



Civil, Environmental, &  
Architectural Engineering

UNIVERSITY OF COLORADO **BOULDER**

# Undergraduate Advising Guide for Civil Engineering

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**Civil, Environmental, and Architectural Engineering**

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## Introduction

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The purpose of this guide is to assist undergraduate students majoring in Civil Engineering (CVEN) to fulfill the CVEN curriculum requirements for the Bachelor of Science (BS) degree. These requirements are structured to comply with College rules and to maintain our accreditation, in compliance with the rules of the Engineering Accreditation Commission of ABET ([www.abet.org](http://www.abet.org)).

To respond to the rapid changes in technology and needs of the profession, our curriculum is dynamic, and consequently undergoes both major and minor revisions annually. As an undergraduate student, you will generally be expected to follow the curriculum in effect when you entered as a freshman. You should keep a copy of the university catalog and all written information including the version of the Advising Guide that was in effect when you entered the Civil Engineering program. Copies of the curriculum, a course checklist, and a graphical flow chart are contained in this document. Alternatively, you may elect to follow a future revision to the curriculum in its entirety. If you decide to follow new curriculum guidelines, you must inform the Department.

The student is responsible for adherence to the CVEN curriculum rules and requirements and should be aware that deviation from the planned sequence of courses may result in delayed graduation.

Because of the diversity of the activities of civil engineers, the basic Civil Engineering Curriculum is intended to provide for a fundamental foundation of engineering science, a proficiency in four of the following five areas: construction, environmental, geotechnical, structural, and water resources engineering; and advanced courses in one of these areas leading to a concentration; culminating in an integrating multidisciplinary civil engineering major design experience. For talented students who seek the next-level preparation for R&D (Research and Development) careers or advanced degrees, they should consider the Engineering Science (ES) Track in Civil Engineering. In a special partnership with the Department of Applied Mathematics (APPM), a streamlined dual-degree program in Civil Engineering and Applied Mathematics via the Engineering Science track is now available. Catering to those who are interested in issues pertinent to the developing world, students can also elect the Engineering for Developing Communities (EDC) Track which focuses on sustainability and globally responsible engineering in developing communities and countries.

## Mission Statement

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The mission of the Department of Civil, Environmental and Architectural Engineering is the education of undergraduate students to become leaders in the professional practice of engineering, contributing to technological advances that benefit humankind while enhancing the earth's physical and biological resources.

## Program Educational Objectives

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The program objectives for the Bachelor of Science degree in Civil Engineering are that within five years:

- Graduates will be successfully employed in engineering, science, or technology careers
- Graduates are assuming management or leadership roles
- Graduates will engage in continual learning by pursuing advanced degrees or additional educational opportunities through coursework, professional conferences and training, and/or participation in professional societies

- Graduates will pursue professional registration or other appropriate certifications
- Graduates will be active in civic engagement

## Student Outcomes

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The outcomes that students are expected to have attained upon graduation with a bachelor of science degree in civil engineering are:

1. the ability to apply knowledge of mathematics, science, and engineering
2. the ability to design and conduct experiments
3. the ability to analyze and interpret data
4. the ability to design a system or component to meet desired needs
5. the ability to function on multidisciplinary teams
6. the ability to identify, formulate, and solve engineering problems
7. an understanding of professional and ethical responsibilities
8. the ability to communicate effectively through writing and/or drawing
9. the ability to communicate effectively through oral presentations
10. an understanding of the impact of engineering on society
11. an understanding of the necessity to engage in life-long learning
12. a knowledge of contemporary issues in civil, environmental, and architectural engineering
13. the ability to use modern engineering techniques, skills, and tools
14. the ability to explain basic concepts in management, business, public policy, and leadership

## Accreditation and Assessment

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The CVEN curriculum is accredited by the Engineering Accreditation Commission of ABET. Accreditation involves a process of continuous improvement using a series of assessment tools that measure how well the program is achieving its stated outcomes and objectives. As a student, you can expect to take part in the following evaluations during (and after) your academic career at CU:

- **Faculty Course Questionnaire (FCQ)** – You will evaluate and provide feedback in every course you take at CU at the end of every semester.
- **Fundamentals of Engineering (FE) Exam** – This national exam is the first step toward professional registration as an engineer and all CVEN students are required to take the exam prior to graduation. Most students take it in their last semester at CU.
- **Senior Exit Survey** – In your last semester, you will be asked to fill out a survey administered by the College that asks how well the outcomes listed above were met, and your overall satisfaction with the program, department, faculty, etc.
- **Alumni Survey** – We will send you a survey five years after graduation to evaluate if we met the program educational objectives.

## Employment Opportunities for Civil Engineering Graduates

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Civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems. Civil engineering encompasses many specialties. The major specialties within civil engineering are structural, water resources, environmental, construction, transportation, and geotechnical engineering.

Many civil engineers hold supervisory or administrative positions, from supervisor of a construction site to city engineer. Others may work in design, construction, research, and teaching. More than 4 in 10 were employed by firms providing architectural, engineering, and related services, primarily developing designs for new construction projects. Almost one-third of the jobs are in federal, state, and local government agencies. The construction industry accounted for most of the remaining employment. About 15,000 civil engineers were self-employed, many as consultants.

Civil engineers usually work near major industrial and commercial centers, often at construction sites. Some projects are situated in remote areas or in foreign countries. In some jobs, civil engineers move from place to place to work on different projects.

