



Civil, Environmental, &
Architectural Engineering

UNIVERSITY OF COLORADO **BOULDER**

Undergraduate Advising Guide for Architectural Engineering



Civil, Environmental, and Architectural Engineering

428 UCB, ECOT 441

Boulder, CO 80309-0428

t (303) 492-6382

f (303) 492-7317

<http://ceae.colorado.edu>

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Introduction

The purpose of this guide is to assist undergraduate students majoring in Architectural Engineering (AREN) to fulfill the AREN 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 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 AREN curriculum rules and requirements and should be aware that deviation from the planned sequence of courses may result in delayed graduation.

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.

Program Educational Objectives

The educational objective of the Architectural Engineering program is to develop graduates who acquire the broad knowledge and skills necessary to successfully begin and sustain a career, and to become leaders who advance the state-of-the-art, in one of four core disciplines of the building industry:

- electrical and lighting systems
- heating, ventilating, and air conditioning (HVAC) systems
- structural systems
- construction engineering and management

The areas of knowledge required to achieve these objectives include both technical and non-technical areas. Technical areas include an elementary understanding of the fundamentals of architectural engineering, proficiency in the engineering sciences of buildings and their systems, proficiency in architectural engineering design and its integration across disciplines, and specialization in one of the four core areas of AREN practice. Non-technical areas include professional management and ethics, processes for communication, and broad exposure to the humanities and social sciences, especially architectural history.

These areas of knowledge must be complemented by skills in design, communication, and professional practice necessary to develop and sustain a career in the building industry. Design skills include problem definition, design workflow and processes, application of codes and standards, and design experience.

Communication skills include oral and written communication in the form of presentations, drawings, and report. Professional skills include resource allocation, planning, and teamwork.

While the educational objectives do not specifically address the development of graduates who pursue further graduate studies, it is recognized that advancing the state-of-the-art in the disciplines of the building industry may require additional education. To that end, the AREN program education objectives include graduate school in engineering and disciplines relevant to the building industry.

Student Outcomes

The outcomes that students are expected to have attained upon graduation with the Bachelor of Science degree in Architectural 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

Accreditation and Assessment

The AREN program 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 AREN 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.

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 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 AREN Undergraduate Academic Advisor 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 advisor for the course of study for each semester. First- and second-year students meet with the AREN Undergraduate Academic Advisor, while third-year students and above meet with their faculty advisors. This activity occurs during the individual advising period, of which notification will be sent by email each semester. After the advising session, the 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) Graduation requirements are met through one of four distinct concentrations within the AREN curriculum – electrical/lighting, mechanical (HVAC), structural, or construction. Each concentration has a specific set of required upper-division courses and recommended technical electives. During the third year, each student must select one of the concentration tracks. While new students are randomly assigned an initial faculty advisor, students are encouraged to change faculty advisors to obtain advice from a faculty member in their area of concentration. With this alignment of interests, the faculty advisor will best be able to help you identify appropriate technical electives; discuss career options; and suggest opportunities for internships, research, and employment.
- 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 with advising, the following steps are suggested:
 - i. See the AREN Undergraduate Academic Advisor.
 - ii. See the Associate Chair for Undergraduate Education.
 - iii. Contact the Assistant Dean for Students (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>.

Math Placement

Incoming freshmen are placed in their first math course based on their score on the ALEKS math assessment. Students who do not start in Calculus 1 their first semester will not be able to follow the standard AREN block diagram on page 13 of this guide, as they will not have the prerequisites to take all courses in the semesters shown. These students are encouraged to complete APPM 1360 Calculus 2 for Engineers during the summer session after their freshman year in order to get back on the standard block diagram.

Students who cannot take APPM 1360 during the summer session should follow the Modified AREN Block Diagram on page 15 of this guide. While students following this modified plan may still be able to graduate in four years, please note that the four-year guarantee does not apply. The Department will make every effort to avoid course conflicts for students following the modified block diagram, but cannot guarantee that students will never encounter conflicts.

