Environmental Engineering (EVEN) Degree Guidelines
Academic Year 2015-2016
College of Engineering and Applied Science
University of Colorado at Boulder

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Version: February 2015
Latest and previous versions at http://www.colorado.edu/even/current-students/guidelines
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1. Overview of Guidelines and Introduction to Environmental Engineering

The Environmental Engineering (EVEN) Degree Guidelines provide an outline of the curriculum and policies of the Environmental Engineering (EVEN) degrees offered by the College of Engineering and Applied Science of the University of Colorado at Boulder. These guidelines are written primarily for students and Faculty Advisors of the Environmental Engineering Program. The current version of these Guidelines and versions dating back to the beginning of the Program in 1998 are kept on the Program’s web site (http://www.colorado.edu/even/current-students/guidelines).

General policy information for students is also available from the Office of Student Services in the Dean’s Office of the College of Engineering and Applied Science (http://www.colorado.edu/engineering/academics/policies) and in the University of Colorado at Boulder Catalog (http://www.colorado.edu/catalog/). Further information on academic support programs, is available at http://www.colorado.edu/engineering/academics/support.

Information on courses offered, including course descriptions, is available in the University Catalog. The course schedule for each semester is available to CU students through the MyCUInfo portal (http://mycuinfo.colorado.edu). A .pdf file of course listings, alphabetical by college and department, can be found on the Continuing Education Access site: http://conted.colorado.edu/programs/access/ (This document is not updated past its “publication date”, however, so check the online schedule for the most recent information.)

1.1. Overview of Environmental Engineering

Environmental engineers play a vital role in maintaining the quality of both human environmental systems 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 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 air pollution, indoor air pollution and transfer of infectious diseases, human health and ecological risk management, prevention of pollution through product or process design, and renewable and sustainable energy sources and their effects on the environment.

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 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.

1.2. History of the Environmental Engineering Program

The Environmental Engineering Program at the University of Colorado at Boulder originated with a college-wide faculty committee that met during the 1993-1994 academic year to develop a multi-disciplinary curriculum for a Bachelor of Science degree in Environmental Engineering. The committee was headed by Prof. John Daily of Mechanical Engineering. The degree program was intended to supplement environmental engineering options that were offered through the Departments of Chemical and Biological Engineering and Civil, Environmental, and Architectural Engineering (the Department of Mechanical Engineering now offers an environmental engineering option as well).

The initiative to develop the EVEN BS degree and the Environmental Engineering Program to administer the degree was motivated by recognition that (1) environmental engineering had matured into a full-fledged discipline of its own and (2) environmental engineering intersected with the traditional disciplines of chemical, civil, and mechanical engineering, but was not adequately covered by any single discipline. The faculty committee decided that students intending to work in environmental engineering would benefit from a curriculum that focused on environmental engineering and related courses regardless of which department offered those courses. At the same time, the existing environmental engineering options could be retained in the departments for students who were interested in environmental engineering but wanted to pursue traditional chemical, civil, or mechanical engineering degrees.
The proposed EVEN BS degree program was approved by the faculty of the College of Engineering and Applied Science in the spring of 1994. The faculty committee then prepared a full proposal for the new degree program for the Colorado Commission on Higher Education (CCHE), and the new EVEN BS degree program was approved in the spring of 1998. The first Director of the Environmental Engineering Program was Prof. Jana Milford of Mechanical Engineering. Students began entering the program in the fall of 1998. The first degree was awarded in December 1999 (to a student who transferred into the program as a third-year student).

In approving the new degree, CCHE relied on the College's intent to deliver the EVEN BS degree using existing courses and faculty. To this end, the program is administered by the College, and operates through the participation of affiliated faculty from Aerospace Engineering Sciences, Chemical and Biological Engineering, Civil, Environmental, and Architectural Engineering, and Mechanical Engineering. The College provides support for a faculty Director, an Academic Advisor, administrative support, and teaching support for courses to supplement the EVEN curriculum. The four departments that participate in the program are committed to regularly offering the courses that comprise the EVEN curriculum, coordinating to avoid scheduling conflicts, and sharing academic advising and other faculty service requirements.

During the 2002-2003 academic year, the Environmental Engineering Program applied for accreditation of the EVEN BS degree with the Engineering Accreditation Commission of ABET (Accreditation Board of Engineering and Technology, http://www.abet.org). The ABET examiners were thoroughly satisfied with the EVEN BS degree and ABET granted accreditation to the degree in September 2003. The Environmental Engineering Program completed the first major revision of the EVEN curriculum for the 2004-2005 academic year, and was re-accredited in 2006 and 2012.

1.3. Mission and Educational Objectives

The EVEN faculty, its Professional Advisory Board (representing prospective employers of our graduates), and EVEN alumni and current students have contributed to the creation of the Program’s mission and the educational objectives of the EVEN BS degree.

The mission of the Environmental Engineering Program 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 life-long learning, and prepares students for broad and dynamic career paths in environmental engineering.

The educational objectives of the EVEN BS degree are to produce students who reach the following achievements three to five years after graduation:

1. EVEN graduates have become established in professional careers and/or earned advanced degrees;
2. EVEN graduates have applied multidisciplinary approaches to manage the unique challenges and balance the competing social, political, economic, and technical goals of environmental problems and solutions; and
3. EVEN graduates have served the needs of our society and protected the future of our planet in an ethical manner.

1.4. Program Outcomes

A list of program outcomes for EVEN graduates was developed that satisfies the requirements of ABET in the Criteria for Accrediting Engineering Programs for general engineering programs (ABET Criterion 3) and for environmental engineering programs as developed by the American Academy of Environmental Engineers (AAEE) and cooperating societies. As defined by ABET, outcomes are “statements that describe what students are expected to know and are able to do by the time of graduation” (ABET, 2010).¹

The outcomes that students are expected to have attained upon graduation with a Bachelor of Science degree in environmental engineering are:

- the ability to apply knowledge of math, science and engineering
- the ability to design and conduct experiments
- the ability to analyze and interpret data
- the ability to design a system, component or process to meet desired needs within realistic constraints
- the ability to function on multidisciplinary teams
- the ability to identify, formulate and solve engineering problems
- an understanding of professional and ethical responsibility
- the ability to communicate effectively through writing
- the ability to communicate effectively through oral presentations
- an understanding of the impact of engineering on society
- a recognition of the need for and an ability to engage in life-long learning
- an understanding of contemporary issues in environmental engineering
- the ability to use modern engineering techniques, skills and tools

The curriculum that has been developed and the content of those courses help to ensure that the Environmental Engineering Program satisfies these outcome goals. Extracurricular activities, internships, co-ops and participation in research also contribute to satisfying these goals. Evaluation of courses and surveys of graduating seniors and alumni help us to document that the EVEN Program successfully achieves these outcomes. Student performance on the Fundamentals of Engineering (FE) exam also documents our success. Review of course syllabi and student work by faculty and the Advisory Board ensures on-going evaluation and improvement of our curriculum to best serve our students and the Environmental Engineering profession.

2. Environmental Engineering Degree Programs

2.1. Bachelor of Science Degree in Environmental Engineering

2.1.1. Overview of EVEN BS Degree

The Bachelor of Science degree in Environmental Engineering at the University of Colorado 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, biology, and earth science, as well as the arts, humanities and social sciences. Courses specific to environmental engineering practice include water chemistry, 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 delivered by the departments of Chemical and Biological Engineering, Civil, Environmental, and Architectural Engineering, and Mechanical Engineering. The curriculum also includes three Option courses, three technical elective courses and a free elective. The three Option courses represent an area of specialization in environmental engineering selected by the student beginning in the third year. The curriculum includes seven sets of prescribed Option courses in these areas of specialization:

- Air Quality
- Environmental Remediation
- Chemical Processing
- Engineering for Developing Communities
- Energy Conversion Fundamentals
- Applied Ecology
- Water Resources and Treatment
In addition to these prescribed Options, students may also formulate their own sequence of Option courses (referred to
as a "Special Option") representing an area of specialization not included in the Options listed above. This selection must
be approved through petition to the Environmental Engineering Program. Examples of special option topics include
Energy and Industrial Monitoring, and Remediation and Ecology.

Students in the program are also encouraged to participate in research through independent study projects, a senior
thesis, the Undergraduate Research Opportunities Program (UROP), the Discovery Learning Apprenticeship Program
(http://engineering.colorado.edu/activelearning/discovery.htm), or as undergraduate research assistants in sponsored
research programs.

2.1.2. Curriculum for EVEN BS Degree

The following section contains the curriculum table for the EVEN BS degree. The curriculum represents a “contract” of
sorts with incoming students – for students entering the program during the current academic year, completion of
this curriculum with a satisfactory grade point average is the requirement for graduation. The curriculum also
represents a guarantee that the courses listed (or acceptable substitutes) will be available in the semesters listed.

The curriculum is somewhat dynamic despite its contractual nature. Minor changes may be made by the Program during
the academic year, and major changes may be made between academic years. To meet graduation requirements,
students are expected to follow the curriculum in effect for the academic year that they matriculated into the program;
therefore, students should keep a copy of the Environmental Engineering (EVEN) Degree Guidelines for that year. An
archive of the Guidelines is retained on the program’s web site (http://www.colorado.edu/even/current-
students/guidelines). Students may elect to follow a later curriculum revision with program approval; however, students
may not elect to follow a curriculum in effect before they started the program, and may not combine curricula for
different years.

The curriculum below shows the recommended sequence of courses. Courses marked with an asterisk (*) are offered
only in the semester shown (fall or spring). Other courses are offered in both semesters, and sometimes in the summer.
Students may take courses in terms other than those shown, but must be careful to meet prerequisites or co-requisites
for each course. The air or earth sciences lab or field course and the free elective (both listed in the fourth year) may be
taken in any semester.

Many of the required courses in the EVEN BS curriculum (solid mechanics, engineering economics, fluid mechanics,
thermodynamics, heat transfer, probability and statistics) may be satisfied by courses from various engineering
departments. Students may choose a course from any of the approved options for each requirement; however, students
should evaluate these choices carefully depending on their major interest in environmental engineering. For example, a
student interested in the Air Quality Option would want to take the Mechanical Engineering courses for solid mechanics,
fluid mechanics, thermodynamics, and heat transfer. A student interested in the Chemical Processing Option would
choose chemical engineering (CHEN) courses. Sometimes a specific version of a course is required for a certain option.

For certain courses in the EVEN BS degree curriculum, students may encounter questions about prerequisite and co-
requisite course requirements not being met. If students are following the recommended curriculum sequence there is
no need for concern; the Environmental Engineering Program has consulted in detail with the departments and faculty
offering these courses to ensure that the sequence of courses in the EVEN curriculum is appropriate for engineering
students.

Guidance on selection of Option, Humanities and Social Science (H&SS), and technical elective courses is offered in
Section 4.
# ENVIRONMENTAL ENGINEERING (EVEN) B.S. DEGREE Curriculum

## 2015-2016 Academic Year

<table>
<thead>
<tr>
<th>Fall, First Year</th>
<th>Spring, First Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPM 1350 Calculus 1 for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>CHEN 1211 General Chemistry for Engineers</td>
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</tr>
<tr>
<td>CHEM 1221 General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>EVEN 1000 Introduction to Environmental Engineering (*)</td>
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<tr>
<td>GEEN 1400 Engineering Projects</td>
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</tr>
<tr>
<td>H&amp;SS Elective I</td>
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<tr>
<td><strong>Total Credit Hours</strong></td>
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<th>Fall, Second Year</th>
<th>Spring, Second Year</th>
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<tbody>
<tr>
<td>APPM 2350 Calculus 3 for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1120 General Physics 2</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1140 Experimental Physics 1</td>
<td>1</td>
</tr>
<tr>
<td>Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>H&amp;SS Elective III</td>
<td>3</td>
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<tr>
<td><strong>Total Credit Hours</strong></td>
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<tr>
<th>Fall, Third Year</th>
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</thead>
<tbody>
<tr>
<td>EVEN 4404 Water Chemistry (*)</td>
<td>3</td>
</tr>
<tr>
<td>EVEN 4414 Water Chemistry Lab (*)</td>
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<tr>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>Required Communication/Writing Course</td>
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<tr>
<td><strong>Total Credit Hours</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Fall, Fourth Year</th>
<th>Spring, Fourth Year</th>
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<tr>
<td>EVEN 4464 Environmental Engineering Processes (*)</td>
<td>3</td>
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<tr>
<td>H&amp;SS Elective V</td>
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<tr>
<td>Free Elective</td>
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</tr>
<tr>
<td>Option Course II</td>
<td>3</td>
</tr>
<tr>
<td>Air or Earth Science Laboratory/Field Course</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective II</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Credit Hours</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

*Only offered in the semester shown (not including summer offerings). Total Credit Hours 128

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1. A total of 9 credit hours of technical electives is required, from engineering, mathematics or sciences. Three TE credits may be lower division (1000-, 2000-level); remaining TE credits must be upper division (3000+). Three TE credits must be in the earth sciences, either lower or upper division. An independent study or senior thesis may be completed as technical electives for up to 6 credits.

2. A total of 15 credit hours of humanities and social sciences (H&SS) electives is required. At least six hours must be at the upper division level.

3. Solid Mechanics options: CVEN 2121 Analytical Mechanics (F,S), GEEN 2851 Statics for Engineers, or MCEN 2023 Statics and Structures (F)

4. fluid Mechanics options: CHEN 3200 Chemical Engineering Fluid Mechanics (S, required for Chemical Processing Option), CVEN 3313 Theoretical Fluid Mechanics (S), GEEN 3853 Fluid Mechanics for Engineers (Sum), or MCEN 3021 Fluid Mechanics (F,S)

5. Heat Transfer options: CHEN 3210 Chemical Engineering Heat Transfer (F) or MCEN 3022 Heat Transfer (F,S)

6. Thermodynamics options: AREN 2110 Thermodynamics (F,S), CHEN 3320 Chemical Engineering Thermodynamics (F; required for Chemical Processing Option), GEEN 3852 Thermodynamics for Engineers (Sum), or MCEN 3012 Thermodynamics (F, S, required for Air Quality Option)

7. Probability and Statistics options: APPM 4570 Statistical Methods (F,S), CHEN 3010 Applied Data Analysis (F), CVEN 3227 Probability, Statistics, and Decision (S)

8. Option courses are specified on the following pages.

9. Communication/writing: HUEN 1010 Intro to the Humanities Freshman only (F,S), HUEN 3100 Humanities for Engineers 1 (F,S), PHYS 3050 Writing in Physics: Problem Solving & Rhetoric (F), WRTG 3030 Writing on Science and Society (F,S,Sum), or WRTG 3035 Technical Communication and Design (F, S).

10. Air or Earth Science Lab/Field Course: A 3 credit hour course with a significant laboratory or field component related to air quality or earth science. If course is less than 3 credits, the difference is required as an upper division technical elective. Options: ATOC 1050/1070 Weather and the Atmosphere Lab/Lecture or ATOC 1070 and Upper Tech Elec., CVEN3708 Geotechnical Engineering, EVEN4100 Environ. Sampling & Analysis, GEOL1030 Intro to Geology 1 Lab, GEOL2700 Intro to Field Geology, GEOL3010 Intro to Mineralogy (F), GEOL4716 Environmental Field Geochemistry (S)

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

12. Engineering Economics options: CVEN 4147 Civil Engineering Systems (F), EMEN 4100 Business Methods and Economics for Engineers
2.2. EVEN Options

Beginning in the spring semester of their third year, EVEN students must select an option, an area of specialization in environmental engineering. For each option, a total of 9 credit hours of option courses are required. Students may choose from the lists of possible Option courses listed below. Special topics courses may also be approved on a case-by-case-basis. See websites (under revision) listed under each option for more information, including specific curricula and courses, faculty, research, jobs and employers and other professional opportunities and links.