With advanced degrees, civil engineers can pursue careers in academics, engineering consulting, research laboratories, and technology development in a wide range of engineering disciplines.

## Advising

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- A) The faculty and staff are here because they have a true commitment to education and want to see students succeed. However, you the student are ultimately responsible for ensuring that all graduation requirements have been satisfied, and for seeking out the advice and help you need. To assist in this, each student is assigned a faculty advisor. You are free to change advisors to better serve your needs, with the approval of the new advisor (see CEAE department for advisor form). After selecting an area of specialty, a new advisor from that area will typically be assigned. The department's undergraduate coordinator can also assist you with many questions about the curriculum.
- B) It is the individual student's responsibility to secure the approval of her/his faculty advisor for the course of study for each semester. This activity occurs during the group/individual advising period, of which notification will be sent in advance by email in each semester. After the advising session, the faculty advisor will sign the pink card in your file that will authorize the CEAE staff to remove the registration HOLD that prevents you from registering. IT IS NOT POSSIBLE TO REGISTER BEFORE THIS HOLD IS REMOVED.
- C) There are a number of decisions to be made concerning choice of elective courses. These decisions should be made in close consultation with the academic advisor so that the electives contribute to overall educational objectives and become part of a cohesive, rational program. The development of such an academic program is the principal purpose for meeting with the academic advisor. A second, and equally important, purpose is for the student to be able to identify a friendly, experienced, and knowledgeable person with whom s/he can discuss her/his academic progress and solve any difficulties that may possibly arise.
- D) Block diagrams and graduation planners for each program are included in this guide. Each student is responsible for keeping his or her graduation planner up-to-date.
- E) Not all courses are offered every semester. Those that are only offered once per year are marked on the block diagrams.

- F) The minimum course load for full time enrollment is 12 credit hours. The maximum course load is 19 credit hours. Variation must be requested by petition to the college. After 18 credit hours, a tuition surcharge is applied.
- G) If problems arise, the following steps are suggested:
  - i. See CEAE Undergraduate Coordinator.
  - ii. See the Chair of the Operations Committee (Milan Halek).
  - iii. Contact the Office of the Dean of the College (ECAD 100) for questions concerning College or University rules or policies.

For more information on the civil, environmental and architectural engineering program, visit our website at <http://ceae.colorado.edu>.

## Transfer Procedures

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The University and College have established procedures for admission of transfer students and evaluation of transfer credits. These policies are described on the undergraduate admissions website: <http://admissions.colorado.edu/undergraduate/apply/transfer>. However, once a student is admitted and transfer credits have been evaluated by the University, the CEAE Department is responsible for the final evaluation of the application of transfer credits to degree requirements. A student is required to obtain the approval of the CEAE Transfer Credit Evaluator for all transfer credits. Prof. Dobroslav Znidarcic ([dobroslav.znidarcic@colorado.edu](mailto:dobroslav.znidarcic@colorado.edu)) is the current (Fall 2012) CEAE Transfer Credit Evaluator. The following recommendations are offered:

- A) It is the student's responsibility to ensure that transfer credits have been evaluated and approved by the Department.
- B) Newly admitted transfer students should make an appointment with the CEAE Transfer Credit Evaluator as soon as possible to obtain final approval of transfer credits. A transfer credit approval form, signed by the Transfer Credit Evaluator, will be placed in the student's file and will be required for graduation. The form will also be used by advisors to inform academic guidance.
- C) If there are questions or concerns about a transfer course, the Evaluator may request catalog pages or course descriptions, or may seek the advice of other faculty members. In some cases, it may be recommended that the student prepare a petition for transfer credit, with multiple levels of approval, to ensure that there will be no future questions. While the petition process may seem onerous, it is only used to protect the student's interest.
- D) Transfer credit issues can also arise for current students who take one or more courses at other institutions during their academic career, e.g., study abroad programs or summer school at a local college. Current students who are planning to take courses at another institution should seek preliminary approval of the transfer credits before taking the courses.

## Additional Advising Resources

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There are many advising resources available at CU-Boulder, but students frequently do not know they exist or hesitate to take advantage of them:

### College of Engineering Advising Guides

The College publishes a comprehensive set of advising guides to provide students with timely and accurate information. These guides are not intended as a substitute for personal interaction between student and advisor, but can be a great way to get answers to many common questions and concerns.

Brief summaries of the curricula and requirements for individual majors in the College can be found at [www.colorado.edu/engineering/academics](http://www.colorado.edu/engineering/academics) along with the following advising guides:

- Guide to Degrees, Minors & Certificates
- Personalize Your Academic Experience
- Academic Support
- Advising & Registration
- Career Services
- Summer Session
- Student Organizations
- Internships, Research & Service Learning
- Graduation Ceremonies
- Undergraduate FAQs

The following College and University policies can also be found on the College website at [www.colorado.edu/engineering/academics/policies](http://www.colorado.edu/engineering/academics/policies):

- Academic Honesty
- Academic Policies
- Academic Probation and Suspension
- Classroom and Course-Related Behavior
- Confirming Your Major
- Four-Year Graduation Guarantee
- Grading Policies
- Grade Appeal Policy
- Graduation Requirements
- Humanities & Social Sciences/Writing
- Student Conduct Code Policy
- Student Honor Code Policy

### **Career Counseling**

Career Services can help students and alumni clarify career interests, values and work-related skills; explore potential careers and employers; and refine job seeking, interviewing, and resume preparation skills. They host Career Fairs and Internship Fairs, sponsor resume writing workshops, and hold mock interview sessions. Career Services is located in the Center for Community (C4C) Room N352, (303) 492-6541, or you may visit their website: <http://careerservices.colorado.edu>.

