

**UNDERGRADUATE
ADVISING GUIDE
FOR
CIVIL ENGINEERING

2011 CURRICULUM**

**UNIVERSITY OF COLORADO
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Table of Contents

<u>Topic</u>	<u>Page</u>
Introduction	1
Mission Statement	1
Objectives and Outcomes	1
Accreditation and Assessment	1
Employment Opportunities for Graduates	2
CVEN Advising	2
Additional Advising Resources	3
Academic Policies and Requirements	4
Career Counseling in Career Services.....	3
Counseling and Psychological Services.....	3
Graduation Requirements	4
CVEN Technical Elective Requirements	5
CVEN Senior Design Requirement	5
Engineering Science Track	5
Double Degrees in Civil Engineering and Applied Math	5
Engineering for Developing Communities Track	5
Independent Study & Undergraduate Research	5
Additional Education Opportunities	6/7
• Concurrent BS/MS Program.....	6/7
• Undergraduate Research Experience.....	6/7
• Discovery Learning Apprenticeships	6/7
• Double Degrees	6/7
• Minors	6/7
• Semester At Sea	6/7
• Study Abroad	6/7
Student Societies	6/7
CVEN Faculty List	8/9
CVEN Staff List	10
CVEN BS Regular Track Graduation Planner	11
CVEN BS Regular Track Block Diagram	12
CVEN BS Regular Track Concentrations	13
CVEN BS Eng Sc Track Graduation Planner	14
CVEN BS Eng Sc Track Block Diagram	15
CVEN BS Eng Sc Track Concentration-Tech Electives.....	16

Introduction

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).

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.

Civil Engineering Mission Statement

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.

Civil Engineering Objectives and Outcomes

Program Educational Objectives

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

1. Graduates will be successfully employed in engineering, science, or technology careers
2. Graduates are assuming management or leadership roles
3. 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
4. Graduates will pursue professional registration or other appropriate certifications
5. Graduates will be active in civic engagement

Civil Engineering Program Outcomes

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

The CVEN curriculum is accredited by the Engineering Accreditation Commission of ABET. Accreditation is a process of continuous improvement that uses a series of assessment tools that measure how well the program is achieving the objectives listed above. 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 the end of every semester, including your assessment of how well the learning objectives for the course were met.
- **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 also send you a similar survey five years after graduation.

Employment Opportunities for Civil Engineering Graduates

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.

CVEN Advising

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 advisor 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.

- A. 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.**
- B. 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.
- C. 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.
- D. Not all courses are offered every semester. Those that are only offered once per year are marked on the block diagrams.
- E. 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.
- F. If problems arise, the following steps are suggested:
 1. See department undergrad coordinator.
 2. See the Chair of the Operations Committee (Milan Halek).
 3. Contact the Office of the Dean of the College (ECAD 100) for questions concerning College or University rules or policies.

CEAE Resources

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

Additional Advising Resources

There are a vast number of 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 Guide is published by the Engineering Dean's Office. These College guides are actually a series of individual sheets which cover a wide range of topics, including everything from academic honesty and ethics to scholarships to descriptions of every degree program offered in the College. They are located in a wall-mounted display in the front hallway of the Engineering Center just southeast of the revolving doors. To view these Guides online, or for additional advising-related information in the College of Engineering and Applied Science, please visit the website:

<http://engineering.colorado.edu/students/advising.htm>

These guides include:

Undergraduate Students FAQ
Preparing for Engineering Coursework
How Do I Contact My Advisor
What Humanities and Social Science Courses Should I Take
Advising Guides By Majors
College Forms

Advising Guides and Policies

- Academic Honesty
- Academic Policies
- Academic Probation and Suspension
- Academic Success
- Admission to the College, New Transfer Students
- Advanced Placement, IB, and MAPS
- Advising Resources
- Bioengineering Options
- Engineering Certificates

- Enrollment Limited Majors
- Four Year Guarantee
- Grading Policies
- Graduate Programs
- Herbst Program of Humanities
- Humanities & Social Sciences
- Intercampus Transfer
- Intra-University Transfer (IUT) Students
- Minor Programs
- Open Option
- Transfer Credit Policy
- Undergraduate Scholarships
- Major Departments within engineering
- Change of Major Form
- Course Schedule Approval Form
- Incomplete Grade Form
- Independent Study Policy & Guidelines Form
- Minor Completion Form
- College Petition Form

