASEN 1400	Gateway to Space	
or ASEN 1403	Introduction to Rocket Engineering	
or GEEN 2400	Engineering Projects for the Community	
ECEN 1310	Introduction to C Programming	4
or CSCI 1300	Computer Science 1: Starting Computing	
ECEN 2250	Introduction to Circuits and Electronics	3
ECEN 2260	Circuits as Systems	3
ECEN 2270	Electronics Design Lab	3

ECEN 2350	Digital Logic	4
ECEN 2360	Programming Digital Systems	3
or CSCI 2400	Computer Systems	
ECEN 2370	Embedded Software Engineering	3
ECEN 3250	Microelectronics	3
ECEN 3300	Linear Systems	3
ECEN 3400	Electromagnetic Fields and Waves	3
ECEN 4610	Capstone Laboratory Part 1	3
ECEN 4620	Capstone Lab, Part 2	3
Sophomore Electives		
Choose two:		6
ECEN 2410	Renewable Sources and Efficient Electrical Energy Systems	
ECEN 2420	Electronics for Wireless Systems	
ECEN 2440	Application of Embedded Systems	
ECEN 2450	Electronic and Semiconductor Device Laboratory	
Additional Electives		
Advanced Concentration Electives		*12*
Complete 12 credits of Advanced Concentration Elective coursework - at least 6 credits must be 4000-level or higher [3]		
Technical Electives		*12*
Complete 12 credits of Technical Elective coursework - at least 9 credits must be upper-division (3000-level or higher) [4]		
Free Electives		*7*
Complete 7 credits of Free Electives to meet the minimum 128 credit hours required for the BS degree.		
Total Credit Hours		**128**

1. Refer to 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.
2. Refer to ECEE's General Science Electives (https://www.colorado.edu/ecee/students/undergraduate-students/advising/general-science-electives/) webpage.
3. Refer to ECEE's Advanced Concentration Electives (https://www.colorado.edu/ecee/students/undergraduate-students/advising/advanced-concentration-electives-ace/) webpage.
4. Refer to ECEE's Technical Electives (https://www.colorado.edu/ecee/students/undergraduate-students/advising/technical-electives/) webpage.

Sample Four-Year Plan of Study

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		**Credit Hours**
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
COEN 1500	CEAS First Year Seminar	1
	Credit Hours	**16**
Spring Semester		
APPM 1360	Calculus 2 for Engineers	4
ECEN 1310	Introduction to C Programming	4
PHYS 1120	General Physics 2	4
PHYS 1140	Experimental Physics 1	1
Humanities & Social Sciences Elective [1]		2
	Credit Hours	**15**

Year Two

Fall Semester		
APPM 2360	Introduction to Differential Equations with Linear Algebra	4
ECEN 2250	Introduction to Circuits and Electronics	3
ECEN 2350	Digital Logic	4
ECEN 24XX Sophomore Elective [2]		3
Humanities & Social Sciences Elective [1]		3
	Credit Hours	**17**
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 [3]		3
ECEN 3XXX Advanced Analog Core [3]		3
General Science Elective [4]		3
	Credit Hours	**15**
Spring Semester		
ECEN 3XXX Advanced Analog Core [3]		3
Advanced Concentration Elective [6]		3
Technical Elective [5]		3
Technical Elective [5]		3
College-Approved Writing Course [1]		3
Free Elective		3
	Credit Hours	**18**

Year Four

Fall Semester		
ECEN 4610	Capstone Laboratory Part 1	3
Advanced Concentration Elective [6]		3
Advanced Concentration Elective [6]		3
Humanities & Social Sciences Elective [1]		3
Free Elective		4
	Credit Hours	**16**

Spring Semester		
ECEN 4620	Capstone Lab, Part 2	3
Advanced Concentration Elective [6]		3
Technical Elective [5]		3
Technical Elective [5]		3
Humanities & Social Sciences Elective [1]		3
	Credit Hours	**15**
	Total Credit Hours	**128**

1. Refer to 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.
2. Refer to ECEE's Sophomore Electives (https://www.colorado.edu/ecee/students/undergraduate-students/advising/sophomore-electives/) webpage.
3. The three options for Advanced Analog Core courses are ECEN 3250, ECEN 3300 and ECEN 3400.
4. Refer to ECEE's General Science Electives webpage (https://www.colorado.edu/ecee/students/undergraduate-students/advising/general-science-electives/).
5. Refer to ECEE's Technical (https://www.colorado.edu/ecee/students/undergraduate-students/advising/technical-electives/)Electives (https://www.colorado.edu/ecee/students/undergraduate-students/advising/sophomore-electives/) webpage.
6. Refer to ECEE's Advanced Concentration (https://www.colorado.edu/ecee/students/undergraduate-students/advising/advanced-concentration-electives-ace/)Electives (https://www.colorado.edu/ecee/students/undergraduate-students/advising/sophomore-electives/) webpage.

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, 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

By the completion of the program, students will 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 5000-level coursework taken as an undergraduate student; minimum of solid C for undergraduate coursework.
- Have completed 9-10 core ECEN courses (see BAM degree (https://www.colorado.edu/ecee/academics/undergraduate-programs/bachelors-accelerated-masters/) website for more information).
- Have at least junior class standing.

BS in Electrical Engineering, Professional ME in Engineering Management

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.
- Have at least junior class standing.

Program Requirements

For all 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.

Students can refer to the Electrical & Computer Engineering/Electrical Engineering BAM (https://www.colorado.edu/ecee/academics/undergraduate-programs/bachelors-accelerated-masters/) and Engineering Management BAMwebpages for more information.