### **Counseling and Psychological Services**

This multicultural center provides a variety of programs and assistance to address general academic or personal issues. They are located in C4C (Center for Community), 303-492-6766, or visit their website: <http://counseling.colorado.edu>.

## Graduation Requirements

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Failure to complete the requirements listed below will postpone graduation. Any exceptions will require authorization from the CEAE Operations Committee and the Dean's Office. Students should meet with the CEAE Undergraduate Coordinator at least one semester prior to their planned graduation to review their records. It is the student's responsibility to be certain that all degree requirements have been met, to fill out the on-line diploma card, and to keep the CEAE Undergraduate Coordinator and the Dean's Office informed of any change in graduation plans.

To be eligible for the CVEN BS degree, students must meet the following minimum requirements:

1. The satisfactory completion of the prescribed and elective work in the CVEN BS curriculum. A student must complete a minimum number of 128 semester hours, of which the last 45 shall be earned after admission to the College of Engineering and Applied Science as a degree student.
2. A minimum cumulative grade point average of 2.25 for all courses attempted and for all courses that count toward graduation requirements, excluding P grades for courses taken Pass/Fail. (Pass/Fail courses do not count for graduation credit.)
3. A minimum cumulative grade point average of 2.25 for all CEAE course work. This "major" grade point average is computed separately from the student's cumulative grade point average and includes only course work from CVEN and AREN.
4. Successful completion of all Minimum Academic Preparation Standards (MAPS) requirements of the College.
5. Successful completion of WRTG 3030, Writing on Science and Society or an approved alternate writing course (WRTG 3035, GEEN 3000, or HUEN 3100). Any other exceptions to the WRTG 3030 requirement must be approved via petition by the Dean of Engineering.
6. Take the Fundamentals of Engineering (FE) Examination, fall or spring of the student's senior year (including both the morning general and the afternoon civil, environmental, or other disciplines subject section), is required. Graduation is not contingent upon passing. However, it is beneficial for your career to do so because this exam is the first step toward professional registration.
7. Submission of a completed Application for Diploma Form, on-line.
8. Obtain the recommendation of the CEAE faculty.
9. Obtain the recommendation of the faculty of the College of Engineering and Applied Science.

Note: Double degree students must obtain approval of both designated departments and colleges. The University normally requires that a minimum of an additional 30 semester credit hours be earned for the second degree outside of engineering or 15 credits for a second degree within engineering. However, BOTH degree requirements must be completed. Minor students must provide Engineering Dean's Office with a Minor Completion form to verify minor requirements have been completed.

BECAUSE THE **BURDEN OF PROOF** IS ON THE STUDENT, CONSULT THE ASSOCIATE CHAIR FOR UNDERGRADUATE PROGRAMS, YOUR FACULTY ADVISOR, OR THE UNDERGRADUATE COORDINATOR, AND PETITION FOR APPROVAL OF **ANY** PROGRAM DEVIATIONS.

### CVEN Technical Elective Requirements

A technical elective is generally a course in engineering or science with technical content, selected in consultation with a faculty advisor at the upper (3000+) level. Courses listed as Concentrations in this guide are examples of technical electives. Consult the departmental website for a complete list of eligible courses in different areas in the CVEN program.



Up to 3 credit hours of Independent Study, Undergraduate Research, or the following ROTC courses are acceptable as technical elective credit: AIRR 3010 or NAVR 4010.

A maximum of 6 credit hours of technical electives other than CVEN or AREN courses may be selected with the consent of the student's faculty advisor.

## **Engineering Science Track**

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For those students who have advanced placement credits, seek additional career opportunities in research and development (R&D) in engineering and technology or better preparation for advanced degrees in engineering, they should consider the Engineering Science Track which aims to provide a higher-level preparation in analytical and computer modeling essential in modern engineering and technology. Interested students should contact Prof. Ronald Pak, ES Track Advisor: [pak@colorado.edu](mailto:pak@colorado.edu) or visit the department website.

## **Double Degrees in Civil Engineering and Applied Mathematics**

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For students who are interested in civil engineering science, applied mathematics, and their close relationship, a special dual BS degree program is now available by which one can earn a baccalaureate degree in both civil engineering and applied mathematics with a minimum of only 143 credits instead of 158. Contact the dual CE-APPM degree program advisor, Professor Ronald Pak ([pak@colorado.edu](mailto:pak@colorado.edu)), in civil engineering or Professor Anne Dougherty ([anne.dougherty@colorado.edu](mailto:anne.dougherty@colorado.edu)) in Applied Mathematics for more details and consultation.

## **Additional Educational Opportunities**

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### **Engineering For Developing Communities Track**

The Engineering for Developing Communities (EDC) track educates globally-responsible engineering students and professionals who can offer sustainable and appropriate solutions to the endemic problems faced by developing communities worldwide. Interested students should contact Robyn Sandekian, EDC Track coordinator, ([sandekian@colorado.edu](mailto:sandekian@colorado.edu)) or Prof. Bernard Amadei ([amadei@colorado.edu](mailto:amadei@colorado.edu)) or visit the department website.