Note that not all of the courses listed are offered every year, denoted by *I

Air Quality Option (http://www.colorado.edu/even/air-quality-option)
- ATOC 3500/CHEM 3151 Air Chemistry and Pollution (3 credits, *I; prerequisites: two semesters chemistry)
- ATOC 4720 Introduction to Atmospheric Physics and Dynamics (3 credits, *I; prerequisites: APPM 1350, PHYS 1110)
- CVEN 4554 Fundamentals of Air Quality Management (3 credits, prerequisites: APPM 2360, fluid mechanics)
- MCEN 3032 Thermodynamics 2 (3 credits, F&S; prerequisites: thermodynamics and fluid mechanics)
- MCEN 4141 Indoor Air Pollution (3 credits, F; prerequisites: fluid mechanics, heat transfer)
- MCEN 4228 Environmental Modeling (3 credits, *I; prerequisites: chemistry, fluid mechanics, CHEN 1310)
- MCEN 4228 Sustainable Energy (3 credits, F; prerequisite: thermodynamics)

Applied Ecology Option (http://www.colorado.edu/even/current-students/even-options/applied-ecology-option)

Required for this option
- CVEN 3434 Intro to Applied Ecology (3 credits, S; prerequisites: CHEN 1211-1221)

Two courses (6 credit hours) from among the following:
- EBIO 2070 Genetics: Molecules to Populations (4 credits; prereqs: CVEN 3434 or EBIO 1240)
- EBIO 3270 Ecosystem Ecology (3 credits, S; prerequisites: CVEN 3434 or EBIO 1240, EBO 2040 or EBO 3020†)
- EBIO 4030 Limnology (3 credits, S; prerequisites: CVEN 3434 or EBIO 1240, EBO 2040 †)
- EBIO 4060 Landscape Ecology (3 credits, F; prerequisite: CVEN 3434 or EBO 1240)
- EBIO/GEOL/ENVS 4160 Introduction to Biogeochemistry (3 credits; prerequisite: CHEM 1011 or higher, EBO 3270 or GEOL 3320)
- GEOG 4311 Watershed Biogeochemistry (3 credits, prerequisite: GEOG 1011 and GEOG 3511†)

Chemical Processing Option (http://www.colorado.edu/even/current-students/even-options/chemical-processing-option)

Required for this option
- CHEN 4521 Physical Chemistry for Engineers (3 credits, prerequisite: APPM 2350 and CHEN 1211; co-requisite APPM 2360)
- CHEN 3220 Chemical Engineering Separations and Mass Transfer (3 credits, S; prerequisites: CHEN 3210 and CHEN 3320)
- CHEN 4330 Chemical Engineering Reaction Kinetics (3 credits, S; prerequisites: CHEN 3320 and APPM 2360)

One course from among the following is recommended as a technical elective:
- CVEN 3424 Water and Wastewater Treatment (3 credits, S, prerequisite: CVEN 3414)
- CVEN 4474 Hazardous and Industrial Waste Management (3 credits, F; prerequisite: CVEN 3414)

Energy Conversion Fundamentals Option (http://www.colorado.edu/even/current-students/even-options/energy-conversion-fundamentals-option)

Required for this option
- ECEN 3010(S)/MCEN 3017(F) Circuits and Electronics (3 credits, prerequisites: APPM 2360, PHYS 1140)
- MCEN 3032 Thermodynamics 2 (3 credits, F&S, prerequisites: MCEN 3012, MCEN 3021 or equivalents)

One course from among the following:
- CHEN 4838 Energy Fundamentals (3 credits, S, prerequisite: thermodynamics)
- AREN 5020 Building Energy Audits (3 credits, F, prerequisite: AREN 3010 or equivalent, instructor permission required)
- AREN 5050 Advanced Solar Design (3 credits, F, AREN 2120 or equivalent, instructor permission required)
- MCEN 4228 Sustainable Energy (3 credits, F, prerequisite: thermodynamics)
- CVEN 5834 Bioenergy and Bioresources Recovery (3 credits, F, desired prerequisite: EVEN 4484, instructor permission required)
Engineering for Developing Communities Option

A minimum of one of the following two courses:

- CVEN 3424 Water and Wastewater treatment (3 credits, S, Prerequisite: CVEN 3414) or
- CVEN 4554 Fundamentals of Air Quality Management (3 credits, F, Prerequisite: APPM 2360 (or MATH 3130 and 4430) and CHEN 3313 (or CHEN 3200 or MCEN 3021)

Two additional courses from the following below or a second from above:

- GEOG 3682 Geography of International Development (3 credits, F): recommended prerequisite: GEOG 1982, 1992, 2002 or 2412
- EMEN 4200 Technology and Entrepreneurship for the Developing World (3 credits, F or sum; Jr or Sr only)
- CVEN 4837 Sp Top: Global Engineering (3 credits)
- CVEN 5834 Sp Top: Water, Sanitation and Hygiene (3 credits, F, prerequisites: CVEN 3424 or equivalent and instructor permission)
- *ATLS 5210 Global Development I (3 credits, F, prerequisite: instructor permission, also listed as CVEN 5919)
- *ATLS 5250 Fieldwork Methods for ICTD Practitioners (3 credits, S, prerequisites: ATLS 5210 Global Development I and instructor permission)

Remediation Option

- CVEN 4353 Groundwater Engineering (3 credits, F; prerequisite: CVEN 3313 or equivalent fluid mechanics course)
- CVEN 4474 Hazardous and Industrial Waste Management (3 credits, *I; prerequisite: CVEN 3414)
- EVEN 4100 Environmental Sampling and Analysis (3 credits, *I; prerequisites: EVEN 4404/4414, CVEN 3313, EVEN 4424)
- GEOL 3030 Introduction to Hydrogeology (3 credits, F; prerequisites: GEOL 1010 or GEOL 2100 and MATH 1300, or instructor consent)
- GEOL 4716 Environmental Field Geochemistry (2 credits, S; prerequisites: GEOL 2700 or 2001, and CHEM 1011/1031, or CHEM 1113/1133, and GEOL 3320, or instructor consent) and will need to make up extra 1 credit.
- MCEN 4228 Environmental Modeling (3 credits, *I, prerequisites: chemistry, fluid mechanics, CHEN 1310)

Water Resources and Treatment Option

- CVEN 3323 Hydraulic Engineering (3 credits, F; prerequisite: CVEN 3313 or CHEN 3200 or CVEN 3313 or GEEN 3853 or MCEN 3021 or AREN 2120)
- CVEN 3424 Water and Wastewater Treatment (3 credits, S; prerequisite: CVEN 3414)
- CVEN 4353 Groundwater Engineering (3 credits, F; recommended prerequisite: CVEN 3313 or CHEN 3200 or CVEN 3313 or GEEN 3853 or MCEN 3021)
- CVEN 4474 Hazardous and Industrial Waste Management (3 credits, F, *I; prerequisite: CVEN 3414)
- CVEN 4383 Groundwater Modeling (3 credits, S; prerequisite: CVEN 4353)
- CVEN 4594 Water Reuse and Reclamation (3 credits, *I; Prerequisite: CVEN 3414)
- GEOG 4501 Water Resources and Water Management of the Western U.S. (3 credits)
- MCEN 4228 Environmental Modeling (3 credits, *I; prerequisites: chemistry, fluid mechanics, CHEN 1310)

Special Option

Students with unique educational goals may formulate a personalized sequence of three courses (9 credit hours) as the Option sequence. To do so, students must present their Option plan to their Faculty Advisor and submit a Special Option Proposal to the Environmental Engineering Program for approval. A special option must have a specific, well-thought-out purpose related to your education or career goals (i.e., "scheduling conflict" is not an acceptable reason for a special option.) Ordinarily, special option courses should be upper division technical electives.


2.3. Dual Degrees

Students in the College of Engineering and Applied Science may obtain Bachelor of Science degrees in two engineering disciplines or one degree in engineering and a second degree from a department in another college or school of the University. Students must satisfy the curricula for both programs and may need to complete additional credit hours beyond the larger minimum credit hour requirement. Currently a minimum of 15 additional credit hours are required for each additional major.

Colorado residents should be aware that the College Opportunity Fund (COF) may not cover all tuition costs associated with a double degree program (those beyond 145 semester credit hours).

2.4. Concurrent Bachelor of Science/Master of Science Degree

The Environmental Engineering Program is cooperating with the Department of Civil, Environmental, and Architectural Engineering to offer concurrent EVEN BS/CVEN MS degrees in a five-year curriculum. The purpose of the concurrent EVEN BS/CVEN MS degrees is to allow capable students to gain greater depth of knowledge in environmental engineering by jointly pursuing BS and MS degrees. The concurrent degree program offers students greater flexibility in scheduling technical electives and graduate courses.

To fit the BS and MS degrees in only five years, students are allowed to count 6 credit hours taken at the graduate level for both the EVEN BS and CVEN MS degrees. Students must first complete the four-year Environmental Engineering Bachelor of Science curriculum (Section 2.1); they then complete the requirements of the CVEN MS degree.

Students seeking to pursue the concurrent EVEN BS/CVEN MS degrees must have a minimum grade point average of 3.25 when they submit an application for admission to the program. Students are expected to submit an application during the sixth or seventh semester of their undergraduate program in EVEN (75 to 110 credit hours). Applications are made to the Department of Civil, Environmental, and Architectural Engineering. The following items are needed to complete an application:

- Concurrent EVEN BS/CVEN MS Degrees application form (no application fee)
- Four letters of recommendation
- University of Colorado Application for Graduate Admission form, Part II only
- Certification by the EVEN Program that the required number of coursework hours have been completed
- Copy of internal transcript

The application deadlines are March 31st for admission to the program for the following fall and October 31st for admission for the following spring semester.

To continue in the program, students must maintain full-time status with a cumulative GPA of 3.25. In addition, to count the two graduate courses (6 credit hours) for both the EVEN BS and CVEN MS degrees, the student must achieve a grade point average of at least 3.5 in the 24 credit hours taken immediately after admission to the program. For the CVEN MS, students may complete the requirements for either the Plan I (thesis), Plan II (report) or Plan III (coursework and final exam) Master of Science degrees.

Students admitted to the concurrent EVEN BS/CVEN MS degrees program who do not meet the requirements for completing the concurrent degrees or who elect not to complete the concurrent degrees may count appropriate graduate courses toward the technical elective (up to 9 credit hours) and option course (up to 9 credit hours) requirements for the EVEN BS.
2.5. Certificate Programs and Minors

The College of Engineering and Applied Science offers four certificate programs, which can be obtained along with the EVEN degree:

**Certificate in Engineering Science and Society:** [http://engineering.colorado.edu/academics/ess.htm](http://engineering.colorado.edu/academics/ess.htm). This program considers the question: “How can the increasingly vast powers of science be guided toward the solution of human problems and kept from aggravating them?” Students are guided toward courses that will help them identify and become engaged in the ethical and policy issues, and the risks as well as the benefits of engineering, applied science and technology.

**Engineering Entrepreneurship Certificate and Engineering Management Certificate:** [http://emp.colorado.edu/current/ceas_grads.htm](http://emp.colorado.edu/current/ceas_grads.htm). Students take courses in engineering management, finance and marketing, culminating in a senior design project which incorporates an entrepreneurship business plan.

**Global Engineering Certificate** [http://mced.colorado.edu/education/undergraduate-certificate-global-engineering](http://mced.colorado.edu/education/undergraduate-certificate-global-engineering). Undergraduate certificate focusing on international teamwork, including understanding global economics and governance, international development, and conversational foreign language skills.

**International Engineering Certificate** [http://www.colorado.edu/engineering/node/191453]. This certificate is available in Chinese, French, German, Italian, Japanese and Spanish and can include an international co-op or study abroad.

**Engineering Leadership Program:** [http://engineering.colorado.edu/leadership/index.htm](http://engineering.colorado.edu/leadership/index.htm). Students have an opportunity to pursue leadership courses and experiences.

Other certificate programs are available throughout the CU-Boulder campus, in many different disciplines.

**Minors** are available in the College of Engineering and Applied Science in: Computer Science, Computer Engineering, Electrical Engineering, Electrical Renewable Energy Systems, and Signals and Systems (http://www.colorado.edu/engineering/academics/degrees-minors-certificates/minors) as well as in Applied Mathematics. Minors are also available through the College of Arts and Sciences (http://artsandsciences.colorado.edu/artssciences/departments) and the Leeds School of Business (http://www.colorado.edu/leeds/minor-business). Minors typically require 18-33 credits in the discipline, including some specific coursework.

Some minors are particularly compatible with the EVEN BS degree: Applied Math, Chemistry, Ecology and Evolutionary Biology, Electrical Renewable Energy Systems, Geological Sciences and Math. The Academic Advisor can provide more details on how these minors fit with the EVEN degree requirements.

3. Advising

### 3.1. Advising Process

In the Environmental Engineering Program, freshmen and sophomore students meet with the Academic Advisor and junior and senior students are assigned a Faculty Advisor to provide academic counseling and promote greater student-faculty interaction. Students are **required** to participate in the advising process during designated advising weeks just prior to course registration for each semester. An **advising hold** to block registration remains on each student’s record until advising has occurred. Faculty Advisors/mentors are also available for all students during any semester by appointment, for academic and career counseling beyond the required pre-registration meetings.

A few weeks before each advising period, the Academic Advisor will announce to students and Faculty Advisors by email the advising period schedule and advising procedures. Students are required to read these important advising messages and to follow the instructions for making appointments with Faculty Advisors or attending group informational and advising sessions. Faculty Advisors will give meetings with advisees high priority during this time; please be courteous and meet with your advisor during the designated advising period.

In preparation for the meeting, students should complete a proposed course plan for the following two semesters using these **Environmental Engineering (EVEN) Degree Guidelines** and the course schedule for the following semester, which is available through MyCUInfo. After the advising meeting, students must complete an Advising Evaluation Form to provide feedback on the advising process. These forms and the student’s academic file, noted and signed by the advisor, must be returned to the Academic Advisor, who will then remove the advising hold to allow the student to register.

Many academic advising questions pertain to the “logistics” of course scheduling and registration. Most of these questions should be directed to the Academic Advisor (see the cover sheet for contact information) instead of the Faculty Advisors. The Advisor will provide assistance on procedural questions involving registration, degree plans, graduation requirements, and the petition process. In addition, the Advisor will help students determine whether a particular situation should be discussed with their Faculty Advisors.
3.2. Program Contact with Students (Email)

Official notices to students concerning Environmental Engineering Program advising, curriculum, registration, graduation requirements, and policies will be made by e-mail. By default, official notices will be sent to your university e-mail address as listed on the student directory on the web (http://www.colorado.edu/search/). If you do not think you are receiving official EVEN e-mail correspondence (you should be receiving messages from the Academic Advisor or program director at least every couple of weeks, probably more often), please contact the Academic Advisor to ensure that you are on the e-mail list. To reiterate, the Program is required to notify you only at your CU e-mail address.

