ENVIRONMENTAL ENGINEERING - BACHELOR OF SCIENCE (BSEV)

Environmental engineers play a vital role in maintaining the quality of both public health and the natural environment. Environmental engineering encompasses the scientific assessment and development of engineering solutions to environmental problems impacting the biosphere, land, water, and air quality. Environmental issues affect almost all municipal, commercial, and industrial sectors, and are a central concern for the public, for all levels of government, and in international relations. These issues include safe drinking water, wastewater processing, solid and hazardous waste disposal, outdoor and indoor air pollution, human health and ecological risk management, prevention of pollution through alternative product or process design, and renewable and sustainable energy sources.

To address these challenges, environmental engineers often encounter challenging problems that must be solved in data-poor situations as members of multidisciplinary teams. Environmental problems require creative solutions blended with contributions from scientists, lawyers, business people, and the public. Good communication skills, as well as technical proficiency, are essential for success in this arena. In addition, technology designed to address environmental problems is marketed globally, opening up increasing opportunities for international work in the environmental engineering field.

Mission

The mission of the Environmental Engineering Program (http://www.colorado.edu/even) is to provide a multidisciplinary undergraduate environmental engineering education that emphasizes mastery of principles and practices, inspires service for the global public good, endows a desire for lifelong learning, and prepares students for broad and dynamic career paths in environmental engineering.

Faculty

The faculty of the Environmental Engineering (EVEN) Program (http://www.colorado.edu/even/people) are drawn from the Departments of Civil, Environmental, and Architectural Engineering; Mechanical Engineering; Chemical and Biological Engineering; and Aerospace Engineering Sciences. The EVEN faculty, its Professional Advisory Board (representing prospective employers of its graduates), and EVEN alumni and current students have contributed to the creation of the program's mission and the educational objectives of the BS in environmental engineering degree.

Requirements

The BS degree in environmental engineering at the University of Colorado Boulder provides preparation for professional proficiency or graduate training in environmental engineering in a four-year curriculum. The curriculum includes courses in engineering fundamentals and applications, advanced mathematics, chemistry, physics, microbiology and earth science, along with courses in the arts, humanities and social sciences.

Courses specific to environmental engineering practice include water chemistry, environmental microbiology, and air pollution control. In addition, environmental engineering requires hands-on laboratory experiences, up-to-date skills in the use of computers for modeling and data analysis, and experience in the design of environmental engineering systems. Many of the required engineering courses in the bachelor of science curriculum are culled from civil, environmental, and architectural engineering; chemical and biological engineering; and mechanical engineering.

The curriculum also includes three technical electives, three environmental engineering sequence courses, and two free electives. Technical elective courses include a broad range of science and engineering courses, and must include an earth sciences course.

The environmental engineering sequence courses are selected by the student beginning in the junior year. The sequence consists of one environmental engineering design course and two environmental engineering technical elective (https://www.colorado.edu/even/sites/default/files/attached-files/list_b_environmental_engineering_technical_electives_2017-2018.pdf) courses.

Students in the program are also encouraged to participate in research through independent study or senior thesis projects, the Undergraduate Research Opportunities Program (UROP), or as undergraduate research assistants in sponsored research programs. Students are required to take the Fundamentals of Engineering (FE) exam when they are within 32 credit hours of graduation.

Sample Four-Year Plan of Study

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td><strong>Year One</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>APPM 1350</td>
<td>Calculus 1 for Engineers</td>
<td>4</td>
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<tr>
<td>CHEM 1221</td>
<td>Engineering General Chemistry Lab</td>
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<tr>
<td>CHEN 1211</td>
<td>General Chemistry for Engineers</td>
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<tr>
<td>EVEN 1000</td>
<td>Introduction to Environmental Engineering</td>
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<tr>
<td></td>
<td>First-Year Engineering Projects course</td>
<td>3</td>
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<tr>
<td></td>
<td>Humanities and social science elective</td>
<td>3</td>
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<tr>
<td></td>
<td><strong>Credit Hours</strong></td>
<td><strong>16</strong></td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>APPM 1360</td>
<td>Calculus 2 for Engineers</td>
<td>4</td>
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<tr>
<td>CHEN 1310</td>
<td>Introduction to Engineering Computing</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 1110</td>
<td>General Physics 1</td>
<td>4</td>
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<td></td>
<td>Humanities and social science elective</td>
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<tr>
<td></td>
<td>Technical elective</td>
<td>3</td>
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<td><strong>Credit Hours</strong></td>
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<tr>
<td><strong>Year Two</strong></td>
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<td><strong>Fall Semester</strong></td>
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<tr>
<td>APPM 2350</td>
<td>Calculus 3 for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1120</td>
<td>General Physics 2</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1140</td>
<td>Experimental Physics 1</td>
<td>1</td>
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<td>Select one of the following in Statics:</td>
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<td></td>
<td>CVEN 2121</td>
<td>Analytical Mechanics 1</td>
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<td>GEEN 2851</td>
<td>Statics for Engineers</td>
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<td></td>
<td>MCEN 2023</td>
<td>Statics and Structures</td>
</tr>
<tr>
<td></td>
<td>Humanities and social science elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Credit Hours</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>
Spring Semester
APPM 2360 Introduction to Differential Equations with Linear Algebra 4
CVEN 3414 Fundamentals of Environmental Engineering 3
Select one of the following inFluids Mechanics:
CVEN 3313 Theoretical Fluid Mechanics 3
GEEN 3853 Data Analysis for Engineers 3
MCEN 3021 Fluid Mechanics 3
CHEN 3200 Chemical Engineering Fluid Mechanics (Select one of the following in Fluids Mechanics) 3
Humanities and social science elective 4 3
Free Elective 3
Credit Hours 16