### **Independent Study and Undergraduate Research**

Undergraduates can participate in ongoing research through independent study projects, the Undergraduate Research Opportunities Program (UROP), and as research assistants for sponsored projects. These opportunities promote individual contact with faculty and graduate students, and they provide an educational experience that cannot be obtained in the normal classroom setting.

Up to three (3) semester credit hours of Independent Study is acceptable for Technical Electives.

An Independent Study is normally supervised by a CEAE faculty member. An approved Independent Study supervised by a faculty member outside of CEAE may also be applied to curriculum requirements as an out-of-department technical elective.

To pursue an independent study, an Independent Study Agreement Form must be completed and signed by both the student and the sponsor of the Independent Study or Undergraduate Research (which includes a written Statement of Work). These forms are available through the College of Engineering

Advising Guide <http://engineering.colorado.edu/students/advising.htm> or the CEAE Undergraduate Coordinator.

### **Concurrent BS/MS Program**

Civil Engineering students who plan to continue their education to obtain a graduate degree after completing the requirements for their BS in Civil Engineering will usually find it advantageous to apply for admission to the concurrent BS/MS degree program. This program allows students who qualify (a 3.25 cumulative GPA is required) to plan a graduate program from the beginning of their junior year rather than from their first year of graduate study. Up to six credit hours of appropriate 5000 level technical elective courses may be applied to the MS degree, subject to GPA restriction. Interested students should discuss this option with their faculty advisor and obtain additional information from the Undergraduate Coordinator or Graduate Coordinator.

The tuition rate for students in this program will be at the undergraduate rate unless the student converts to graduate status after completing the BS requirements.

### **Undergraduate Research Experience**

The Department of Civil, Environmental, and Architectural Engineering of the University of Colorado Boulder is a major research center in the U.S. Most of the CEAE faculty members are active researchers in their field, leading interesting and challenging research projects supported by the government and industry. Students are encouraged to take advantage of such an inquisitive setting to enhance their educational experience by exploring early their ability in guided or independent research.

Undergraduate research assistantships are available during the academic year and the summer semester from individual faculty, the College of Engineering, as well as campus's UROP program. Those who are in the Engineering Science Track are particularly encouraged to participate in such undergraduate research activities.

### **Discovery Learning Apprenticeships**

As a way to encourage undergraduate students to experience research, the College invites applications annually for a number of a Discovery Learning Apprenticeships. Students can earn an hourly wage while engaging in research with college faculty and graduate students. Positions are announced in April for the following fall term and spring term. Students must apply and selection for positions is competitive. For more information, an application and a list of current discovery learning projects, visit <http://engineering.colorado.edu/activelearning/discovery.htm>.

### **Double Degrees**

It is possible to obtain double 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 curricula for both programs and normally complete a minimum of 30 additional semester credit hours above and beyond the degree with the larger minimum credit hour requirement. If the student can satisfy both degree requirements with fewer than 30 additional hours, the difference can be made up with free electives. If both bachelor's degrees are in the College of Engineering and Applied Science, a minimum of 143 credits are required (128 + 15). Another exception is the pioneering dual CVEN-APPM degree program described earlier, which is a special opportunity for research- and analytically-inclined students or those who seek a broader career horizon.

Of the 30 additional semester credit hours, regular double degree students must complete 24 semester credit hours in courses offered by the secondary academic department or in courses approved in advance by the department as substitutes. Transfer students pursuing double degrees must complete a minimum of 75 semester credit hours as a degree student in the College of Engineering and Applied Science and must satisfy all other stipulations regarding total hours required and approval of all coursework by both departments concerned.

Students may coordinate their double degree schedule by closely interacting with academic advisors in each of the departments involved. It is in the student's best interest to select courses that satisfy degree requirements in both departments as frequently as possible. In some cases, it may be preferable to pursue an MS degree rather than two undergraduate degrees.

### **Minors**

Numerous minor opportunities exist that would satisfy humanities/social science electives and/or technical electives. Many require no additional course work beyond the minimum BS requirements. For more information on minor opportunities and requirements, visit:

<http://advising.colorado.edu/students/current-students/majors-and-minors-available-to-as-students> and <http://www.colorado.edu/engineering/academics/degrees-minors-certificates>.

### **Semester at Sea**

Administered through the Office of International Education, and managed by the University of Pittsburgh's Institute for Shipboard Education, students explore and learn valuable insights into the various societies visited, allowing students to analyze and discuss their observations in formal classes on the shipboard campus. Set sail aboard the SS Universe Explorer each semester and summers. Contact the Office of International Education for more information, Center for Community (C4C) Suite S355, (303) 492-7741.

### **Study Abroad**

Study abroad, usually taken in the junior year, can be an enriching experience. Information about this unique opportunity can be obtained from the University Study Abroad Office, Center for Community (C4C) Suite S355, 303-492-7741. The purpose of these guidelines is to assist the student and his or her faculty advisor in planning the courses to take overseas. In order to guarantee that the courses taken abroad will count toward the CU degree, the student must get the planned program approved by the CVEN Undergraduate Study Abroad Advisor.

Many liberal arts courses taken abroad will satisfy the requirements for electives in the humanities and social sciences. Some courses taken abroad may count as technical electives. To guarantee that the courses taken abroad will count toward the CVEN degree, the planned program must be approved by your faculty advisor and the Transfer Credit Evaluator.

### **Student Societies**

Students have excellent opportunities to become involved in discipline-related activities outside of the classroom. The department has active chapters in a number of major student societies including American Society of Civil Engineers (ASCE), Association of General Contractors (AGC), Illumination Engineering Society (IES), and Engineers without Borders (EWB-CU).