The College of Engineering and Applied Science will also send official notices to your CU e-mail address. The college has developed a series of “code words” for the beginning of the subject line to alert you to the content of the message, and the EVEN program tries to use these codes as well:

- **Career** - includes opportunities that will help advance a student’s career, e.g. résumé reviews, mock interviewing, meetings with employers, Career Fair, etc.
- **Job** - includes job opportunities for students still in school such as internships, co-ops, and on-campus jobs, as well as information on permanent positions.
- **Scholarship** - includes information on scholarships, grants, other sources of funding, and application deadlines.
- **Academic Advising** or **Advising** - includes advising information, curricular options, registration, academic issues, course information, missing pre-requisites, degree progress, etc.
- **Graduation** - includes information for graduating seniors such as FE exam, senior checkout, recognition ceremonies, senior survey, etc.
- **Event** - includes upcoming meetings, programs, events, trips, and opportunities for volunteers to participate in various functions
- **Extracurricular Opportunity** - includes information on student societies, clubs, etc.
- **Deadline** - includes anything with a looming deadline to which you should pay special attention
- **Urgent** - this will be used sparingly and will indicate a critical communication

3.3. Academic Records

An official Environmental Engineering Program academic file will be maintained for each student by the Academic Advisor. This file will contain copies of official documentation related to academic history and progress.

The Environmental Engineering Academic Advisor and Faculty Advisors will strive to provide you with complete, timely, and accurate academic advising; but ultimately, the responsibility of meeting graduation requirements is yours. Consequently, you should ensure that all copies of relevant paperwork are present in your academic file and that you keep your own copies of critical information.

3.4. Additional Advising Resources

The College of Engineering and Applied Science’s advising website (http://www.colorado.edu/engineering/academics/advising-and-registration) contains other information, including forms for specific situations.

Students may also be referred to various College of Engineering and Applied Science and University of Colorado counselors for certain issues. In particular, several groups within the College offer academic support, including training on study skills and time management, and one-on-one or small group tutoring. These academic programs and other support services are listed on the college web page http://www.colorado.edu/engineering/academics/support. At the campus level, students may consult with the following groups:

- Career Services – provides services for resume and interview skills improvement, internship and job postings, and career fairs (http://careerservices.colorado.edu, N352 Center for Community (C4C), 303 492 6541)
- Counseling and Psychological Services: A Multicultural Center -- provides a variety of programs and assistance to address general academic or personal issues. (http://www.colorado.edu/counseling/about, S440 C4C, 303 492 6766)
- Student Academic Services Center (http://www.colorado.edu/sasc/, 141 Fleming, 303 492 1416)

3.5. Faculty Mentor/Advisor Assignments

All students in the Environmental Engineering Program will be assigned a faculty mentor for the first two years and then a Faculty Advisor for the last two years. Students entering EVEN by change-of-major and transfer students may also need to meet with the Program Director for a transfer credit evaluation. Students may also confer with the Academic Advisor.
4. Academic Policies

Academic policies and guides for the College of Engineering and Applied Science, as well as many forms mentioned in this section, can be found at http://engineering.colorado.edu/students/advising.htm.

4.1. Prerequisite and Co-Requisite Courses

Most of the courses in the Environmental Engineering curriculum have prerequisite and/or co-requisite requirements (see tables on pp. 8-9 and the Appendix). The purpose of these requirements is to ensure that you are adequately prepared for subsequent courses.

Students must successfully complete all prerequisite courses before enrolling for a required course in the Environmental Engineering curriculum. Students must also simultaneously enroll in and complete satisfactorily all co-requisite courses. Successful completion means receiving a grade of C- or better (some courses require a grade of C in prerequisites). Grades of D+, D, D-, F, IF, IW, P or NC do not satisfy this requirement. Successful completion of prerequisite and co-requisite courses will be monitored for all required courses in the Environmental Engineering curriculum. Students who do not successfully complete prerequisite and co-requisite courses must retake those courses before advancing in the curriculum.

If a student registers for a course without satisfactorily completing prerequisite courses, he/she will be notified that the course must be dropped and, if necessary, the student will be dropped from the course. Students required to retake courses are strongly urged to consult their Faculty Advisors for advice on how successful academic performance can be achieved.

The prerequisite and co-requisite policy applies only to required and option courses in the curriculum (prereqs sometimes differ from catalog prereqs; see Appendix for EVEN prereqs). If a student has not satisfied all of the prerequisite and co-requisite requirements for an elective course (technical, humanities & social sciences, or free elective), permission to take that elective course must be obtained from the instructor before enrolling in the course.

Courses not listed in the curriculum may be used to satisfy prerequisite and co-requisite requirements if transfer credit or a petition to the Environmental Engineering Program has been approved. College of Engineering and Applied Science petition forms for this purpose may be obtained from the Academic Advisor or at http://www.colorado.edu/engineering/academics/advising-and-registration.

4.2. Transfer Credit

Several types of students transfer into the Environmental Engineering program. For all transfer students, the College of Engineering and Applied Science requires that the last 45 credit hours used to fulfill degree requirements must be CU-Boulder coursework taken after admission to the college. More details about the college’s transfer credit policies are available in the Dean’s office or online at the following URL on the college website (http://www.colorado.edu/engineering/admissions/transfer).

4.2.1. Change of Major: From the College’s Open Option to EVEN

The EVEN program accepts the College of Engineering and Applied Science Open Option curriculum as a substitute for its own first-year curriculum. Within the open option curriculum, students must take CHEN 1310 for the computer course, and CHEN 1211/CHM 1221 for their chemistry course (or the equivalent of CHM 1113-1114 and 1133-1134). Grades of C- or better must have been achieved for all courses counting for required courses in the EVEN curriculum. Students changing from Open Option to EVEN must complete a change-of-major form for the college. A description of the college’s Open Option is available online on the college website (http://www.colorado.edu/engineering/students/first-year/open-option).

4.2.2. Change of Major: From a College of Engineering Degree to EVEN

Evaluation of the credit hours earned in another engineering degree curriculum in the College of Engineering and Applied Science for credit in EVEN will be done at the first advising meeting with the EVEN Program Director. Grades of C- or better must have been achieved for all courses counting for required courses in the EVEN curriculum. Because EVEN is a multi-department program, most students coming into EVEN from other engineering degree programs in the College are able to transfer most of their basic courses for credit toward the EVEN BS degree. Students changing from another engineering degree to EVEN must complete a change-of-major form for the College.
4.2.3. Change of Major: From another UCB College or School to EVEN

Students transferring into EVEN from another of the University of Colorado at Boulder’s Colleges and Schools must complete an Intra-University Transfer (IUT) application to the College of Engineering and Applied Sciences and follow the college’s IUT procedures (details are available in the Dean’s Office or at http://www.colorado.edu/engineering/admissions/transfer/Intra-university). Students are encouraged to attend one of the listed IUT meetings. Once the application is approved, credit hours from the non-engineering degree will be evaluated for EVEN credit at the first advising meeting with the EVEN Program Director.

4.2.4. Transfer From Another Campus of the University of Colorado System

Students transferring into EVEN from another campus of the University of Colorado system will, in almost all cases, have the same status as transfers from within the University of Colorado at Boulder. Students should refer to the three change-of-major sections above and http://www.colorado.edu/engineering/admissions/transfer.

4.2.5. Transfer from Another Institution

Students transferring from another university or community college can find information at http://www.colorado.edu/admissions/undergraduate/transfer-center. An initial and official transfer credit evaluation is performed by the CU-Boulder Office of Admissions using the transcript from the previous institution(s). Courses in which the student received a grade lower than a C- will not be accepted by the admissions office.

Once the Office of Admissions has completed its evaluation, the student will meet with the EVEN Director for evaluation of transfer credits for the EVEN curriculum. Note that acceptance of transfer credits by the admissions office does not ensure that the transfer credits will count toward the EVEN BS degree; courses taken at another institution must match the course requirements for the EVEN curriculum. In many cases, identification of courses is straightforward; however, for some courses, the EVEN Director may request documentation of course content (catalog descriptions, course syllabi).

4.2.6. Advanced Placement and International Baccalaureate Credit

Advanced Placement (AP) credit may be approved on the basis of College Entrance Examination Board’s Advanced Placement tests. International Baccalaureate (IB) credit may be granted to students who have participated in IB diploma or certificate programs. For students who have taken AP or IB courses in high school and who achieve the required score, AP/IB credit will be granted as part of the admission process. AP and IB credits must also be evaluated for credit toward the EVEN curriculum by the EVEN Director or Academic Advisor. If a student later takes a course for which AP or IB credit was granted, the credit for the course taken at the University of Colorado will replace the AP/IB credit.

For a listing of CU course equivalents for typical AP and IB credit, see the College of Engineering and Applied Science “Advanced Placement, IB and MAPS” Advising Guide (available in the dean’s office or online at http://www.colorado.edu/admissions/undergraduate/sites/default/files/AP-IB_Charts_2011-12_FINAL3.pdf).

College courses taken while in high school (e.g., through the “CU Succeed” Program) will be evaluated as transfer credits according to the applicable section above.

4.2.7. Continuing Education Courses

Courses may be taken for EVEN degree credit through programs offered by the University of Colorado’s Division of Continuing Education (see a full description at http://www.colorado.edu/ContEd/):

- Summer Session, including Maymester
- Available Credit for Eligible Special Students (ACCESS)
- Center for Advanced Engineering and Technology Education (CAETE)
- Boulder Evening Credit
- Independent Learning
- Concurrent High School
A maximum of 16 credit hours taken through Continuing Education programs other than Summer Session can be applied to the EVEN BS degree (Maymester and Summer Session courses are equivalent to courses offered during the regular academic year). A maximum of 8 of the 16 credit hours can be taken as Humanities and Social Sciences courses. Registration occurs through the MyCUinfo portal, but students should be advised that a separate tuition charge may apply.

4.3. Humanities and Social Sciences Electives

4.3.1. Importance of Humanities and Social Sciences to Environmental Engineers

The purpose of humanities and social sciences (H&SS) electives is to broaden the engineering education. In environmental engineering, appreciation and knowledge of the social, historical, political, and economic context of environmental problems is critically important. The EVEN faculty recommends that you select a sequence of courses that complement and broaden your education in environmental engineering and that you avoid random selection of unrelated introductory courses. See below for some specific courses that may interest environmental engineering students.

4.3.2. Humanities and Social Sciences Requirements

The Environmental Engineering Program follows the College of Engineering and Applied Science H&SS requirements (http://www.colorado.edu/engineering/academics/policies/hss). A total of 15 credit hours of H&SS electives is required for graduation. At least six of the required credit hours must be at the upper division level (3000- or 4000-level courses). In addition, a communication course is required to improve writing and oral presentation skills. HSS courses must be selected from the College’s approved course lists (http://www.colorado.edu/engineering/academics/policies/hss).

**Instructor’s consent must be obtained on a petition form if prerequisites are not met.** Permission must be obtained from the relevant department if courses have other restrictions.

**Courses on the approved list that might be of interest to environmental engineers include:**

- ARSC 3001-3 Social Engagement and Human Rights: The South Africa Model (Restricted to Juniors and Seniors)
- ANTH 4330 Human ecology: Archaeological Aspects (prerequisite: ANTH 2200)
- ATLS 2000 The meaning of Information Technology
- BAKR 1500 Colorado: History, Ecology, and Environment
- BAKR 1600 Creating a Sustainable Future
- COMM 2400-3 Discourse, Culture and Identities
- COMM 3410-3 Intercultural Communication (recommended prereqs: COMM 1210 and 1600, restricted to Juniors and Seniors)
- ECEN 3070 Edges of Science (prereq., MATH 1020/1070 /2510 or PSYC 3101 or SOCY 2061/4061 or equivalent)
- ECON 3535 Natural Resources Economics (prerequisite: ECON 1000 or 2010, restricted to nonmajors)
- ECON 3545 Environmental Economics (prerequisite: ECON 1000 or 2010, restricted to nonmajors)
- ECON 4626-3 Economics of Inequality and Discrimination (prereq: ECON 3070)
- ENV 3621 Energy Policy and Society
- GEOG 1982 World Regional Geography
- GEOG 1992 Human Geographies
- GEOG 3402 Natural Hazards
- GRMN/HUMN 1701 Nature and Environment in German Literature and Thought
- INVS 1000 Responding to Social and Environmental Problems Through Service Learning
- INVS 4302/PSCI 4732 Critical Thinking in Development (prereq: PSCI 2012/IAFS 1000, ECON 2010-2020, and 1 UD PSCI course)
- MCD 1030 Molecules, Plagues and People
- PHIL 1400 Philosophy and the Sciences
- PHIL/ENV 3140 Environmental Ethics (prerequisite: PHIL 1100, 1200, 2200, 3100 or 3200, or sophomore)
- PHIL 3160 Bioethics (prereq: 6 hours of philosophy course work; restricted to sophomores/juniors/seniors)
- PHIL 3410 History of Science: Ancients to Newton (prereq: 6 hours of philosophy course work; restricted to soph/juniors/seniors)
• PHIL 3430 History of Science: Newton to Einstein (prereq: 6 hours of philosophy course work; restricted to soph/juniors/seniors)
• PHYS 3000 Science and Public Policy (recommended prereq., completion of core science requirement)
• PSCI 2223-3 Introduction to International Relations
• PSCI 3064 Environmental Political Theory (recommended prereq: PSCI 2004)
• PSCI 3082-3 Political Systems of Sub-Saharan Africa (prereq PSCI 2012 or IAFS 1000; restricted to soph/juniors/seniors)
• PSCI 4012 Global Development (prereq: PSCI 2012, ECON 2020, IAFS 1000, or one upper-division PSCI course)
• SEWL 2000 America, the Environment, and the Global Economy
• SOCY 2077 Environment and Society
• SOCY 4007 Global Human Ecology (sometimes restricted to sociology majors)
• SOCY/ENVS 4027 Inequality, Democracy and the Environment (restricted to juniors/seniors)
• HUEN or EHON courses, offered by the Herbst Program in the Humanities, and designed especially for engineers. A list of current offerings can be found at http://engineering.colorado.edu/herbst/.

Students may petition the College of Engineering and Applied Science for approval of an H&SS course not on the list of previously approved courses. It is strongly suggested that the petition be approved before enrolling in the course. The College encourages meaningful groupings of courses in related subjects and thus may approve courses that are not on the list if they form a coherent plan of study. (Prior approval has already been granted for groups of four courses that would count toward a minor in certain fields, listed at http://www.colorado.edu/engineering/academics/policies/hss.)

The following courses may be of interest to environmental engineers and might be approved for inclusion in such a grouping (you must petition for approval):
• ANTH 4150 Human Ecology: Biological Aspects (prerequisite: ANTH 2010 and 2020, or EBIO 1210 and 1220)
• ATLS 3519 Sp Top: Building Interactive Technology
• ECON 4999 Economics in Action: A Capstone Course (prerequisites: ECON 3070 & 3080, JR or SR standing)
• ENVS 3020 Advanced Writing in Environmental Studies (restricted to junior/senior ENVS majors)
• ENVS 3621 Energy Policy and Society (recommended prereq: ENVS 3070)
• ENVS 4100 Sp Topics in Environmental Policy
• GEOG 1962 Geographies of Global Change
• GEOG 1972 Environment and Culture
• GEOG 3412 Conservation Practice and Resource Management (restricted to GEOG and ENVS majors)
• GEOG 3422 Conservation Thought
• GEOG 4430 Seminar: Conservation Trends (restricted to junior/senior GEOG/ENVS majors)
• GEOG 4742 Environments and Peoples (recommended prerequisites: GEOG 1982, 1992, 2002 or 2412; restricted to juniors/seniors)
• GEOG 4812 Environment and Development in South America (recommended prerequisites: GEOG 1982, 1992, 2002, 3812,3422, ANTH 3110 or PSCI 3032)
• GEOG 4822 Environment and Development in China (recommended prereqs: GEOG 1982, 1992, 2002 or HIST 1608)
• PHIL 2140 Environmental Justice
• PSCI 4028 Special Topics: Political Theory and Environment additional courses from the required and recommended curricula for the Environmental Studies program in the College of Arts and Sciences (http://envs.colorado.edu)
• PSCI 3206 The Environment and Public Policy (Prereq: PSCI 1101. Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only).