Career Counseling in 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 C4C (Center for Community), 3rd floor (303-492-6541), or you may visit their website: <http://careerservices.colorado.edu>

Counseling and Psychological Services: A 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

Failure to complete the requirements listed below will postpone graduation. Any exceptions will require authorization from the CVEN Undergraduate Committee and the Dean's Office. Students should meet with the CVEN Undergraduate Advising 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 CVEN 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 CVEN 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 CVEN 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 EN 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. 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.
- B. A student must take 6 credit hours of technical electives in the regular Civil Engineering track. These can be used to serve as a second concentration.
- C. 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.
- D. 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.

CVEN SENIOR DESIGN REQUIREMENT

All students must take the 4-hour Senior Project Design course CVEN 4899-4.

ENGINEERING SCIENCE TRACK

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 or visit the department website and go to:
ENGINEERING SCIENCE TRACK

DOUBLE DEGREES IN CIVIL ENGINEERING AND APPLIED MATH

For students who are interested in civil engineering science, applied mathematics and their close relationship, a special dual B.S. 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) in civil engineering or Professor Ann Dougherty (anne.dougherty@colorado.edu) in applied math for more details and consultation.

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 or Prof. Bernard Amadei amadei@colorado.edu or visit the department website and go to:

ENGINEERING FOR DEVELOPING
COMMUNITIES TRACK

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

To pursue an independent study, the following requirements must be observed:

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 CVEN Undergraduate Coordinator.

Additional Educational Opportunities

Concurrent B.S./M.S. Program

Civil Engineering students who plan to continue their education to obtain a graduate degree after completing the requirements for their B.S. 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 CVEN technical elective courses may be applied to the M.S. degree, subject to GPA restriction. Interested students should discuss this option with the Undergraduate Advising Coordinator and Graduate Coordinator; with their assigned faculty advisor.

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 at 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 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 new 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. For a degree from engineering and another college or school of the University, a minimum of 30 additional semester credit hours above and beyond the degree with the larger minimum credit hour requirement is needed. 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. For dual degrees within the College of Engineering and Applied Science, a minimum of 15 additional credit

hours is required above the degree with the larger number of minimum credit hours. If the student can satisfy both degree requirements with fewer than the required additional hours, the difference can be made up with free electives.

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 a Master's degree rather than two undergraduate degrees.

Minors

Numerous minor opportunities exist that would satisfy Humanities/Social Science Elective, Technical Elective, and/or Free Elective. Many require no additional course work beyond the minimum BS requirements. For more information on minor opportunities and requirements, visit:

<http://www.colorado.edu/aac/minor.htm>

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, Environmental Design, Room 1B45, 303-492-27741.

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, ENVD 1B01, 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. Consult with the ME Study Abroad Advisor for approval of specific courses.

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, and Engineers without Borders (EWB-CU).

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GRADUATION PLANNER

CIVIL ENGINEERING

Fall 2011

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 (28)

CVEN 1317-1 _____
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 (6)

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

CVEN BLOCK DIAGRAM

SEMESTER CR

8TH SEM	15	CVEN XXXX-3 Proficiency IV	CVEN XXXX-3 Concentration II	Technical Elective-3	Technical Elective-3		3 S-H Elective (upper-level)
7TH SEM	16	CVEN XXXX-3 Proficiency III	CVEN 3602-3 Transportation Systems (Instructor consent) #	CVEN XXXX-3 Concentration I		CVEN 4899-4 Senior Design Project #	3 S-H Elective (upper-level)
6TH SEM	15	CVEN 3227-3 Probability Statistic & Decision for Civil Engrs. JR Standing) #	CVEN XXXX-3 Proficiency I	CVEN 3111-3 Analytical Mechanics II (CVEN 2121 & co-req APPM 2360) #	CVEN XXXX-3 Proficiency II		WRTG 3030-3 Writing on Science & Society (JR standing)
5TH SEM	15	CVEN 3246-3 Intro. To Construction (JR level or Instructor Consent)	CVEN 3323-3 Hydraulic Engineering (CVEN 3313) #	CVEN 3525-3 Structural Analysis (CVEN 3161)	CVEN 3414-3 Fund. of Env. Engr. (CHEM 1211) (APPM 1360)	CVEN 3708-3 Geotechnical Engineering I (CVEN 3161)	
4TH SEM	16	APPM 2360-4 Introduction to Linear Algebra & Differential Equations	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 (APPM 1350, co-req)	
3RD SEM	18	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)	CVEN 2121-3 Analytical Mechanics I (PHYS 1110 co-req APPM 2350)		AREN 2110-3 Thermodynamics (APPM 1360 co-req) & PHYS 1110	3 S-H Elective
2ND 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	3 S-H Elective
1ST SEM	16	APPM 1350-4 Calculus I for Engineers (2yr HS Alg 1yr Geom. 1/2yr Trig or approval by faculty advisor)	CHEN 1211-3 Gen Chem for Engineers \$ (1yr HS CHEM or Satis. In CHEM 1001 or CHEM 1021 & HS Alg coreq CHEN 1221)	CHEM 1221-2 General Chemistry Lab for Engineers \$	Basic Engineering Elective, / GEEN 1400 -3	CVEN 1317-1 Introduction to Civil & Environmental Engineering #	3 S-H Elective