## CEAE Policy on Academic Integrity

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The Department of Civil, Environmental, and Architectural Engineering (CEAE) requires all students to adhere to a strict policy of academic integrity. These expectations are in accordance with the University of Colorado Boulder Honor Code (<http://www.colorado.edu/honorcode/>), but this policy is intended to provide more specific guidelines for all undergraduate and graduate students in CEAE. Ethical behavior in college sets the stage for a lifetime of professional and ethical behavior that is expected of all engineering professionals. This policy describes the academic sanctions that will be imposed by CEAE faculty members. Faculty retain the right to set academic sanctions, and if they choose individual courses can deviate from the expectations stated below; these changes will be noted in the course syllabus. All incidents of academic misconduct will be reported to the Honor Code Council. Non-academic sanctions are the purview of the Honor Code Council.

Any activity that could give you an unfair advantage over other students may be cheating. Specific examples of actions that are considered to be cheating and therefore violations of academic integrity:

- Plagiarizing a homework, lab report, or problem set. On assignments that require you to use supplemental materials, you must properly document the sources of information that you used. If you are uncertain about allowable reference materials or how to document your sources, ask your instructor in advance. Specific examples of plagiarism include:
  - copying from a solution manual
  - copying from Internet sites
  - copying from previous semester's homework set or lab report
  - copying directly from classmates
  - copying lab data that you yourself did not participate in collecting
- Plagiarizing content in a paper, report, thesis, or dissertation, by copying material from a published sources or the internet, without appropriate citation format and attribution
- Using unapproved information during a closed-book test or quiz (such as a reference sheet, information stored in a calculator, iPhone, information written on your skin)
- Copying from another student during a quiz, exam, or test
- Working in groups on web based quizzes, exams, or tests
- Working in groups on take-home quizzes, exams, or tests
- Asking another student about questions on an exam that you have not yet taken
- Changing the answer on your test/homework after it was graded and then telling the instructor that there was a grading mistake
- Allowing another student to copy your homework, lab report, or allowing another student to look at your answers during a quiz or exam
- The list above is not exhaustive; other violations are possible

Any violation will be reported to the Honor Code Council.

Any first violation of academic integrity on graded course activities (i.e. homework, lab reports, exams) will result in a minimum sanction of a zero score and an entry in your department file. Instructors can increase these penalties to assigning a failing grade (F) for the entire course. The department will retain a list of all instances of academic integrity violations. Additional sanctions will be imposed for subsequent violations.

## CEAE Faculty

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SEM	CR	CVEN BLOCK DIAGRAM					
8 <sup>TH</sup> SEM	14	CVEN XXXX-3 Proficiency IV	CVEN XXXX-3 Concentration II	Technical Elective-2	Technical Elective-3		S-H Elective-3 (upper-level)
7 <sup>TH</sup> SEM	16	CVEN XXXX-3 Proficiency III	CVEN 3602-3 Transportation Systems #	CVEN XXXX-3 Concentration I		CVEN 4899-4 Senior Design Project (SR standing) #	S-H Elective-3 (upper-level)
6 <sup>TH</sup> SEM	15	CVEN 3227-3 Probability Statistics & Decision for Civil Engrs. (Restricted to JRs/SRs) #	CVEN XXXX-3 Proficiency I	CVEN 3111-3 Analytical Mechanics II (CVEN 2121, APPM 2360) #	CVEN XXXX-3 Proficiency II		WRWG 3030-3 Writing on Science & Society (JR standing)
5 <sup>TH</sup> SEM	15	CVEN 3246-3 Intro. To Construction (JR standing or instructor consent)	CVEN 3323-3 Hydraulic Engineering (CVEN 3313) #	CVEN 3525-3 Structural Analysis (CVEN 3161)	CVEN 3414-3 Fund. of Env. Engr. (CHEN 1211, APPM 1360)	CVEN 3708-3 Geotechnical Engineering I (CVEN 3161)	
4 <sup>TH</sup> SEM	16	APPM 2360-4 Introduction to Linear Algebra & Differential Equations (APPM 1360 or MATH 2300)	CVEN 3313-3 Theoretical Fluid Mechanics (CVEN 2121) #	CVEN 3161-3 Mechanics of Materials I (CVEN 2121, co-req. APPM 2360)	CVEN 3698-3 Engineering Geology #	GEEN 1300-3 Intro Engr. Computing (co-req. APPM 1350 or equiv.)	
3 <sup>RD</sup> SEM	18	APPM 2350-4 Calculus III for Engineers (APPM 1360 or MATH 2300)	PHYS 1120-4 PHYS 1140-1 Gen.Phys II/Lab (PHYS 1110, co-req. MATH 2300 or APPM 1360)	CVEN 2121-3 Analytical Mechanics I (PHYS 1110, co-req. APPM 2350)		AREN 2110-3 Thermodynamics (PHYS 1110, co-req. APPM 1360)	S-H Elective-3
2 <sup>ND</sup> SEM	17	APPM 1360-4 Calculus II for Engineers (APPM 1350 or MATH 1300)	PHYS 1110-4 Gen. Physics I (co-req. APPM 1350 or MATH 1300)		CVEN 2012-3* Introduction to Geomatics (APPM 1350) #	AREN 1027-3* Engineering Drawing	S-H Elective-3
1 <sup>ST</sup> SEM	17	APPM 1350-4 Calculus I for Engineers (2 yr. HS alg., 1yr geom., ½ yr. trig.; or approval by faculty advisor)	CHEN 1211-3 Gen Chem for Engineers \$ (1 yr. HS chem. or CHEM 1021, HS Alg, co-req. CHEM 1221)	CHEM 1221-2 General Chemistry Lab for Engineers \$	Basic Engineering Elective/ GEEN 1400-3**	CVEN 1317-2 Introduction to Civil & Environmental Engineering #	S-H Elective-3

Fall 2012

# Courses marked thus are offered only in SEMESTER shown (fall or spring).

\$ CHEN 1211 & CHEM 1221 must be taken concurrently.