The communication/writing requirement may be fulfilled by one of the following courses:
• HUEN 1010 Humanities for Engineers: The Human Quest (restricted to freshmen)
• HUEN 3100 Advanced Humanities for Engineers: The Human Quest Continues (prerequisite: junior standing & program approval)
• PHYS 3050 Writing in Physics: Problem-Solving and Rhetoric (prereq: PHYS 2130 or 2170 and lower-division core writing requirement)
• WRTG 3030 Writing on Science and Society (restricted to junior/senior engineering/physical and biological science majors)
• WRTG 3035 Technical Communication and Design (restricted to junior/senior majors in engineering, architecture & planning, physical, earth and life sciences)
4.3.3. Some Specific Inclusions and Exclusions for the H&SS List
Most foreign language courses will satisfy the humanities and social science requirements. Generally, courses in performance and fine arts production, mathematics, and natural sciences are not acceptable as H&SS electives. Some courses in the history of art, music, theatre, dance or film are acceptable. The following courses are specifically excluded from satisfying H&SS requirements:

- courses in painting, sculpture, photography, film and other fine arts production
- courses in musical instruments, band, choir, and other performance courses
- courses in accounting, finance, personnel administration, and other business practices
- critical thinking courses in science departments
- These courses may be taken as free electives (up to 3 credits; see section 4.5)

4.4. Technical Electives
4.4.1. Overview of Technical Electives
Technical electives provide an opportunity for students to explore a range of engineering, mathematical, and natural sciences topics to provide increased breadth or to focus on a specific technical area to develop in-depth understanding. In addition, one technical elective must be used to meet a requirement for a course in earth sciences. Students should consult their Faculty Advisors to plan their technical elective program.

4.4.2. Technical Elective Requirements
The EVEN BS curriculum requires nine credit hours of technical electives. Technical elective credit may be met by courses in the following categories:

- most engineering, physics, biology (both EBIO and MCDB), chemistry, geology, physical geography, atmospheric and oceanic sciences, and mathematics (both APPM and MATH) courses that are substantially different from required EVEN courses;
- many courses taught by Computer Science and Engineering Management;
- quantitatively rigorous courses in social sciences (economics, psychology, human geography);
- EVEN senior thesis; and
- independent study courses with appropriate technical content.

Three credit hours of technical electives may be lower division (1000-, 2000-level course). The remaining technical elective courses must be taken at the 3000-level or above. Both undergraduate and graduate courses (5000 level and above) may be taken as technical electives; enrollment in graduate courses requires the consent of the instructor.

One of the technical elective courses (3 credit hours) must be an earth science course at either the lower or upper division level. See the list of recommended earth science courses in the Appendix.

All technical elective course selections should be approved by your advisor. Technical electives counted toward the graduation requirements for the EVEN BS degree may not be taken pass/fail.

Exceptions to these rules will be considered by petition to the Environmental Engineering faculty.

4.4.3. Specific Inclusions and Exclusions for Technical Electives
A list of selected courses that will meet this requirement appears in the Appendix. If a course is not on this list, check with your advisor or the Academic Advisor; you may need to petition to have the course approved as a technical elective.

Independent study (see Section 4.7) is accepted as technical elective credit up to a maximum of 6 credit hours.

Co-op credits will not count as technical electives nor toward other degree requirements, except as free elective credits.

A maximum of 3 credit hours of some Reserve Officer Training Corps (ROTC) courses may be used as technical electives upon commissioning.

EVEN/CHEN graduate Lily Isenhart perches precariously for a precious water sample from the Snake River in Summit County.
4.4.4. Earth, Science Technical Electives
Courses that meet the earth sciences requirement are typically found in the Departments of Geological Sciences, Geography, Atmospheric and Oceanic Sciences, and some engineering departments. See the Appendix for a specific list.

**Note:** If using ATOC 1050 or GEOL 1010 to satisfy Air or Earth Science Laboratory or Field Course, you may not use them to also satisfy a Tech Elec.

Many students have found that a course devoted to the use of computer software for engineering drawing (e.g., AutoCAD) or geographic information science (GIS) and mapping (e.g. ARCview®) can open up job opportunities. The following courses are available on the Boulder campus:

- AREN 1027 Engineering Drawing (formerly AREN 1017)
- ASEN 4090 Global Positioning Systems Applications (prereq APPM 2360, GEEN 1300, recom. JR/SR standing)
- CVEN 2012 Introduction to Geometrics (prereq APPM 1350)
- GEOG 3053 Cartography: Visualization and Information Design (restricted to junior/senior GEOG/ENVS majors)
- GEOG 4043 Cartography 2: Interactive and Multimedia Mapping (prerequisite GEOG 3053)
- GEOG/GEOI4093 Remote Sensing of the Environment
- GEOG 4103/4203/4303 Geographic Information Science (prerequisite GEOG 2053 or 3053; restricted to junior/senior GEOG/ENVS majors)
- GEOL 3050 GIS for Geologists (prereq: basic computer skills)
- MCEN 1025 Computer aided Design and Fabrication

4.4.5. Advice on Technical Electives
Many students are interested in energy-related courses. Some of these courses can be found in the Appendix. It is also suggested that students check each semester for courses in individual departments’ special topics classes for topics of interest.

**Instructor’s consent must be obtained on a petition form if prerequisites are not met.** Permission must be obtained from the relevant department if courses have other restrictions.

4.5. Free Electives
The EVEN curriculum allows for two credits of free elective(s). College-level CU or transfer credits, upper- or lower division, may be used for these credits to broaden the student’s academic experience. Students may also use AP or IB credits, courses from Residential Academic Programs (RAP), President’s Leadership Class (PRLC), ROTC, courses required to pursue a minor, etc., as long as they are substantially different from required EVEN courses. Or they may be used to take a “fun” class in something you always wanted to study!

4.6. Air or Earth Science Laboratory or Field Course
Students are required to take one 3-credit course with a significant lab or field component focusing on air quality or earth science. If the course chosen is less than three credits, the difference is required as an upper division technical electives or accompanying lecture (Note: courses taken to complete this Air or Earth Science Lab/Field course cannot be used to fulfill both a technical elective and this lab/field requirement on the same student record).

**The following courses will fulfill the lab/field requirement:**

- **ATOC 1070** Weather and the Atmosphere Lab (1) **AND** ATOC 1050 Weather and the Atmosphere (3) (prereq or co req: ATOC 1050 or instructor consent)
- CVEN 3708 Geo technical Engineering 1 (3) (prerequisite: CVEN 3161)
- EVEN 4100 Environmental Sampling and Analysis (3) (prerequisites: CVEN 4404 & 4414 and fluid mechanics or instructor consent)
- GEOL 1030 Introduction to Geology Lab (1) **AND** GEOL 1010 Introduction to Geology (3) (prior or current registration in 1000 level GEOL recommended)
- GEOL 2700 Introduction to Field Geology (2) **AND** GEOL 1010 Introduction to Geology (1) (prerequisites: GEOL 1010 & 1030)
- GEOL 3010 Introduction to Mineralogy (3) (prerequisites: CHEM 1113/CHEN 1211, MATH 1300/APPM 1350)
- GEOL 4716 Environmental Field Geochemistry (2) (Requires prerequisite courses of GEOL 2001 or GEOL 2700 and GEOL 3320 and CHEM 1011 and CHEM 1031 or CHEM 1113 and CHEM 1133.)

**Another option:**

- **ATOC 1070** (1) **AND** Upper Tech Elec (2-3) (ATOC 1050 will be used as your Lower level Tech Elec to satisfy Earth Science)
- **GEOL 1030** (1) **AND** Upper Tech Elec (2-3) (GEOL 1010 will be used as your Lower level Tech Elec to satisfy Earth Science)
4.7. Independent Study

4.7.1. Introduction to Independent Study
An independent study is a collaboration between a student and a faculty member on a special project that provides the student with a learning experience. An independent study may also fill an academic need of importance to the student that cannot be filled by the regular course offerings. Independent studies are opportunities for students to earn credit for learning outside the normal lecture and laboratory class structure.

In the EVEN BS curriculum, independent studies may be counted as technical electives (up to a maximum of six credit hours) or free elective. Independent studies may be conducted in any increment of credit hours up to a maximum of 3 credit hours per semester, with one credit hour representing 25 hours of actual work on the task or project. The Environmental Engineering Program encourages students to consider independent study to engage in a long-term research project with a faculty member.

4.7.2. Independent Study Requirements
The following rules apply to independent studies:

- A maximum of 6 credit hours of independent study may be applied to EVEN BS degree requirements as technical electives.
- Independent studies may not be applied as required courses or option courses.
- A maximum of 3 credit hours of independent study may be taken per semester.
- Independent studies may be supervised by any appropriate University of Colorado faculty member.
- A proposal for an independent study must be made by submitting the Independent Study Agreement Form, complete with student and supervising faculty signatures.
- The EVEN Program Director must approve the proposal.
- A final product of the independent study must be submitted to the Environmental Engineering Program before credit is awarded toward degree requirements.
- Approval of a second independent study is contingent on successful completion of the requirements for the first independent study.
- Independent studies may not be arranged retroactively.
- Independent study credit is not allowed for internship experiences, co-ops, work-study, or work done for pay, following University rules.

4.7.3. Independent Study Procedures
To propose an independent study, students must first determine with a collaborating faculty member the topic, goals, number of credit hours, work plan, and required product for the independent study. This information must be recorded on an Independent Study Agreement Form (see the Forms Appendix) and submitted before the drop/add deadline of the semester in which the independent study will be conducted.

The independent study proposal will be reviewed by the EVEN Director and approved, returned for amendment, or disapproved owing to some deficiency in the proposal. The form must then be submitted to the Academic Advisor.

For an EVEN independent study, the Academic Advisor will enroll the student. The student will conduct the independent study under the guidance of the Faculty Advisor. At the end of the independent study, the student must submit to the Environmental Engineering Program a copy of the final product (a report, a computer code, etc.) in addition to any required products due to the collaborating faculty.

4.8. Senior Thesis
Students in their final year may choose to do a senior thesis, which is conducted over two terms and demonstrates that a student can complete scientific and engineering research independently and can communicate results. A senior thesis must be supervised and graded by a member of the Environmental Engineering faculty and defended before a committee of three faculty members, two of whom must be affiliated with the Environmental Engineering Program. Senior thesis hours (3 credits each term) may be applied toward the technical elective requirement.
The student is required to complete (in collaboration with the thesis supervisor) and sign a Senior Thesis Proposal form for each semester; the form must then be signed by the student and thesis supervisor and approved by the EVEN Program Director before registration in the courses. The final thesis must be submitted to the Environmental Engineering Academic Advisor by the final day of the second term of the thesis. More details on senior thesis policy and procedures may be found on the Senior Thesis Proposal Forms (see Forms Appendix).

4.9. Engineering Co-op Program

A Co-operative Education Program is available to EVEN students, whereby semesters of academic coursework alternate with semesters of paid engineering work at an engineering firm or university. International co-ops are also available. The co-op program provides professional experience in a real-world situation with university oversight and a chance to explore career options during the undergraduate career. Students enroll in co-op credit hours through the Division of Continuing Education; these credits do not apply toward degree requirements except as free electives. For more information, see http://engineering.colorado.edu/activelearning/co-op.htm.

4.10. Petitions

Any exceptions or waivers of the rules and regulations of the Environmental Engineering Program or the College of Engineering and Applied Science must have prior approval by petition. The petition must be completed and submitted to the Environmental Engineering Program for approval; the petition will then be forwarded to the Dean's Office. Exceptions to the humanities/social sciences requirement must also be approved by the Director of the Herbst Program of Humanities for Engineers. It is the student's responsibility to follow up on the petition's progress. Petition forms may be obtained from the Academic Advisor, the dean's office, or from http://www.colorado.edu/engineering/academics/advising-and-registration.

The following list provides some examples of situations for which a petition is required:

- enrolling in less than 12 or more than 19 credit hours per semester
- enrolling in a course when prerequisites have not been satisfied (requires instructor signature)
- substituting for or waiving a required course
- dropping or adding a course after deadlines
- requesting the pass/fail or no credit (NC) grade option for a course
- when more than half of a semester's credit hours do not meet degree requirements
- to ensure that courses taken elsewhere will count toward degree requirements (including study abroad courses)
- to request approval of technical electives or humanities and social sciences classes that are not on the approved lists

Follow these guidelines when completing the petition:

- review the rules and policies of the College of Engineering and Applied Science as published in the University of Colorado Catalog and EVEN Degree Guidelines during the year of your admission to the College and the current edition(s) of the appropriate Advising Guide(s) to establish your need to petition and the specific rule or policy you wish to waive.
- consult with the Academic Advisor and Faculty Advisor for clarification of Program rules and policies.
- write or, preferably, type the petition clearly (and neatly!).
- provide complete information in the petition, including the number and title of all courses and pertinent data such as course description and syllabi. Additional pages may be attached if necessary.

If properly completed, the petition process will normally take one to two weeks.

4.11. Academic Honesty

The Environmental Engineering Program adheres to the policies of the University of Colorado at Boulder and the College of Engineering and Applied Science on academic honesty, which state:

"As members of the academic community, students have a responsibility to conduct themselves with the highest standards of honesty and integrity. These qualities are also vital to the profession of engineering. Violations of academic ethics tarnish the reputation of all students and will be treated with the utmost seriousness."

Be forewarned and discourage your fellow students from participating in any unethical activities. The following are examples of some, but certainly not all, acts that violate academic ethics:

- plagiarizing
- cheating on assignments and exams (including text messaging during exams, quizzes, etc.)
- possessing or observing of exams or solutions to examinations prior to the exam
- altering, forging, or falsifying official records
• performing work or taking an exam for another student
• providing material/work of your own or of others to a fellow student

The College of Engineering and Applied Science procedures for handling academic ethics violations are available in the Dean's Office and on the college website (http://www.colorado.edu/engineering/academics/policies/honesty). University academic honesty policies are available at the Honor Code website (http://honorcode.colorado.edu/).

5. Graduation Requirements

5.1. Requirements for EVEN BS Degree
5.1.1. General Requirements

To graduate with a Bachelor of Science degree in Environmental Engineering from the College of Engineering and Applied Science at the Boulder campus, students must meet the following minimum requirements:

1. Satisfactory completion of the required and elective courses in the Environmental Engineering Bachelor of Science curriculum (see Section 2.1). Students must satisfactorily complete a minimum of 128 credit hours, of which the last 45 credit hours shall be CU-Boulder coursework earned after admission to the College of Engineering and Applied Science as a degree student.

2. A minimum CU cumulative grade point average of 2.250 for all courses attempted and for all courses that count toward graduation requirements, excluding "P" grades for courses taken Pass/Fail.