- Courses marked thus are offered only in SEMESTER shown.

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

* - The Senior Design Course incorporates professional material from the prior course, Senior Seminar

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

*** See curriculum description for acceptable courses

List of Courses for Civil Engineering Concentrations

GEOTECHNICAL ENGINEERING

Fundamental- Proficiency – Concentration-	CVEN 3708 Geotechnical Engineering 1(Spring or Fall), pre-reqs CVEN 3161 CVEN 3718 Geotechnical Engineering 2 (Fall or Spring), pre-reqs CVEN 3708 CVEN 4728 Foundation Engineering (Fall) pre-reqs CVEN 3718 or consent CVEN 5748 Design of Earth Structures (Spring) pre-reqs CVEN 5708 or consent or any CVEN 4000/5000 geotech courses
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WATER RESOURCES ENGINEERING

Fundamentals- Proficiency – Concentration-	CVEN 3323 Hydraulic Engineering (Fall), pre-reqs CVEN 3313 CVEN 4333 Engineering Hydrology (Spring), pre-reqs CVEN 3227 & 3323 CVEN 4353 Ground Water Engineering (Fall) pre-reqs CVEN 3313 CVEN 5363 Modeling of Hydrologic Systems (Spring) co-reqs CVEN 4333
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CONSTRUCTION ENGINEERING AND MANAGEMENT

Fundamentals- Proficiency – Concentration-	CVEN 3246 Introduction to Construction (Spring or Fall) pre-reqs JR or consent CVEN 3256 Const Equipment and Methods (Fall), rec. pre-req CVEN 3246 CVEN 4087 Engineering Contracts (Spring), pre-reqs CVEN 3246 AREN 4466 Construction Planning and Scheduling (Fall) AREN 4420 Cost Engineering (Spring)
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STRUCTURAL ENGINEERING/ STRUCTURAL MECHANICS

Fundamentals- Proficiency – Concentration-	CVEN 3525 Structural Analysis (Spring or Fall), pre-reqs CVEN 3161 CVEN 4545 Steel Design (Spring) or CVEN 4555 Reinforced Concrete (Fall) pre-reqs CVEN 3525 for both CVEN 4161 Mechanics of Materials II, (Spring), pre-reqs CVEN 3161 and of the following: CVEN 4545 or 4555 (whichever not selected as proficiency)
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ENVIRONMENTAL ENGINEERING

Fundamentals- Proficiency – Concentration-	CVEN 3414 Fundamentals of Environmental Engineering, pre-reqs CHEN 1211 & APPM 1360 CVEN 3424 Water and Waste Water (Spring), pre-reqs CVEN 3414 Any two of the following: CVEN 3454 Water Chemistry (Fall), pre-reqs CHEN 1211 & CVEN 3414 CVEN 3434 Introduction to Applied Ecology (Spring), pre-reqs CHEN 1211, CHEM 1221, PHYS 1110 & PHYS 1140 CVEN 4474 Hazardous & Industrial Waste Mgmt (Fall), pre-reqs CVEN 3414 CVEN 4484 Intro to Environmental Microbiology (Spring), pre-reqs CHEN 1211, CHEM 1221, APPM 1350, APPM 1360 & APPM 2350
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GRADUATION PLANNER