\* Both CVEN 2012 and AREN 1027 may be taken earlier or later in the program

\*\* See curriculum description for acceptable courses

## Civil Engineering Concentrations

### GEOTECHNICAL ENGINEERING

- Fundamental** - CVEN 3708 Geotech Engr 1 (**Spring or Fall**), **prereq CVEN 3161**  
**Proficiency** - CVEN 3718 Geotech Engr 2 (**Spring or Fall**), **prereq CVEN 3708**  
**Concentration** - CVEN 4728 Foundation Engineering (**Fall**), **prereq CVEN 3718 or consent**  
CVEN 5748 Design of Earth Structures (**Spring**), **prereq CVEN 5708 or consent**  
**OR any 4XXX level or above Geotech Engr. course**

### WATER RESOURCES ENGINEERING

- Fundamentals** - CVEN 3323 Hydraulic Engineering (**Fall**), **prereq CVEN 3313**  
**Proficiency** - CVEN 4333 Engineering Hydrology (**Spring**), **prereqs CVEN 3227 & 3323**  
**Concentration** - CVEN 4353 Ground Water Engineering (**Fall**), **prereq CVEN 3313**  
CVEN 5363 Modeling of Hydrologic Systems (**Spring**), **prereq CVEN 3313 and instructor consent**

### CONSTRUCTION ENGINEERING AND MANAGEMENT

- Fundamentals** - CVEN 3246 Introduction to Const (**Spring or Fall**), **prereq JR or instructor consent**  
**Proficiency** - CVEN 3256 Const Equipment and Methods (**Fall**), **rec. prereq CVEN 3246**  
**Concentration** - CVEN 4087 Engineering Contracts (**Spring**), **prereq CVEN 3246**  
AREN 4466 Construction Planning and Scheduling (**Fall**)  
AREN 4420 Cost Engineering (**Spring**), **prereq CVEN 3246**

### STRUCTURAL ENGINEERING/ STRUCTURAL MECHANICS

- Fundamentals** - CVEN 3525 Structural Analysis (**Spring or Fall**), **prereq CVEN 3161**  
**Proficiency** - CVEN 4545 Steel Design (**Spring**) or CVEN 4555 Reinforced Concrete (**Fall**), **prereq CVEN 3525 for both**  
**Concentration** - CVEN 4161 Mechanics of Materials II (**Spring**), **prereq CVEN 3161**  
**AND one of the following:**  
CVEN 4545 or 4555 (whichever not selected as proficiency)

### ENVIRONMENTAL ENGINEERING

- Fundamentals** - CVEN 3414 Fundamentals of Environmental Engineering (**Spring or Fall**), **prereqs CHEN 1211 & APPM 1360**  
**Proficiency** - CVEN 3424 Water and Wastewater (**Spring**), **prereq CVEN 3414**  
**Concentration** - **Any two of the following:**  
CVEN 4404 Water Chemistry (Lab CVEN 4414) (**Fall**), **prereqs CHEN 1211 & CVEN 3414**  
CVEN 3434 Introduction to Applied Ecology (**Spring**), **prereqs CHEN 1211 & CHEM 1221**  
CVEN 4474 Hazardous & Industrial Waste Mgmt (**Fall**), **prereq CVEN 3414**  
CVEN 4484 Intro to Environmental Microbiology, (**Spring**), **prereqs CHEN 1211; CHEM 1221; APPM 1350, 1360 and 2350**