3. A minimum cumulative major grade point average of 2.250. This major grade point average includes only course work in EVEN, CHEN, CVEN and MCEN courses.


5. Submission of copies of independent study or thesis final product(s), if applicable toward degree requirements.

6. Completion of the Fundamentals of Engineering (FE) examination during the final academic year.

7. Notification to the EVEN Academic Advisor of intent to graduate.

8. Submission of a request for diploma/graduation.

Graduation will be postponed by failure to complete these requirements. Any exceptions to these requirements will require approval of the Environmental Engineering Program Director and the Dean's office by petition. In addition, students must be recommended for graduation by the faculty of the EVEN Program and the faculty of the college, and should complete the senior survey.

To be sure that all requirements are met, students can consult with the Environmental Engineering Academic Advisor, Director, and their Faculty Advisors. Students must be aware that meeting graduation requirements is ultimately their own responsibility.

5.1.2. Grading Policy

Students are evaluated by their performances in the courses that make up the Environmental Engineering curriculum following the standard procedures implemented by the College of Engineering and Applied Science (http://www.colorado.edu/engineering/academics/policies/grading). Student performance is determined by course instructors. Instructors award grades following the University of Colorado standardized grading system (Table 1). Grade point averages of students are determined only for "quality credit hours." Quality credit hours are those earned in courses taken for standard grades at the University of Colorado. "Earned credit hours" include quality credit hours plus credit hours earned in courses taken pass/fail and credit hours transferred from other institutions; thus, grades in pass/fail courses and courses from other institutions do not count in the University of Colorado grade point average.

Other grades appearing on student transcripts include Incomplete (I), No Credit (NC), and Pass (P). A grade of I indicates that course requirements were not completed owing to documented reasons beyond the control of the student.
Grades of I require completion of an "Incomplete Grade Record Form" by the instructor and student stating the work that must be completed to award a final grade. All work required for the final grade must be completed within one year or the I grade is changed to F. A grade of NC indicates that the course taken cannot be used to fulfill graduation requirements and cannot be repeated for a standard grade. A grade of P in a course taken pass/fail indicates that the student achieved the minimum passing grade of D- or better.

### 5.1.3. Pass/Fail Grading

Pass/fail grading is permitted only for courses used as H&SS electives or for courses above and beyond degree requirements. The primary purpose for offering the opportunity for students to enroll in a course for a grade of P or F instead of a standard letter grade is to encourage students to broaden their educational experience by selecting challenging courses without serious risk to the cumulative grade point average. Students on academic probation may not elect the P/F grade option.

The College allows a maximum of six pass/fail credit hours per semester. Pass/fail hours counting toward graduation shall not exceed a cumulative total of 16 (Study Abroad pass/fail grades do not count toward this limit). Transfer students are allowed one credit hour pass/fail for every nine credit hours completed under the Standard Grading System. Students are required to submit a petition requesting approval to register for a course with the pass/fail option.

### 5.2. Fundamentals of Engineering Exam

One of the requirements for graduation with the EVEN BS degree is that students must take the Fundamentals of Engineering (FE) Exam. This test serve two purposes: (1) it provides students with the opportunity to complete the first step toward Professional Engineer (PE) status and (2) it provides the Environmental Engineering Program with a useful assessment of engineering proficiency attained by EVEN graduates. Students usually take the FE Exam during their final semester.

The Fundamentals of Engineering Examination is the first step toward achieving licensure as a Professional Engineer (PE), a particularly important credential for engineers working as consultants. The FE Exam is administered by the National Council of Examiners for Engineering and Surveying (NCEES). The FE Exam is offered in testing windows throughout the year: Jan-Feb, Apr-May, Jul-Aug, Oct-Nov (exams are NOT offered during March, June, September, or December). Students will register online with NCEES and with a paper application from DORA. Registration notices will be distributed by the EVEN Academic Advisor.

The exam covers engineering, science, and mathematics fundamentals. It is also discipline-specific. The NCEES offers general information, study materials, and sample questions for the FE Exam. Numerous review books for the FE Exam are also readily available at web booksellers.
5.3. Requirements for Dual Degrees

Students may choose to pursue a second Bachelor of Science or Bachelor of Arts degree simultaneously with the EVEN BS degree in a College or School at the University of Colorado at Boulder. To do this, they must satisfy the requirements of both degree curricula and may be required to take credit hours beyond the 128 required for the EVEN BS degree. To complete a dual degree, the student should find an Academic Advisor in the other program to ensure that its course requirements are satisfied.

6. Society of Environmental Engineers (SEVEN)

The Society of Environmental Engineers (SEVEN) is a student society which engages in a combination of educational, service and social activities. It is open to students in all majors who are interested in environmental issues and sustainable solutions. See http://www.colorado.edu/even/current-students/seven-society-even for more information about meetings and activities, and to contact the current officers.
More than twenty College of Engineering and Applied Science faculty members are affiliated with the Environmental Engineering Program. These faculty members are rostered in the Aerospace Engineering Sciences, Chemical and Biological Engineering, Civil, Environmental, and Architectural Engineering, and Mechanical Engineering departments.

**Angela Bielefeldt**, Professor, Civil, Environmental, and Architectural Engineering, former EVEN Director, Education: B.S., Iowa State University (1992), M.S., Ph.D., University of Washington (1994, 1996) Teaching: CVEN 4474 Hazardous Waste Management Research: Engineering Education, In-situ Bioremediation, Sustainable water and wastewater treatment for developing communities Email: angela.bielefeldt@colorado.edu, phone: 303 492 8433, office: ECES128

**Sherri Cook**, Assistant Professor, Civil, Environmental, and Architectural Engineering Education: B.S., Virginia Polytechnic Institute and State University (2008), M.S.E., Ph.D., University of Michigan (2009, 2014) Teaching: CVEN 5534 Wastewater Treatment, CVEN 4834 Sustainability Principles for Engineers Research: Sustainable water system design, resource recovery from waste, environmental biotechnology, biological process stability and reliability. Email: Sherri.Cook@colorado.edu Phone: 303 735 7288, Office: ECES 110


**Michael Hannigan**, Associate Professor, Mechanical Engineering, Education: B.S., Southern Methodist University (1990), M.S., Ph.D., California Institute of Technology (1991, 1997) Teaching: MCEN 4228 Sustainable Energy, MCEN 3037 Experimental Design and Data Analysis, MCEN 4131 Air Pollution Control Research: Characterization and Abatement of Air Pollution, Impact of air quality on health, Energy links to air quality Email: michael.hannigan@colorado.edu, phone: 303 735 5045, Office: ECES 116

**Daven Henze**, Assistant Professor, Mechanical Engineering Education: B.S., University of Washington (2001), M.S., Ph.D., California Institute of Technology (2004, 2007) Teaching: MCEN 4131 Air Pollution Control Research: Aerosols and Air Quality, Climatology and atmospheric chemistry, Adjoint sensitivity analysis, Data assimilation and remote sensing & modeling tools Email: daven.henze@colorado.edu, phone: 303 492 8716, office: ECES 114


**Kristine Larson**, Professor, Aerospace Engineering Sciences Education: A.B., Harvard University (1985), Ph.D., University of California, San Diego (1990) Teaching: ASEN 2012 Exptl/Computational Methods Research: Applications of GPS, incl. navigation, positioning, precise orbit determination, earthquakes, volcanoes, soil moisture, snow depth, and vegetation sensing Email: kristine.larson@colorado.edu, phone: 303 492 6583; office: ECAE177

**Karl Linden**, Helen and Huber Croft Professor, Civil, Environmental, and Architectural Engineering Education: B.S., Cornell University, (1989), M.S., Ph.D., University of California (1993, 1997) Teaching: CVEN 5969 Water, Sanitation and Hygiene, CVEN 4594/5494 Water Reuse, CVEN 5604 UV Processes Research: Water Treatment, Wastewater Treatment, Disinfection, Advanced Oxidation Email: karl.linden@colorado.edu, phone: 303 492 4798; office: ECES 132

**Diane McKnight**, Professor, Civil, Environmental, and Architectural Engineering Education: B.S., M.S., Ph.D., Massachusetts Institute of Technology (1975, 1978, 1979) Teaching: CVEN 3434 Applied Ecology, CVEN 5322 Applied Stream Ecology Research: Aquatic Ecology, Limnology, Reactive transport of metals and organic material in streams and rivers Email: diane.mcknight@colorado.edu, phone: 303 492 4687 or 492 7573; Office: ECES 124 or LITR 115
Forms and Appendices

These forms can be found on the College of Engineering and Applied Science’s Advising website at http://www.colorado.edu/engineering/academics/advising-and-registration:

- Change of Major (including adding additional major or minor)
- Concurrent BS/MS Application
- Course Schedule Approval (for students on academic probation)
- Incomplete Grade
- Independent Study
- Minor Completion (for engineering minors)
- Petition

In addition to the forms listed above, the following forms may be obtained from the Academic Advisor:
- Advising Evaluation Form
- Degree Requirements Worksheet (see also following pages)
- Senior Thesis Proposal Forms
- Special Action Form
- Special Option Selection Proposal
- Transfer Credit Appeal

These appendices are included here in the following pages:
- Technical Elective Suggestions
- Useful Websites

A settling pond for the treatment of acid mine drainage.
Technical Elective Suggestions

Any of the courses listed in the options are good technical electives. Other example Technical Elective Courses for EVEN are listed below. If a course is not on this list, you may request approval on a petition form. Honors sections of the courses listed below will also be accepted. Check for prerequisites with your advisor and in the catalog: http://www.colorado.edu/catalog/2014-15/courses. Some graduate-level classes (5000+) can also be taken as technical electives -- check with your advisor. Note, however, that prerequisites are not listed in the catalog for graduate courses; instructor’s permission may be required. Courses marked with an asterisk (*) fulfill the earth sciences technical elective requirement (geology, meteorology or soil science). Courses marked with † will fulfill the air/earth sciences lab/field requirement.

Arts & Sciences

AIRR 3010 (3) Air Force Leadership Studies I

APPM 2750 (4) Java: Training and Mathematical Algorithms.
APPM 3010 (3) An Introduction to Nonlinear Systems: Chaos
APPM 3050 (3) Scientific Computing in Matlab
APPM 3170 (3) Discrete Applied Mathematics
APPM 3310 (3) Matrix Methods and Applications
APPM-3350 (3) Advanced Engineering Calculus
APPM 3570 (3) Applied Probability
APPM 4120 (3) Introduction to Operations Research
APPM 4350 (3) Methods in Appl Math: Fourier Series/Boundary Value
APPM 4360 (3) Methods in Appl Math: Complex Variables & Appl

ASTR/GEOL 3300 (3) Extraterrestrial Life
ASTR/ATOC 3720 (3) Planets and Their Atmospheres

ATOC 1050 (3) Weather and the Atmosphere *
ATOC 1060 (3) Our Changing Environment: El Nino, Ozone and Climate *
ATOC 1070 (1) Weather and the Atmosphere Lab * †
ATOC/GEOL 3070 (3) Introduction to Oceanography *
ATOC 3180 (3) Aviation Meteorology *
ATOC 3300 (3) Analysis of Climate and Weather Observation *
ATOC 3500/CHM 3151 (3) Air Chemistry and Pollution *
ATOC 3600 (3) Principles of Climate *

CHEM 3151/ATOC 3500 (3) Air Chemistry and Pollution
CHEM 3311 (4) Organic Chemistry 1
CHEM 3321 (1) Lab in Organic Chemistry 1
CHEM 3331 (4) Organic Chemistry 2
CHEM 3341 (1) Lab in Organic Chemistry 2
CHEM 4011 (3) Modern Inorganic Chemistry
CHEM 4021 (3) Inorganic Laboratory

CHEM 4131 (3) Chemistry of Global Health
CHEM 4141 (3) Environmental Water and Soil Chemistry
CHEM 4171 (3) Instrumental Analysis
CHEM 4181 (4) Instrumental Analysis Lab with Environ Emphasis
CHEM 4251 (3) Materials Chemistry and Properties

EBIO 1030 (3) Biology: A Human Approach 1
EBIO 1040 (3) Biology: A Human Approach 2
EBIO 1050 (1) Biology: A Human Approach Laboratory
EBIO 1210 (3) General Biology 1
EBIO 1220 (3) General Biology 2
EBIO 1230 (1) General Biology Laboratory 1
EBIO 1240 (1) General Biology Laboratory 2
EBIO 1300 (1-3) Topics in Biological Sciences
EBIO 2010 (1-3) Environmental Issues and Biology
EBIO 2040 (4) Principles of Ecology
EBIO 2070 (4) Genetics: Molecules to Populations
EBIO-2090 (3) Tropical Island and Marine Ecology
EBIO-2091 (1) Marine Ecology, Oceanography and Island Ecology Field Studies

EBIO 2590 (2) Plants and Society
EBIO 3010 (1-2) Teaching Biology
EBIO 3040 (4) Conservation Biology
EBIO 3080 (4) Evolutionary Biology
EBIO 3110 (3) Population and Community Ecology
EBIO 3170 (3) Mountain Ecology and Conservation
EBIO 3175 (1) Arctic and Alpine Ecology Lab
EBIO 3180 (3) Global Ecology
EBIO 3190 (3) Tropical Marine Ecology
EBIO 3240 (4) Animal Behavior
EBIO 3270 (3) Ecosystem Ecology
EBIO 3630 (4) Parasitology
EBIO 3770 (4) Animal Diversity: Vertebrates
EBIO 3850 (4) Animal Diversity: Invertebrates

ASTR 3830 (3) Astrophysics 2 - Galactic and Extragalactic
ASTR 4330 (3) Cosmochemistry

ATOC/ASTR 3720 (3) Planets and Their Atmospheres

APPM 4380 (3) Modeling in Applied Mathematics
APPM-4390 (3) Modeling in Mathematical Biology
APPM 4440 (3) Undergraduate Applied Analysis 1
APPM 4540 (3) Introduction to Time Series
APPM 4450 (3) Undergraduate Applied Analysis 2
APPM 4560 (3) Markov Processes, Queues, Monte Carlo Sims
APPM 4580 (3) Statistical Applications: Software & Methods
APPM 4650 (3) Intermediate Numerical Analysis 1
APPM 4660 (3) Intermediate Numerical Analysis 2
APPM 4720 (3) Open Topics in Applied Mathematics

ASTR 3010 (3) Air Force Leadership Studies I

CHEM 3080 (4) Evolutionary Biology
CHEM 4251 (3) Materials Chemistry and Properties

CHEM 4021 (3) Inorganic Laboratory
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<td>Energy and Climate Change: An Interdisciplinary Approach</td>
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<td>Environl Systems 1 - Climate &amp; Vegetation *</td>
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ASEN 4315 (2) Design of Masonry Structures
ASEN 4317 (5) Architectural Engineering Design
ASEN 4506 (3) Project Management 1
ASEN 4530 (3) Advanced Lighting Design
ASEN 4540 (3) Exterior Lighting Systems

ASEN 3111 (4) Aerodynamics
ASEN 3112 (4) Structures
ASEN 3116 (3) Introduction to Biomedical Engineering
ASEN 3128 (4) Aircraft Dynamics
ASEN 3200 (4) Orbital Mechanics/Attitude Dynamics & Control
ASEN 3300 (4) Aerospace Electronics and Communications
ASEN 3930 (6) Aerospace Engineering Cooperative Education
ASEN 4010 (3) Introduction to Space Dynamics
ASEN 4012 (3) Aerospace Materials
ASEN 4013 (3) Foundations of Propulsion
ASEN 4090 (3) Global Positioning Systems Applications
ASEN 4114 (3) Automatic Control Systems