Year Three
Fall Semester
EVEN 4404 Water Chemistry 3 3
EVEN 4414 Water Chemistry Laboratory 3 1
EVEN 3550 Sustainability Principles for Engineers 3
Select one of the following in Economics:
CVEN 3246 Introduction to Construction 3
CVEN 4147 Civil Engineering Systems 3
EMEN 4100 Engineering Economics 3
Select one of the following in Thermodynamics:
AREN 2110 Thermodynamics 3
MCEN 3012 Thermodynamics 3
CHEN 3320 Chemical Engineering Thermodynamics 3
GEEN 3852 Thermodynamics for Engineers 3
College-approved writing course 5 3
Credit Hours 16

Spring Semester
EVEN 4424 Environmental Organic Chemistry 3 3
EVEN 4484 Introduction to Environmental Microbiology 3
MCEN 3022 Heat Transfer 3 or CHEN 3210 Chemical Engineering Heat Transfer 3
Select one of the following in Probability and Statistics:
CVEN 3227 Probability, Statistics and Decision 3
APPM 4570 Statistical Methods 3
CHEN 3010 Applied Data Analysis 3
Environmental engineering design/technical elective I 2 3
Credit Hours 15

Year Four
Fall Semester
EVEN 4464 Environmental Engineering Processes 3 3
Humanities and social science elective 4 3
Air or earth science laboratory or field course 3
Choose from: EVEN 4100, ATOC 1050/ATOC 1070, GEOI 1010/GEOI 1030, GEOI 3010 3
Environmental engineering design/technical elective II 2 3
Select one of the following:
Technical elective II 3
Senior Thesis 6
Environmental engineering design/technical elective III 2
Free elective 2
Credit Hours 17

Spring Semester
CVEN 4333 Engineering Hydrology 3 3
EVEN 4434 Environmental Engineering Design 4
MCEN 4131 Air Pollution Control Engineering 3 3
Select one of the following:
Environmental engineering design/technical elective III 2
Technical Elective II 1
Select one of the following:
Technical elective III 1
Senior Thesis 6
Credit Hours 16
Total Credit Hours 128

A total of 9 credit hours of technical electives is required. Three technical elective credit hours may be lower-division (1000–2000-level). Three technical elective credit hours must be in the earth sciences, either lower or upper division. Remaining technical elective credit hours must be upper division in engineering, mathematics or sciences. Independent study (EVEN 4840) or senior thesis (EVEN 4980 and EVEN 4990) may be completed as technical electives for up to 6 credits hours.

A nine-credit-hour (three-course) sequence in environmental engineering – one environmental engineering design course and two environmental engineering technical electives.

Only offered in the semester shown (not including summer offerings).

Students may choose courses from the list of college-approved humanities and social sciences (HSS) electives (http://www.colorado.edu/engineering/academics/policies/hss).

Students may choose a course from the list of college-approved writing courses (http://www.colorado.edu/engineering/academics/policies/hss).

A senior thesis can be completed on a single research topic, with faculty approval and direction, and can apply toward technical elective requirements.

Learning Outcomes
Program Educational Objectives
The educational objective of the Environmental Engineering Bachelor of Science degree is to produce graduates who are capable of reaching the following career goals three to five years after graduation:

• Graduates will be employed in engineering, science or other professional careers.
• Graduates will pursue professional registration or other appropriate certifications.
• Graduates will be engaged in continual learning by pursuing advanced degrees or additional educational opportunities through coursework, professional conferences and training, and/or participation in professional societies.
• Graduates will be engaged in activities that provide benefits to communities, the environment and/or public health.

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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.

BS in Environmental Engineering, MS in Civil Engineering

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

• Have a cumulative GPA of 3.250 or higher
• Have at least junior class standing

Program Requirements
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 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.¹

¹ Students who were admitted prior to July 2019 follow a concurrent Bachelor’s/Master’s structure, and the two degrees are awarded simultaneously when requirements for both degrees are met.

Please see the BAM degree program (https://www.colorado.edu/even/current-students/undergraduate-studies/5-year-bsms) web page for more information.