SEM	CR	CVEN BLOCK DIAGRAM – Engineering Science Track					
8 <sup>TH</sup> SEM	14	<b>CVEN XXXX-3</b> <b>Proficiency III</b>	<b>CVEN XXXX-3</b> <b>Proficiency IV</b>	<b>Concentration II</b>			S-H Elective-3 (upper-level)
7 <sup>TH</sup> SEM	16	CVEN 4511/5537 or APPM 4120 – Numer Methods (finite element/ finite difference/ optimiz) #	<b>CVEN 3602-3</b> Transportation Systems #	<b>CVEN XXXX-3</b> <b>Concentration I</b>	<b>CVEN XXXX-3</b> <b>Proficiency II</b>	<b>CVEN 4899-4</b> Senior Design Project (SR standing) #	S-H Elective-3 (upper-level)
6 <sup>TH</sup> SEM	15	<b>CVEN 3227-3</b> Probability Statistics & Decision for Civil Engrs. (Restricted to JRs/SRs) #	<b>CVEN XXXX-3</b> <b>Proficiency I</b>	<b>CVEN 3111-3</b> Analytical Mechanics II (CVEN 2121, APPM 2360) #	<b>CVEN 3246-3</b> Intro. To Construction (JR standing or instructor consent)		<b>WR TG 3030-3</b> Writing on Science & Society (JR standing)
5 <sup>TH</sup> SEM	15	APPM 4350-3 Methods in Appl. Math or equiv. #	<b>CVEN 3323-3</b> Hydraulic Engineering (CVEN 3313) #	<b>CVEN 3525-3</b> Structural Analysis (CVEN 3161)	<b>CVEN 3414-3</b> Fund. of Env. Engr. (CHEN 1211, APPM 1360)	<b>CVEN 3708-3</b> Geotechnical Engineering I (CVEN 3161)	
4 <sup>TH</sup> SEM	16	<b>APPM 2360-4</b> Introduction to Linear Algebra & Differential Equations (APPM 1360 or MATH 2300)	<b>CVEN 3313-3</b> Theoretical Fluid Mechanics (CVEN 2121) #	<b>CVEN 3161-3</b> Mechanics of Materials I (CVEN 2121, co-req. APPM 2360)	<b>CVEN 3698-3</b> Engineering Geology #	<b>GEEN 1300-3</b> Intro Engr. Computing (co-req. APPM 1350 or equiv.)	
3 <sup>RD</sup> SEM	18	<b>APPM 2350-4</b> Calculus III for Engineers (APPM 1360 or MATH 2300)	<b>PHYS 1120-4</b> <b>PHYS 1140-1</b> Gen.Phys II/Lab (PHYS 1110, co-req MATH 2300 or APPM 1360)	<b>CVEN 2121-3</b> Analytical Mechanics I (PHYS 1110, co-req. APPM 2350)		<b>AREN 2110-3</b> Thermodynamics (PHYS 1110, co-req. APPM 1360)	S-H Elective-3
2 <sup>ND</sup> SEM	17	<b>APPM 1360-4</b> Calculus II for Engineers (APPM 1350 or MATH 1300)	<b>PHYS 1110-4</b> Gen. Physics I (co-req. APPM 1350 or MATH 1300)		<b>CVEN 2012-3*</b> Introduction to Geomatics (APPM 1350) #	<b>AREN 1027-3*</b> Engineering Drawing	S-H Elective-3
1 <sup>ST</sup> SEM	17	<b>APPM 1350-4</b> Calculus I for Engineers (2 yr. HS alg., 1yr geom., ½ yr. trig.; or approval by faculty advisor)	<b>CHEN 1211-3</b> Gen Chem for Engineers \$ (1 yr. HS chem. or CHEM 1021, HS Alg. co-req. CHEM 1221)	<b>CHEM 1221-2</b> General Chemistry Lab for Engineers \$	Basic Engineering Elective/ <b>GEEN 1400-3**</b>	<b>CVEN 1317-2</b> Introduction to Civil & Environmental Engineering #	S-H Elective-3

## **Extended List of Concentration-Technical Electives for CE Eng Sci Track**

### **GEOTECHNICAL ENGINEERING**

CVEN 4728 Foundation Engineering	CVEN 5708 Advanced Soil Mechanics
CVEN 5748 Design of Earth Structures or any CVEN 4000/5000 geotech courses	CVEN 5798 Soil Dynamics CVEN 5131 Continuum Mech. & Elasticity

### **WATER RESOURCE ENGINEERING**

CVEN 4333 Engineering Hydrology	CVEN 5333 Hydrology
CVEN 4323 Water Resource Sys Engrg	CVEN 5313 Environ Fluid Mechanics CVEN 5353 Groundwater Hydrology

### **STRUCTURAL ENGINEERING/STRUCTURAL MECHANICS**

CVEN 4161 Mech. of Mat'l II	CVEN 5111 Intro to Struct Dynamics
CVEN 4555 Reinforced Concrete Design	CVEN 5131 Continuum Mech. & Elasticity
CVEN 4545 Steel Design	CVEN 5161 Advanced Mech. of Mat'l
CVEN 4525 Analy of Frame Structures	

### **ENVIRONMENTAL ENGINEERING**

CVEN 3454 Water Chemistry	CVEN 5313 Environ Fluid Mechanics
CVEN 3434 Intro. Applied Ecology	CVEN 5834 Envir Engrg. Processes
CVEN 4474 Haz. & Indust. Waste Mgmt	CVEN 5833 Reactive Transport Modeling
CVEN 4484 Intro to Envir. Microbiology	

### **CONSTRUCTION ENGINEERING AND MANAGEMENT**

CVEN 4087 Engineering Contracts	CVEN 5276 Engrg. Risk & Decision
AREN 4466 Constr. Planning & Sched.	CVEN 5565 Life-Cycle Engrg. or Civil Infrastructure Systems

**GRADUATION PLANNER**

**CIVIL ENGINEERING**

**Fall 2012**

Student \_\_\_\_\_  
Advisor \_\_\_\_\_

SID \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

Transfer credits approved  
by \_\_\_\_\_

Expected date of graduation  
\_\_\_\_\_

**Mathematics (16)**

APPM 1350-4 \_\_\_\_\_  
APPM 1360-4 \_\_\_\_\_  
APPM 2350-4 \_\_\_\_\_  
APPM 2360-4 \_\_\_\_\_

**Basic Science (17)**

CHEM 1221-2 \_\_\_\_\_  
CHEN 1211-3 \_\_\_\_\_  
PHYS 1110- 4 \_\_\_\_\_  
PHYS 1120- 4 \_\_\_\_\_  
PHYS 1140- 1 \_\_\_\_\_  
CVEN 3698-3 \_\_\_\_\_