AREN 2810 (3) Biology for Engineers
AREN 3130 (2) Chemical Engineering Lab 1
AREN 3220 (3) Separations and Mass Transfer
AREN 3930 (6) Chemical Engineering Cooperative Education
AREN 4130 (2) Chemical Engineering Lab 2
AREN 4200 (3) Reaction Kinetics
AREN 4330 (3) Chemical Engineering Materials
AREN 4430 (3) Chemical Engineering Laboratory
AREN 4520 (3) Chemical Process Synthesis.
AREN 4521 (3) Physical Chemistry for Engineers
AREN 4530 (2) Chemical Engineering Design Project

CVEN 2012 (3) Introduction to Geomatics
CVEN 3022 (3) Construction Surveying
CVEN 3032 (3) Photogrammetry
CVEN 3111 (3) Analytical Mechanics 2
CVEN 3141 (2) Engineering Materials Lab
CVEN 3161 (3) Mechanics of Materials 1
CVEN 3246 (3) Introduction to Construction
CVEN 3256 (3) Construction Equipment and Methods
CVEN 3323 (3) Hydraulics Engineering
CVEN 3424 (3) Water and Wastewater Treatment
CVEN 3434 (3) Introduction to Applied Ecology
CVEN 3525 (3) Structural Analysis
CVEN 3602 (3) Transportation Systems
CVEN 3698 (3) Geologic and Geophysical Methods
CVEN 3708 (3) Geotechnical Engineering 1
CVEN 3718 (3) Geotechnical Engineering 2
CVEN 4161 (3) Mechanics of Materials 2
CSCI 4308 (4) Software Engineering Project 1
CSCI-4314 (3) Algorithms for Molecular Biology
CSCI 4317 (3) Genome Databases: Mining and Management
CSCI 4318 (4) Software Engineering Project 2
CSCI 4446 (3) Chaotic Dynamics
CSCI 4448 (3) Object Oriented Analysis and Design
CSCI 4473 (3) Network Security
CSCI-4502 (3) Data Mining

ECEN 1310 (4) C and MATLAB Programming for Electrical and Computer Engineers
ECEN 1400 (3) Introduction to Digital and Analog Electronics
ECEN 2060 (3) Sp Top: Renewable Energy
ECEN 2250 (3) Introduction to Circuits and Electronics
ECEN 2260 (3) Circuits as Systems
ECEN 2270 (3) Electronics Design Lab
ECEN 2350 (3) Digital Logic
ECEN 2410 (3) Renewable Sources and Efficient Electrical Energy Systems
ECEN 2703 (3) Discrete Mathematics for Computer Engineers
ECEN 3010 (3) Circuits and Electronics for Mechanical Engineers
ECEN 3030 (3) Electrical/Electronic Circuits Non-Major
ECEN 3170 (3) Electromagnetic Energy Conservation 1
ECEN 3002 to 3005 (3-5) Special Topics
ECEN 3250 (3) Microelectronics
ECEN 3300 (5) Linear Systems
ECEN 3320 (3) Semiconductor Devices
ECEN-3350 (3) Programming Digital Systems
ECEN-3360 (3) Digital Design Laboratory
ECEN 3400 (5) Electromagnetic Fields and Waves
ECEN 3410 (3) Electromagnetic Waves and transmission
ECEN 3810 (3) Introduction to Probability Theory
ECEN 4021 (3) Sp Top: Design Med Device
ECEN 4106 (3) Photonics
ECEN 4116 (3) Introduction to Optical Communications
ECEN 4120 (3) Neural Network Design
ECEN 4138 (3) Control Systems Analysis
ECEN 4167 (3) Electromagnetic Energy Conservation 2

EMEN 4030 (3) Project Management Systems
EMEN 4050 (3) Leadership and Professional Skills
EMEN 4200 (3) Technology and Entrepreneurship for the Developing World
EMEN 4800 (3) Technology Ventures and Marketing
EMEN 4825 (3) Entrepreneurial Business Plan Preparation
EMEN 4830 (3) Entrepreneurial Management and Leadership

GEEN 3400 (3) Invention and Innovation
GEEN 4830 (3) Solar Thermal Power/Plants

MCEN 1025 (3) Computer-Aided Design and Fabrication
MCEN 1208 (3) Sp Top: Sustainable Energy
MCEN 2024 (3) Materials Science
MCEN 2063 (3) Mechanics of Solids
MCEN 3025 (3) Component Design
MCEN 3030 (3) Computational Methods
MCEN 4026 (3) Manufacturing Processes and Systems
MCEN 4037 (3) Measurements Lab
MCEN 4115 (3) Mechananics and Robotics I
MCEN 4117 (3) Anatomy and Physiology for Engineers
MCEN 4120 (3) Engineering Statistics
MCEN 4123 (3) Vibration Analysis

MCEN 4124 (3) Mechanical Behavior of Materials
MCEN 4141 (3) Indoor Air Pollution
MCEN 4151 (3) Flow Visualization
MCEN 4152 (3) Introduction to Combustion
MCEN 4162 (3) Energy Conversion
MCEN 4173 (3) Finite Element Analysis
MCEN 4174 (3) Failure of Engineering Materials
MCEN 4183 (3) Mechanics of Composite Materials
MCEN 4228 (3) Sp Top: Energy Conservation and Storage
MCEN 4228 (3) Sp Top: Environmental Modeling
MCEN 4228 (3) Sp Top: Renewable and Sustainable Energy
MCEN 4228 (3) Sp Top: Wind Energy
MCEN 4228 (3) Sp Top: Air Measurement
Useful Websites

**Environmental Engineering Program:** [http://www.colorado.edu/even/](http://www.colorado.edu/even/)
**College of Engineering and Applied Science:** [http://engineering.colorado.edu/](http://engineering.colorado.edu/)
**Academic Support Programs:** [http://engineering.colorado.edu/academics/support.htm](http://engineering.colorado.edu/academics/support.htm)
**Active Learning Program:** [http://engineering.colorado.edu/activelearning/index.htm](http://engineering.colorado.edu/activelearning/index.htm)
**Co-op Program:** [http://engineering.colorado.edu/activelearning/co-op.htm](http://engineering.colorado.edu/activelearning/co-op.htm)
**Discovery Learning** (includes Discovery Learning Apprenticeship Program, Undergraduate Research Opportunities Program (UROP), Bioscience Undergraduate Research Skills and Training (BURST), Research Experience for Undergraduate (REU)): [http://engineering.colorado.edu/activelearning/aboutdiscovery.htm](http://engineering.colorado.edu/activelearning/aboutdiscovery.htm)
**Service Learning** (includes Earn-Learn Apprenticeship Program, Engineering for Developing Communities, Engineers Without Borders, etc): [http://engineering.colorado.edu/activelearning/service.htm](http://engineering.colorado.edu/activelearning/service.htm)
**Professional Learning** (includes internships and co-ops): [http://engineering.colorado.edu/activelearning/professional.htm](http://engineering.colorado.edu/activelearning/professional.htm)
**Advising Guides (College):** [http://engineering.colorado.edu/students/advising.htm](http://engineering.colorado.edu/students/advising.htm)
**BOLD Center, Academic Support:** [http://bold.colorado.edu/](http://bold.colorado.edu/)
**Career Services:** [http://careerservices.colorado.edu](http://careerservices.colorado.edu)
**Catalog, University of Colorado at Boulder:** [http://www.colorado.edu/catalog/2014-15/courses](http://www.colorado.edu/catalog/2014-15/courses)
**Engineering Center Map:** [http://www.colorado.edu/engineering/sites/default/files/Engineering_Center_20110429.pdf](http://www.colorado.edu/engineering/sites/default/files/Engineering_Center_20110429.pdf)
**Engineering for Developing Communities (EDC):** [http://mcedc.colorado.edu/](http://mcedc.colorado.edu/)
**Engineering Honors Program:** [http://www.cuhonorsengineering.com](http://www.cuhonorsengineering.com)
**FE Exam:** [National Council of Examiners for Engineering and Surveying](http://www.ncees.org/)
**State of Colorado Board of Licensure:** [http://www.dora.state.co.us/aes/index.htm](http://www.dora.state.co.us/aes/index.htm)
**Forms (College):** Petition form, Change of Major Form, etc): [http://engineering.colorado.edu/students/advising.htm](http://engineering.colorado.edu/students/advising.htm)
**Humanities and Social Sciences Requirements:** [http://engineering.colorado.edu/homer/](http://engineering.colorado.edu/homer/)
**Herbst Program:** [http://engineering.colorado.edu/herbst/](http://engineering.colorado.edu/herbst/)
**International Engineering Certificates:** [http://engineering.colorado.edu/academics/international.htm](http://engineering.colorado.edu/academics/international.htm)
**Minors:** [http://artsandsciences.colorado.edu/artssciences/departments](http://artsandsciences.colorado.edu/artssciences/departments) and [http://www.colorado.edu/leeds/minor-business](http://www.colorado.edu/leeds/minor-business)
**MyCUinfo portal:** [https://mycuinfo.colorado.edu](https://mycuinfo.colorado.edu)
**Office of the Registrar:** [http://registrar.colorado.edu/](http://registrar.colorado.edu/)
**Schedule of Courses:** [http://mycuinfo.colorado.edu](http://mycuinfo.colorado.edu)
Course listings in .pdf format at [http://conted.colorado.edu/programs/access/](http://conted.colorado.edu/programs/access/)
**Student Society for Environmental Engineering:** [http://www.colorado.edu/even/current-students/seven-society-even](http://www.colorado.edu/even/current-students/seven-society-even)
**Study Abroad:** [http://studyabroad.colorado.edu](http://studyabroad.colorado.edu)
**Transfer students, information for:** [http://www.colorado.edu/engineering/admissions/transfer](http://www.colorado.edu/engineering/admissions/transfer)
**Transfer Credits:** [http://www.colorado.edu/admissions/undergraduate/transfer-center](http://www.colorado.edu/admissions/undergraduate/transfer-center)
**GTPathways curriculum:** [http://highered.colorado.gov/Academics/Transfers/gtPathways/default.html](http://highered.colorado.gov/Academics/Transfers/gtPathways/default.html)
**USelect database:** [https://www.transfer.org/](https://www.transfer.org/)
# Degree Requirements Worksheet – EVEN BS Degree  2015-2016

Student Name: _________________________________________________ Student#:__________
Faculty Advisor: ________________________________________________ Catalog year:_________ Major year:_____

## Required Courses

<table>
<thead>
<tr>
<th>course no.</th>
<th>course name</th>
<th>credits</th>
<th>course taken (if different)</th>
<th>grade</th>
<th>term</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVEN 1000</td>
<td>Intro to Environmental Engineering</td>
<td>1</td>
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<td>______</td>
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<tr>
<td>CHEN 1310</td>
<td>Intro to Engineering Computing</td>
<td>3</td>
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<tr>
<td>GEEN 1400</td>
<td>Engineering Projects</td>
<td>3</td>
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<tr>
<td>CVEN 3414</td>
<td>Fundamentals of Environmental Engr</td>
<td>3</td>
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<tr>
<td>CHEN 2120</td>
<td>Chem Engr Matl Energy Balances</td>
<td>3</td>
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<tr>
<td>1</td>
<td>Solid Mechanics</td>
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<tr>
<td>EVEN 4404</td>
<td>Water Chemistry</td>
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<td>EVEN 4414</td>
<td>Water Chemistry Lab</td>
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<td>2</td>
<td>Engineering Economics</td>
<td>3</td>
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<td>3</td>
<td>Fluid Mechanics</td>
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<td>Thermodynamics</td>
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<td>EVEN 4424</td>
<td>Environmental Organic Chemistry</td>
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<td>5</td>
<td>Heat Transfer</td>
<td>3</td>
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<tr>
<td>EVEN 4484</td>
<td>Intro to Environmental Microbiology</td>
<td>3</td>
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</tr>
<tr>
<td>MCEN 4131</td>
<td>Air Pollution Control</td>
<td>3</td>
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<tr>
<td>6</td>
<td>Probability and Statistics</td>
<td>3</td>
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<tr>
<td>CVEN 4333</td>
<td>Engineering Hydrology</td>
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<td>EVEN 4464</td>
<td>Environmental Engineering Processes</td>
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<td>EVEN 4434</td>
<td>Environmental Engineering Design</td>
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**Engineering Total (54)**

<table>
<thead>
<tr>
<th>course no.</th>
<th>course name</th>
<th>credits</th>
<th>course taken (if different)</th>
<th>grade</th>
<th>term</th>
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<tbody>
<tr>
<td>APPM1350</td>
<td>Calculus 1 for Engineers</td>
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<td>APPM1360</td>
<td>Calculus 2 for Engineers</td>
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<tr>
<td>APPM2350</td>
<td>Calculus 3 for Engineers</td>
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<tr>
<td>APPM2360</td>
<td>Intro Diff Eqns w Linear Algebra</td>
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**Mathematics Total (16)**

<table>
<thead>
<tr>
<th>course no.</th>
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<th>credits</th>
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<th>grade</th>
<th>term</th>
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<tbody>
<tr>
<td>CHEN 1211</td>
<td>General Chemistry</td>
<td>4</td>
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<td>CHEM 1221</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>PHYS 1110</td>
<td>General Physics 1</td>
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<tr>
<td>PHYS 1120</td>
<td>General Physics 2</td>
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<td>PHYS 1140</td>
<td>Experimental Physics 1</td>
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<tr>
<td>CVEN 4834</td>
<td>Sustainability Principles for Engineers</td>
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</table>

**Sciences Total (17)**

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2. Engineering Economics options: CVEN 4147 Civil Engineering Systems (F), EMEN 4100 Business Methods and Economics for Engineers
4. Thermodynamics options: AREN 2110 Thermodynamics, CHEN 3320 Chemical Engineering Thermodynamics, GEEN 3852 Thermodynamics for Engineers, MCEN 3012 Thermodynamics.
### Elective Courses

<table>
<thead>
<tr>
<th>course no.</th>
<th>course name</th>
<th>credits</th>
<th>course taken</th>
<th>grade</th>
<th>term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Humanities &amp; Social Sciences Electives (18 hours, 6 hours upper division)</td>
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<tr>
<td></td>
<td>H&amp;SS (lower or upper division)</td>
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<tr>
<td></td>
<td>H&amp;SS (upper division)</td>
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<td>H&amp;SS (upper division)</td>
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<td>7</td>
<td>Required Communication Course</td>
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</table>

**H&SS Total (18)**

| Option Courses (9 hours) | |
|--------------------------|---------|-----|
| Option 1                 |         |     |
| Option 2                 |         |     |
| Option 3                 |         |     |

**Option Total (9)**

**Technical Electives (9 hours: 6 hours upper division, 3 Earth Science)**

<table>
<thead>
<tr>
<th>Tech (lower or upper division)</th>
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<tbody>
<tr>
<td>Tech (upper division)</td>
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</tr>
<tr>
<td>Tech (upper division)</td>
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</table>

**Technical Electives Total (9)**

<table>
<thead>
<tr>
<th>Air/Earth Lab/Field Course</th>
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</table>

**Air/Earth Lab/Field Course Total (12)**

<table>
<thead>
<tr>
<th>Free Elective (2 hours)</th>
<th></th>
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</table>

**Free Elective (2 hours) Total (2)**

### Credit hour Total: **(128)**  
### Grade Point Average: ****

**MAPS Complete:**

**FE Exam:**

**Final Check:**

---

7 Communications course: HUEN 1010 Humanities for Engineers: The Human Quest, HUEN 3100 Advanced Humanities for Engineers: The Human Quest Continues, WRTG 3030 Writing on Science and Society, WRTG 3035 Technical Communication and Design, or PHYS 3050 Writing in Physics.