CIVIL ENGINEERING – ENGINEERING SCIENCE TRACK

Fall 2011

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 (3)

The Adv. Engrg. Elective can be any upper level 3-credit 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 (31)

CVEN 1317-1 _____
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

SEM	CR	CVEN-ENG SC TRACK- MODIFIED BLOCK DIAGRAM					
8	12	<u>CVEN XXXX-3</u> Proficiency III	<u>CVEN XXXX-3</u> Proficiency IV	<u>CVEN XXXX-3</u> Concentration -Tech Elect II			3 S-H Elective (upper-level)
7	19	<u>CVEN 4511/5537</u> or <u>APPM 4120</u> -Numer Methods (finite element/ finite difference/ optimiz) #	<u>CVEN 3602-3</u> Transportation Systems (Instructor consent) #	<u>CVEN XXXX-3</u> Proficiency II	<u>CVEN XXXX-3</u> Concentration -Tech Elect I	<u>CVEN 4899-4</u> Senior Design Project #	3 S-H Elective
6	15	<u>CVEN 3227-3</u> Probability Statistic & Decision for Civil Engrs. (APPM 2360 JR Standing) #	<u>CVEN 3246-3</u> Intro. To Construction (JR level or Instr.uctor Consent	<u>CVEN 3111-3</u> Analytical Mechanics II (CVEN 2121 & co-req APPM 2360) #	<u>CVEN XXXX-3</u> Proficiency I		<u>WR TG</u> 3030-3 Writing on Science & Society (JR standing)
5	15	<u>APPM 4350-3</u> Methods in Appl. Math or equiv #	<u>CVEN 3323-3</u> Hydraulic Engineering (CVEN 3313) #	<u>CVEN 3525-3</u> Structural Analysis (CVEN 3161)	<u>CVEN 3414-3</u> Fund. of Env. Engr. (CHEM 1211) (CHEM 1221) (APPM 2350)	<u>CVEN 3708-3</u> Geotechnical Engineering I (CVEN 3161)	
4	16	<u>APPM 2360-4</u> Introduction to Linear Algebra & Differential Equations	<u>CVEN 3313-3</u> Theoretical Fluid Mechanics (CVEN 2121) #	<u>CVEN 3161-3</u> Mechanics of Materials I (CVEN 2121 co-req APPM 2360)	<u>CVEN 3698-3</u> Engineering Geology #	Advanced Engineering Elective-3***	
3	18	<u>APPM 2350-4</u> Calculus III for Engineers (APPM 1360 or MATH 2300)	<u>PHYS 1120-4</u> <u>PHYS 1140-1</u> Gen.Phys/Lab (PHYS 1110 co-req MATH 2300 or APPM 1360)	<u>CVEN 2121-3</u> Analytical Mechanics I (PHYS 1110 co-req APPM 2350)		<u>AREN 2110-3</u> Thermodynamic s (APPM 1360 & PHYS 1110)	3 S-H Elective
2	18	<u>APPM 1360-4</u> Calculus II for Engineers (APPM 1350 or MATH 1300)	<u>PHYS 1110-4</u> Gen. Physics I (co-req APPM 1350 or MATH 1300)		<u>CVEN 2012-3**</u> Introduction to Geomatics (APPM 1350) #	<u>GEEN 1300-3</u> Intro Engr. Computing (APPM 1350, co-req) #	3 S-H Elective
1	16	<u>APPM 1350-4</u> Calculus I for Engineers (2yr HS Alg 1yr Geom. 1/2yr Trig or approval by faculty advisor)	<u>CHEN 1211-3</u> Gen Chem for Engineers \$ (1yr HS CHEM or Satis. In CHEM 1001 or CHEM 1021 & HS Alg coreq CHEN 1221)	<u>CHEM 1221-2</u> General Chemistry Lab for Engineers \$	<u>AREN 1027-3**</u> Engineering Drawing	<u>CVEN 1317-1</u> Introduction to Civil & Environmental Engineering same as AREN 1316 #	3 S-H Elective

- Courses marked thus are offered only in SEMESTER shown.

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

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

*** See Engrg Science Track curriculum description for acceptable courses and consult ES Track Advisor

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	CVEN 5798 Soil Dynamics
or any CVEN 4000/5000 geotech courses	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