**Basic Engineering Elective (3)**

GEEN 1400-3 Eng Projects

or \_\_\_\_\_

*The Basic Engineering Elective can be any 3-credit technical course given in the engineering college with a designator ASEN, AREN, APPM, CHEN, CVEN, CSCI, ECEN, EVEN, GEEN, or MCEN.*

**Engineering Science (29)**

CVEN 1317-2 \_\_\_\_\_  
AREN 1027-3 \_\_\_\_\_  
AREN 2110-3 \_\_\_\_\_  
GEEN 1300-3 \_\_\_\_\_  
CVEN 2012-3 \_\_\_\_\_  
CVEN 2121-3 \_\_\_\_\_  
CVEN 3111-3 \_\_\_\_\_  
CVEN 3161-3 \_\_\_\_\_  
CVEN 3313-3 \_\_\_\_\_  
CVEN 3227-3 \_\_\_\_\_

**CE – Fundamentals (18)**

CVEN 3246-3 \_\_\_\_\_  
CVEN 3323-3 \_\_\_\_\_  
CVEN 3414-3 \_\_\_\_\_  
CVEN 3525-3 \_\_\_\_\_  
CVEN 3708-3 \_\_\_\_\_  
CVEN 3602-3 \_\_\_\_\_

**Proficiency (12)**

Take 4 from the following 5 areas:

CVEN 3718-3 \_\_\_\_\_  
CVEN 4333-3 \_\_\_\_\_  
CVEN 3256-3 \_\_\_\_\_  
CVEN 4545/4555-3 \_\_\_\_\_  
CVEN 3424-3 \_\_\_\_\_

**Concentration (6)**

Circle Selection

Const Env Geotech Struct Water  
1 \_\_\_\_\_  
2 \_\_\_\_\_

**Technical Electives (5)**

*Technical Electives can be a second concentration.*

1 \_\_\_\_\_  
2 \_\_\_\_\_

**Significant Senior Design Experience (4)**

CVEN 4899 -4 \_\_\_\_\_

**Humanities and Social Sciences (18)**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**WRTG 3030-3** \_\_\_\_\_

*\*Must be 3000 level or above*

*\*Must be 3000 level or above*

**TOTAL 128**

Student \_\_\_\_\_  
Advisor \_\_\_\_\_

SID \_\_\_\_-\_\_\_\_-\_\_\_\_

Transfer credits approved  
by \_\_\_\_\_

Expected date of graduation  
\_\_\_\_\_

**Mathematics (19)**

APPM 1350-4 \_\_\_\_\_  
APPM 1360-4 \_\_\_\_\_  
APPM 2350-4 \_\_\_\_\_  
APPM 2360-4 \_\_\_\_\_  
APPM 4350-3 \_\_\_\_\_  
or equiv

**Basic Science (17)**

CHEM 1221-2 \_\_\_\_\_  
CHEN 1211-3 \_\_\_\_\_  
PHYS 1110- 4 \_\_\_\_\_  
PHYS 1120- 4 \_\_\_\_\_  
PHYS 1140- 1 \_\_\_\_\_  
CVEN 3698-3 \_\_\_\_\_

**Advanced Engineering Elective (2)**

\_\_\_\_\_

*The Adv. Engrg. Elective can be any upper level course given in the engineering college with a designator ASEN, AREN, APPM, CHEN, CVEN, CSCI, ECEN, EVEN, GEEN, or MCEN.  
(GEEN 1400-3 Engrg Projects is acceptable if taken in Yr1)*

**Engineering Science (32)**

CVEN 1317-2 \_\_\_\_\_  
AREN 1027-3 \_\_\_\_\_  
AREN 2110-3 \_\_\_\_\_  
GEEN 1300-3 \_\_\_\_\_  
CVEN 2012-3 \_\_\_\_\_  
CVEN 2121-3 \_\_\_\_\_  
CVEN 3111-3 \_\_\_\_\_  
CVEN 3161-3 \_\_\_\_\_  
CVEN 3313-3 \_\_\_\_\_  
CVEN 3227-3 \_\_\_\_\_  
CVEN 4511-3, CVEN 4537 or APPM 4120  
\_\_\_\_\_

**CE – Fundamentals (18)**

CVEN 3246-3 \_\_\_\_\_  
CVEN 3323-3 \_\_\_\_\_  
CVEN 3414-3 \_\_\_\_\_  
CVEN 3525-3 \_\_\_\_\_  
CVEN 3708-3 \_\_\_\_\_  
CVEN 3602-3 \_\_\_\_\_

**Proficiency (12)**

Take 4 of the following 5 areas:  
CVEN 3718-3 \_\_\_\_\_  
CVEN 3333-3 \_\_\_\_\_ CVEN  
3256-3 \_\_\_\_\_  
CVEN 4545/4555-3 \_\_\_\_\_  
CVEN 3424-3 \_\_\_\_\_

**Concentration-Technical Electives (6)**

Circle Selection  
Const Env Geot Struct Water  
1 \_\_\_\_\_  
2 \_\_\_\_\_

*The C-T Elective can be any upper level 3-credit course in CVEN from the approved list.*

**Significant Senior Design Experience (4)**

CVEN 4899 -4 \_\_\_\_\_

**Humanities and Social Sciences (18)**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**WRTG 3030-3** \_\_\_\_\_

*\*Must be 3000 level or above*

*\*Must be 3000 level or above*

**TOTAL** 128 Hours