8 Consult Environmental Engineering (EVEN) Degree Guidelines for lists of Option courses.

9 Technical Electives: Three technical elective credits may be lower division (1000-, 2000-level). Three technical elective credits must be in the earth sciences, either lower or upper division (eligible departments and programs include ATOC, CVEN, GEOL, and GEOG). Independent studies or senior thesis may be completed as technical electives for up to 6 credits total, 3 credits per semester.

10 Air/Earth Lab/Field course: a 3(+) credit course with a significant laboratory or field component focusing on air quality or earth science. If less than 3 credits, the difference is required as an upper division technical elective or accompanying lecture. Options: ATOC 1050/1070 Weather and the Atmosphere Lab/Lecture or ATOC 1070 and Upper Tech Elec., CVEN 3708 Geotechnical Engineering, EVEN 4100 Environmental Sampling, GEOL 1030 Intro to Geology Lab (1), GEOL 2700 Intro to Field Geology (2), GEOL 3010 Intro to Mineralogy, GEOL 4716 Environmental Field Geochemistry (2) Can NOT be the same T.E. used for Earth Science T.E.
<table>
<thead>
<tr>
<th>SEM</th>
<th>CR</th>
<th>Course</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>Spr</td>
<td>16</td>
<td>Option Course III -3- or Technical Elective II -3- *</td>
<td>3</td>
<td><strong>CHEN 2120-A grade of C or higher is needed to continue into CHEN courses.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCEN 4131 -3- Air Pollution Control (fluid mechanics) #</td>
<td>3</td>
<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
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<tr>
<td></td>
<td></td>
<td>CVEN 4333 -3- Engineering Hydrology (prob&amp;stat, fluids) #</td>
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<td>(Coreq or Co-req)</td>
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<td>EVEN 4434 -4- Environmental Engineering Design (CVEN 3414) #</td>
<td>4</td>
<td>Technical Elective III -3- or Senior thesis *</td>
</tr>
<tr>
<td>Fall</td>
<td>17</td>
<td>Option Course II -3-</td>
<td>3</td>
<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air or Earth Science Lab or Field course -3-</td>
<td>3</td>
<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Free Elective -2-</td>
<td>2</td>
<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
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<tr>
<td></td>
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<td>EVEN 4464 -3- Env Engg Processes (Prereq or Co-req CVEN3414 &amp; fluids) #</td>
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<td>Technical Elective II -3- or Senior thesis *</td>
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<tr>
<td></td>
<td></td>
<td>EVEN 4484 -3- Intro to Environ Microbiology (CHEN1211, calc 3) #</td>
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<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
</tr>
<tr>
<td>Fall</td>
<td>16</td>
<td>Engineering Economics -3-</td>
<td>3</td>
<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
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<tr>
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<td>EVEN 4404 -3- Water Chemistry EVEN 4414 -1- Water Chem Lab (CVEN3414) #</td>
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<td>Technical Elective II -3- or Senior thesis *</td>
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<tr>
<td></td>
<td></td>
<td>Fluid Mechanics -3- (calc 3 or dif eq, solid mech course)</td>
<td>3</td>
<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thermodynamics -3- (calc 3 or CHEN2120+CHEM 4521 or calc 2+PHYS 1110)</td>
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<td>Communications Course -3- (Jr. standing)</td>
</tr>
<tr>
<td>Spr</td>
<td>16</td>
<td>APPM 2360 -4- Introduction to Differential Equations &amp; Linear Algebra (APPM 1360 or MATH 2300)</td>
<td>4</td>
<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CVEN 4834 -3- Sustainability Principles for Engineers #</td>
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<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EVEN 3414 -3- Fundamentals of Env. Engineering (CHEN 1211, CHEM 1221, &amp; APPM 1360)</td>
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<td>Technical Elective I -3- or Senior thesis *</td>
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<tr>
<td>Fall</td>
<td>16</td>
<td>APPM 2350 -4- Calculus III for Engineers (APPM 1360 or MATH 2300)</td>
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<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
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<tr>
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<td>PHYS 1120 -4- PHYS 1140 -1- Gen. Phys/Lab (PHYS 1110 &amp; co-req MATH 2300 or APPM 1360)</td>
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<td>Technical Elective I -3- or Senior thesis *</td>
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<td>Solid Mechanics course -3- (CVEN PHYS 1110 &amp; co-req calc III; MCEN: CHEN 1310)</td>
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<td>Technical Elective I -3- or Senior thesis *</td>
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<tr>
<td>Fall</td>
<td>16</td>
<td>APPM 1360 -4- Calculus II for Engineers (APPM 1350 or MATH 1300)</td>
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<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
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<tr>
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<td>PHYS 1110 -4- Gen. Physics I (prereq or co-req APPM 1350 or MATH 1300)</td>
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<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
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<td>CHEN 1310 -3- Introduction to Computing (prereq or co-req calculus I)</td>
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<td>Technical Elective I -3- or Senior thesis *</td>
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<td>Electrostatic Potential Equations (APPM 1360)</td>
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<td>Technical Elective I -3- or Senior thesis *</td>
</tr>
<tr>
<td>Fall</td>
<td>16</td>
<td>APPM 1350 -4- Calculus I for Engineers</td>
<td>4</td>
<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
</tr>
<tr>
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<td></td>
<td>CHEN 1221 -4- Gen Chem for Engineers (coreq CHEM 1221) $</td>
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<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
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<td>CHEM 1221 -1- General Chem Lab (coreq CHEM 1211) $</td>
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<td><strong>CHEN 2120 &amp; CHEM 1221 must be taken concurrently.</strong></td>
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<td>GEEN 1400 -3- Engineering Projects</td>
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<td>Technical Elective I -3- or Senior thesis *</td>
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<tr>
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<td></td>
<td>EVEN 1000 -1- Introduction to Environmental Engineering #</td>
<td>1</td>
<td>Technical Elective I -3- or Senior thesis *</td>
</tr>
</tbody>
</table>

**Courses marked thus are offered only in SEMESTER shown.**

5 - CHEN 2121 & CHEM 1221 must be taken concurrently.

* - Prerequisite or Co-requisite required before taking course listed.

**CHEN 2120-A grade of C or higher is needed to continue into CHEN courses.**

Solid Mechanics options: CVEN 2121 Analytic Mechanics (F,S; PHYS1110, co-req APPM 2350); GENE 2851 Statics for Engr (PHYS 1110, APPM 2350); MENG 2023 Statics & Structures (F; APPM 1360);

Fluid Mechanics options: CVEN 3313 Theoretical Fluid Mechanics (S; Solid Mechanics); MCEN 3021 Fluid Mechanics (F; APPM 2360, Solid Mech); CHEN 3200 Chem Engr Fluid Mechanics (S; APPM2350/2360, CHEN2120/MENG2023); GEEN 3853 Fluid Mech for Engns (sum,APPM 2350/2360, GEEN 1300)

Thermodynamics options: AREN 2110 Thermo (F, APPM1360, PHYS1110), CHEN 3320 Chem Eng Thermo (F; reqd chem proc option; CHEN2120, CHEM4521); GEEN 3852 Thermo for Engns (sum, APPM2350), MCEN 3012 Thermodynamics (F; reqd air quality option; APPM 2350)

Heat Transfer options: CHEN3210 Chem Eng Heat Transfer (F; CHEN2120, Fluids, COEN 1300), MCEN 3022 Heat Transfer (S, Thermo, Fluids)

*Tech electives: 3 cr can be lower division, others must be 3000 or 4000 level; one tech elective (3cr) must relate to earth science such as geology courses, engineering geology, CVEN Geotech I, etc.

Air/Earth Lab Field course such as: ATOC 1070 Weather & Atmos Lab, CVEN 3708 Geotech Eng, EVEN 4100 Env Sampling, GEOG 4411 Methods of Soil Analysis, GEOG 2700-2 Intro to Field Geol, GEOG 3010 Intro to Mineralogy, GEOG 4716 Env Field Geol. If course is less than 3 credits, remaining credits must be upper division tech electives.

Engineering Economics options: CVEN 4147 Civil Engineering Systems (F), EMEN 4100 Business Methods and Economics for Engineers

Probability and Statistics options: APPM 4570 Statistical Methods (F, S; APPM 1360), CHEN 3010 Appl Math (S, APPM 2360), GEEN 4100 Data Analysis (F, CHEM1310, APPM 2360), CS 327 Probability, Statistics, & Decision (S, APPM 2360)

Communications Course: GEEN 3000 Prof Comm Engrs, HUEN 3100 Humanities for Engrs, WRTG 3030 Writing Sci & Society, WRTG 3035 Tech Comm & Design; PHYS 3050 Wrtg for Phys
<table>
<thead>
<tr>
<th>SEM</th>
<th>CR</th>
<th>Course Description</th>
</tr>
</thead>
</table>
| Spr 15 | 3 | Option Course I -3-  
| Spr 16 | 4 | Introduction to Differential Equations & Linear Algebra  
| Spr 17 | 4 | Calculus III for Engineers  
| Fall 15 | 4 | Calculus III for Engineers  
| Fall 16 | 4 | Calculus I for Engineers  
| Fall 17 | 4 | Calculus II for Engineers  
| Fall 18 | 4 | Calculus I for Engineers  

**Courses marked thus are offered only in SEMESTER shown.**

- **CHEN 2120:** A grade of C or higher is needed to continue into CHEN courses.
- **Solid Mechanics options:** CVEN 2121 Analytic Mechanics (F; Phys1110, co req APPM 2350); GEEN 2851 Statics for Engr (PHYS 1110, APPM 2350), MCEN 2023 Statics & Structures (F; APPM 1360); Fluid Mechanics options: MCEN 3021 Fluid Mechanics (F; APPM 2360, Solid Mech)  
- **Thermodynamics options:** MCEN 3012 Thermodynamics (F; reqd air quality option; APPM 2350)  
- **Heat Transfer options:** MCEN 3022 Heat Transfer (S; MCEN 3021, MCEN 3012)  
- **Technical electives:** 3 cr can be lower division, others must be 3000 or 4000 level; one tech elective (3cr) must relate to earth science such as geology courses, engineering geology, CVEN Geotech I, etc.

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Air/Earth Lab Field course such as: ATOC 1070 Weather & Atmos Lab, CVEN 3708 Geotech Eng, EVEN 4100 Env Sampling, GEOG 4411 Methods of Soil Analysis, GEOL 2700-2 Intro to Field Geol, GEOL 3010 Intro to Mineralogy, GEOL4716 Env Field Geol. If course is less than 3 credits, remaining credits must be upper division tech electives.

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**Probability and Statistics options:** APPM 4570 Statistical Methods (F,S; APPM 1360), CHEN 3010 Appl Data Analysis (F, CHEN1310, APPM 2360), CVEN 3227 Probability, Statistics, & Decision (S, APPM 2360)  

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**Engineering Economics:** CVEN 4147 Civil Engineering Systems (F), EMEN 4100 Business Methods and Economics for Engineers  

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**Communications Course:** GEEN 3000 Prof Comm Engrs, HUEN 3100 Humanities for Engrs, WRTG 3030 Writing Sci & Society, WRTG 3035 Tech Comm & Design; PHYS 3050 Wrtg for Phys
### EVEN B.S. Degree: Applied Ecology Block Diagram 2015-16

#### SEM CR

- **Spr 16**  
  - Option Course III -3- or 
  - Technical Elective II -3-  
  - MCEN 4313 -3-  
  - Air Pollution Control (fluid mechanics)  
  - CVEN 4333 -3-  
  - Engineering Hydrology 
    - (prob&stat, fluids)  
  - EVEN 4434 -4-  
  - Environmental Engineering Design 
    - (CVEN 3414)  
  - Technical Elective III -3- or 
  - Senior thesis  
  - H&S 5 Elective V -3-  
  - upper division  

- **Fall 17**  
  - Option Course II -3-  
  - Air or Earth Science Lab or 
  - Field course -3-  
  - Free Elective -2-  
  - EVEN 4424 -3-  
  - Env Organic Chemistry (CHEN1211, 1221)  
  - Probability & Statistics 
    - (calc 2 or dif eq or 
    - CHEN1310+dif eq)  
  - EVEN 4484 -3-  
  - Intro to Environ Microbiology 
    - (CHEN1211, calc 3)  
  - Heat Transfer -3-  
  - (Fluids; Thermo for 
  - MCEN; 
  - CHEN1210+GEEN 1300 
  - for CHEN)  
  - Communication Course 
    - (Jr. standing)  

- **Spr 15**  
  - Option Course I - 
  - CVEN 3434 -3-  
  - Intro to Applied 
  - Ecology (CHEN 1211/1221)  
  - EVEN 4404 -3-  
  - Water Chemistry 
  - EVEN 4414-1- 
  - Water Chem Lab 
  - (CVEN3414)  
  - Fluid Mechanics -3-  
  - (calc 3 or dif eq, solid 
  - mech course)  
  - Thermodynamics -3-  
  - (calc 3 or 
  - CHEN1210+CHEM 4521 
  - or calc 2+PHYS 1110)  
  - Technical Elective IV -3-  
  - upper division  

- **Fall 16**  
  - Engineering Economics -3-  
  - EVEN 4400 -3-  
  - Water Chemistry 
  - EVEN 4414-1- 
  - Water Chem Lab 
  - (CVEN3414)  
  - Fluid Mechanics -3-  
  - (calc 3 or dif eq, solid 
  - mech course)  
  - Thermodynamics -3-  
  - (calc 3 or 
  - CHEN1210+CHEM 4521 
  - or calc 2+PHYS 1110)  
  - Communication Course 
    - (Jr. standing)  

- **Spr 16**  
  - APPM 2360 -4-  
  - Introduction to 
  - Differential Equations & 
  - Linear Algebra 
  - (APPM 1360 or MATH 2300)  
  - CVEN 4834 -3-  
  - Sustainability Principles for 
  - Engineers  
  - CVEN 3414 -3-  
  - Fundamentals of Env. 
  - Engineering 
  - (CHEN 1211, CHEM 
  - 1221 & APPM 1360) 
  - Technical Elective V -3- 
  - upper division  

- **Fall 15**  
  - APPM 2350 -4- 
  - Calculus III for 
  - Engineers 
  - (APPM 1360 or MATH 2300)  
  - PHYS 1120 -4- 
  - PHYS 1140 -1-  
  - Gen.Phys/Lab 
  - (PHYS 1110 & co-req 
  - MATH 2300 or APPM 
  - 1360)  
  - Solid Mechanics course 
    - -3-  
  - (CVEN:PHYS 1110 & 
  - Gen. Physics I 
  - (prereq or co-req 
  - APPM 1350 or 
  - MATH 1300)  
  - CHEN 1310 -3- 
  - Introduction to 
  - Computing 
  - (prereq or co-req 
  - calculus 1)  
  - Technical Elective I -3- 
  - *  
  - Technical Elective II -3-  
  - or 
  - Option Course III -3- or 
  - Senior thesis  
  - H&S 5 Elective IV -3-  
  - upper division  

- **Spr 17**  
  - APPM 1360 -4- 
  - Calculus II for 
  - Engineers 
  - (APPM 1350 or 
  - MATH 1300)  
  - PHYS 1110 -4- 
  - Gen. Physics I 
  - (prereq or co-req 
  - APPM 1350 or 
  - MATH 1300)  
  - CHEN 1310 -3- 
  - Introduction to 
  - Computing 
  - (prereq or co-req 
  - calculus 1)  
  - Technical Elective I -3-  
  - *  
  - Technical Elective II -3-  
  - or 
  - Option Course III -3- or 
  - Senior thesis  
  - H&S 5 Elective V -3-  
  - lower division  

- **Fall 16**  
  - APPM 1350 -4- 
  - Calculus I for 
  - Engineers  
  - (coreq CHEN 1211) 
  - $  
  - CHEM 1211 -4- 
  - Gen Chem for 
  - Engineers 
  - (coreq CHEN 1211) 
  - $  
  - CHEM 1221 -1- 
  - General 
  - Chem Lab 
  - (coreq CHEN 1211) 
  - $  
  - GEEN 1400 -3- 
  - Engineering Projects  
  - EVEN 1000 -1- 
  - Introduction to 
  - Environmental 
  - Engineering  
  - Technical Elective III -3-  
  - lower division  

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*Tech electives: 3 cr can be lower division, others must be 3000 or 4000 level; one 
tech elective (3cr) must relate to earth science such as geology courses, engineering 
geology, CVEN Geotech I, etc. 
Air/Earth Lab Field course such as: ATOC 1070 Weather & Atmos Lab, CVEN 3708 
Geotech Eng, EVEN 4100 Env Sampling, GEOG 4411 Methods of Soil Analysis, GEOL 
2700-2 Intro to Field Geol, GEOL 3010 Intro to Mineralogy, GEOL4716 Env Field Geol. 
If course is less than 3 credits, remaining credits must be upper division tech 
electives. 

**Course options:**  
- CVEN 4147 Civil Engineering Systems (F), EMEN 4100  
- Business Methods and Economics for Engineers  
- Probability and Statistics options: APPM 4570 Statistical Methods (F, S; APPM 2360)  
- CHEN 3010 Appl Data Analysis (F, CHEN1310, APPM 2360), CVEN 3227 Probability, 
  Statistics, & Decision (S, APPM 2360)  
- Communications Course: GEEN 3000 Prof Comm Engrs, HUEN 3100 Humanities for 
  Engineers, WRTG 3030 Writing Sci & Society, WRTG 3035 Tech Comm & Design; PHYS 
  3050 Writing for Phys  

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- Courses marked thus are offered only in SEMESTER shown. 
- $ - CHEN 1211 & CHEM 1221 must be taken concurrently. 
- ( ) - Prerequisite or Co-requisite required before taking course listed. 
- ** -CHEN 2120-A grade of C or higher is needed to continue into CHEN courses. 
- Solid Mechanics options: CVEN 2121 Analytic Mechanics I (F,S; Phys1110, co-req APPM 2350); GEEN 2851 Statics for Engr (PHYS 1110, APPM 2350), MCEN 2023 Statics & Structures (F; APPM 1360); Fluid Mechanics options: CVEN 3313 Theoretical Fluid Mechanics (S; Solid Mechanics); MCEN 3021 Fluid Mechanics (F; APPM 2360, Solid Mech), CHEN 3200 Chem Engr Fluid Mechanics (S; APPM2350/2360, CHEN1210/MCEN2023), GEEN 3853 Fluid Mech for Engrs (sum,APPM 2350/2360, GEEN 1300) Thermodynamics options: AUREN 2110Thermo (F, APPM1360, PHYS1110), CHEN 3320 
  Chem Eng Thermo (F; reqd chem proc option; CHEN1210, CHEM4521); GEEN 3852 
  Thermo for Engrs (sum, APPM2350), MCEN 3012 Thermodynamics (F; reqd air quality 
  option; APPM 2350) Heat transfer options: CHEN3210Chem Eng Heat Transfer (F; CHEN1210, Fluids, COEN1300), MCEN 3022 Heat Transfer (S; Thermo, Fluids)
## EVEN B.S. Degree: Chem Processing Block Diagram 2015-16

<table>
<thead>
<tr>
<th>SEM</th>
<th>CR</th>
<th>Course</th>
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<tbody>
<tr>
<td>Spr</td>
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<td>Option Course III CHEN 3220 -3- (CHEN 3210 or MCEN 3022 &amp; CHEN 3320) #</td>
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<td>MCEN 4131 -3- Air Pollution Control (fluid mechanics) #</td>
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<td>CVEN 4333 -3- Engineering Hydrology (prob&amp;stat, fluids) #</td>
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<td>EVEN 4434 -4- Environmental Engineering Design (CVEN 3414) #</td>
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<td>Technical Elective III -3- or Senior thesis *</td>
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<td>Fall</td>
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<td>Heat Transfer CHEN 3210 or MCEN 3022 -3- (CHEN 3220 or MCEN 3021, MCEN 3012 or GEEN 3852) #</td>
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<td>Free Elective -2-</td>
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<td>EVEN 4464 -3- Env Engr Processes (Pre-req or Co-req CVEN 3414 &amp; fluids) #</td>
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<td>H&amp;S Elective V -3- upper division</td>
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<td>CVEN 4834 -3- Sustainability Principles for Engineers #</td>
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<td>EVEN 4424 -3- Env Organic Chemistry (CHEN1211, 1221) #</td>
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<td>Option Course II CHEN 4330 -3- (CHEN 3220, APPM 2360) #</td>
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<td>EVEN 4484 -3- Intro to Environ Microbiology (CHEN1211, calc 3) #</td>
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<td>Fluid Mechanics CHEN 3200 or MCEN 3021 -3- (Preq calc 3, pre/coreq dif eq, CHEN 2120) #</td>
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<td>EVEN 4404 -3- Water Chemistry EVEN 4414-1 Water Chem Lab (CVEN 3414) #</td>
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<td>Probability &amp; Statistics CHEN 3010 -3- (APPM 2360, CHEN 1310) #</td>
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<td>Thermodynamics CHEN 3320 -3- (CVEN 2120+CHEN 4521 or CHEM 4511 &amp; CHEM 4531) #</td>
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<td>Communications Course -3- (Jr. standing)</td>
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<td>APPM 2360 -4- Introduction to Differential Equations &amp; Linear Algebra (APPM 1360 or MATH 2300) #</td>
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<td>Option Course I -4- CHEN 4521 -3- (CHEN- 1211, Calc 3) #</td>
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<td>CVEN 3414 -3- Fundamentals of Env. Engineering (CHEN 1211, CHEM 1221, &amp; APPM 1360) #</td>
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<td>CHEN 2120 -3- Material and Energy Balances (CHEM1211, 1310) **</td>
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<td>APPM 2350 -4- Calculus III for Engineers (APPM 1360 or MATH 2300)</td>
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<td>PHYS 1120 -4- PHYS 1140 -1- Gen.Phy/Lab (PHYS 1110 &amp; co-req MATH 2300 or APPM 1360) #</td>
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<td>Solid Mechanics course -3-(CVEN:PHYS 1110 &amp; co-req calc III; MCEN: pre-req of calc II)</td>
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<td>CHEN 1310 -3- Introduction to Computing (prereq or co-req calculus 1)</td>
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<td>PHYS 1110 -4- Gen. Physics I (prereq or co-req APPM 1350 or MATH 1300) #</td>
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<td>CHEN 1310 -3- Introduction to Computing (prereq or co-req calculus 1)</td>
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<td>Technical Elective I -3- *</td>
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<td>APPM 3540 -4- Calculus I for Engineers</td>
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<td>CHEM 1211 -4- Gen Chem for Engineers (coreq CHEN 1221) $</td>
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<td>CHEM 1221 -1- General Chem Lab (coreq CHEN 1211) $</td>
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<td>GEEN 1400 -3- Engineering Projects</td>
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<td>EVEN 1000 -1- Introduction to Environmental Engineering #</td>
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<td>H&amp;S Elective I -3- lower division</td>
</tr>
</tbody>
</table>

# - Courses offered only in SEMESTER shown - once a year.
$ - CHEN 1211 & CHEM 1221 must be taken concurrently.
() - Prerequisite or Co-requisite required before taking course listed.
**CHEN 2120-A grade of C or higher is needed to continue into CHEN courses.
Solid Mechanics options: CVEN 2121 Analytic Mechanics (F, S; Phys1110, co-req Processing) APPM 2350; GEEN 2851 Statics for Engr (PHYS 1110, APPM 2350), MCEN 2023 Statics & Structures (F; APPM 1360-Recom. For Chem Fluid Mechanics options: MCEN 3021 Fluid Mechanics (F; APPM 2360, Solid Mech), CHEN 3200 Chem Engr Fluid Mechanics (S; APPM 2320/2360, MCEN2120/MCEN2023) Thermodynamics options: CHEN 3320 Chem Eng Thermo (F; reqd chem proc option; CHEN2120, CHEM 4521 or CHEM 4511 & CHEM 4531) Heat Transfer options: APPM/CHEN 2310 or MCEN 3021, MCEN 3022 Heat Transfer (S; Thermo, Fluids)
*Tech electives: 3 cr can be lower division, others must be 3000 or 4000 level; one tech elective (3cr) must relate to earth science such as geology courses,
Air/Earth Lab Field course such as: ATOC 1070 Weather & Atmos Lab, CVEN 3708 Geotech Eng, EVEN 4100 Env Sampling, GEOL 4411 Methods of Soil Analysis, GEOL 2700-2 Intro to Field Geol, GEOG 3010 Intro to Mineralogy, GEOG 4716 Env Field Geol. If course is less than 3 credits, remaining credits must be upper division tech electives.
Engineering Economics options: CVEN 4147 Civil Engineering Systems (F), EMEN 4100 Business Methods and Economics for Engineers Probability and Statistics options: APPM 4570 Statistical Methods (F; S; APPM 1360), CHEN 3010 Appl Data Analysis (F, CHEN1310, APPM 2360), CVEN 3227 Probability, Statistics, & Decision (S, APPM 2360)
Communications Course: GEEN 3000 Prof Comm Engrs, HUEN 3100 Humanities for Engrs, WRTG 3030 Writing Sci & Society, WRTG 3035 Tech Comm & Design; PHYS 3050 Wrtg for Phys
**EVEN B.S. Degree: Energy Block Diagram 2015-16**

<table>
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<tr>
<th>SEM</th>
<th>CR</th>
<th>Option Course II-3</th>
<th>Technical Elective II-3</th>
<th>MCEN 4131 -3</th>
<th>Air Pollution Control (fluid mechanics)</th>
<th>CVEN 4333 -3</th>
<th>Engineering Hydrology (prob&amp;stat, fluids)</th>
<th>EVEN 4434 -4</th>
<th>Environmental Engineering Design (CVEN 3414)</th>
<th>Technical Elective III-3</th>
<th>Senior thesis</th>
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<tr>
<td>Fall</td>
<td>17</td>
<td>Option Course II MCEN 3017 (F) or ECEN 3010(F,S) -3</td>
<td>Circuits &amp; Elec (APPM 2360, PHYS 1140)</td>
<td>free Elective -2</td>
<td>EVEN 4424 -3</td>
<td>Env Engrr Processes (pre-req or Co-req CVEN3414 &amp; fluids)</td>
<td>EVEN 4464 -3</td>
<td>Env Engrr Processes (pre-req or Co-req CVEN3414 &amp; fluids)</td>
<td>Technical Elective II -3</td>
<td>Option Course III -3</td>
<td>or Senior thesis</td>
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<td>Fall</td>
<td>16</td>
<td>Engineering Economics -3</td>
<td>Air or Earth Science Lab or Field course -3</td>
<td>EVEN 4404 -3</td>
<td>Water Chemistry EVEN 4414 -1</td>
<td>Water Chem Lab (CVEN3414)</td>
<td>Fluid Mechanics MCEN 3021 -3</td>
<td>solid mech course and dif. Eq, as a pre or co req</td>
<td>Thermodynamics MCEN 3012 or GEEN 3852 -3</td>
<td>(calc 3)</td>
<td>Communications Course -3</td>
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<td>APPM 2360 -4</td>
<td>Introduction to Differential Equations &amp; Linear Algebra (APPM 1360 or MATH 2300)</td>
<td>CVEN 4834 -3</td>
<td>Sustainability Principles for Engineers</td>
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<td>H &amp; S Elective IV -3</td>
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<td>APPM 2350 -4</td>
<td>Calculus III for Engineers (APPM 1360 or MATH 2300)</td>
<td>PHYS 1120 -4</td>
<td>PHYS 1140 -1</td>
<td>Gen. Phys/Lab (PHYS 1110 &amp; co-req MATH 2300 or APPM 1360)</td>
<td>Solid Mechanics course -3</td>
<td>(CVEN PHYS 1110 &amp; co-req calc III; MCEN: pre-req of calc II)</td>
<td>CHEN 3130 -3</td>
<td>Introduction to Computing (prereq or co-req calculus 1)</td>
<td>Technical Elective I -3</td>
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<td>APPM 3350 -4</td>
<td>Calculus I for Engineers</td>
<td>CHEN 1211 -4</td>
<td>Gen. Chem for Engineers (coreq CHEN 1221)</td>
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<td>CHEN 1221 -1</td>
<td>General Chem Lab (coreq CHEN 1211)</td>
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<td>GEEN 1400 -3</td>
<td>Engineering Projects</td>
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</table>

# - Courses marked thus are offered only in SEMESTER shown.
$ - CHEN 1211 & CHEM 1221 must be taken concurrently.
( ) - Prerequisite or Co-req required before taking course listed.
**CHEN 2120-A grade of C or higher is needed to continue into CHEN courses.
**Solid Mechanics options: CVEN 2121 Analytic Mechanics (F,S; Phys1110, co-req APPM 2350); GEEN 2851 Statics for Engr (PHYS 1110, APPM 2350), MCEN 2023 Statics & Structures (F; APPM 1360);
Fluid Mechanics options: MCEN 3021 Fluid Mechanics (F; APPM 2360, Solid Mech), Thermodynamics options: GEEN 3852 Thermo for Engrs (APPM2350), MCEN 3012 Thermodynamics (F; req air quality option; APPM 2350)
Heat Transfer options: CHEN3210 Chem Eng Heat Transfer (F; CHEN2120, Fluids, COEN 1300), MCEN 3022 Heat Transfer (S; Thermo, Fluids)
*Tech electives: 3 or can be lower division, others must be 3000 or 4000 level; one tech elective (3cr) must relate to earth science such as geology courses, engineering geology, CVEN Geotech I, etc.

Air/Earth Lab Field course such as: ATOC 1070 Weather & Atmos Lab, CVEN 3708 Geotech Eng, EVEN 4100 Env Sampling, GEOG 4411 Methods of Soil Analysis, GEOL 2700-2 Intro to Field Geol, GEOL 3010 Intro to Mineralogy, GEOL4716 Env Field Geol.
If course is less than 3 credits, remaining credits must be upper division tech electives.
Probability and Statistics options: APPM 4570 Statistical Methods (F,S; APPM 1360), CHEN 3010 Appl Data Analysis (F, CHEN1310, APPM 2360), CVEN 3227 Probability, Statistics, & Decision (S, APPM 2360)
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