Transfer Procedures

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) is the current (Fall 2013) 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

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 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:

- 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

Failure to complete the requirements listed below will postpone graduation. Any exceptions will require authorization from the CEAE Operations Committee and the Assistant Dean for Students. Students should meet with the AREN Undergraduate Academic Advisor 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 AREN Undergraduate Academic Advisor and the Dean's Office informed of any change in graduation plans.

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

1. The satisfactory completion of the prescribed and elective work in the AREN 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 (HUEN 1010, HUEN 3100, WRTG 3035, or PHYS 3050). 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.

AREN 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. 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.

A list of potential technical electives for CEAE students can be found at <http://ceae.colorado.edu/wordpress/wp-content/uploads/CEAE-tech-elective-list.pdf>.

AREN Free Elective Requirements

A free elective is generally any college-level course. Free electives cannot be remedial courses needed to fulfill deficiencies (algebra, trigonometry, precalculus, introductory calculus, etc. may not be used), and cannot be similar to courses used toward graduation requirements (non-calculus-based physics, etc. may not be used).

Engineering Science Track

For those students who have advanced placement credits, seek additional career opportunities in research and development 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 (pak@colorado.edu) or visit the CEAE website.

Additional Educational Opportunities

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 are 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

AREN students who plan to continue their education to obtain a graduate degree after completing the requirements for their BS 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 AREN Undergraduate Academic Advisor or CEAE 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 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).

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, technical electives, and/or free 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. 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 AREN 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), American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Associated General Contractors (AGC), Illumination Engineering Society (IES), and Engineers without Borders (EWB-CU).

CEAE Policy on Academic Integrity

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

Amadei, Bernard
Professor
Geotechnical
ECOT 546, (303) 492-7734
amadei@colorado.edu

Balaji, Rajagopalan
Professor
Fluid Mechanics & Water Resources
ECOT 549, (303) 492-5968
balajir@colorado.edu

Beamer, C. Walter
Instructor
Building Systems
ECCE 247, (303) 492-7603
walter.beamer@colorado.edu

Bielefeldt, Angela
Professor, Associate Chair
Environmental
ECES 128, (303) 492-8433
angela.bielefeldt@colorado.edu

Brandemuehl, Michael
Professor
Building Systems
ECOT 648, (303) 492-8594
michael.brandemuehl@colorado.edu

Chinowsky, Paul
Professor, Director of Mortensen
Center in Engineering for Developing
Communities
Civil Systems
ECOT 542, (303) 735-1063
paul.chinowsky@colorado.edu

Corotis, Ross
Professor
Structures & Mechanics
ECOT 452, (303) 735-0539
ross.corotis@colorado.edu

Crimaldi, John
Associate Professor
Fluid Mechanics & Water Resources
ECOT 511 (303) 735-2162
john.crimaldi@colorado.edu

Dashti, Shideh
Assistant Professor
Geotechnical
ECOT 514 (303) 492-3118
shideh.dashti@colorado.edu

Goodrum, Paul
Professor
Construction
ECOT 515, (303) 492-0475
paul.goodrum@colorado.edu

Hallowell, Matthew
Assistant Professor
Construction
ECOT 543, (303) 492-7994
matthew.hallowell@colorado.edu

Hearn, George
Associate Professor
Structures & Mechanics
ECOT 548, (303) 492-6381
george.hearn@colorado.edu

Henze, Gregor
Professor
Building Systems
ECCE 242, (303) 492-1094
gregor.henze@colorado.edu

Hernandez, Mark
Professor
Environmental
ECES 118, (303) 492-5991
mark.hernandez@colorado.edu

Javernick-Will, Amy
Assistant Professor
Construction
ECOT 512, (303) 492-6769
amy.javernick@colorado.edu

Kasprzyk, Joseph
Assistant Professor
Fluid Mechanics & Water Resources
ECOT 518
joseph.kasprzyk@colorado.edu

Krarti, Moncef
Professor
Building Systems
ECCE 246B, (303) 492-3389
moncef.krarti@colorado.edu

Liel, Abbie
Assistant Professor
Structures & Mechanics
ECOT 517, (303) 492-1050
abbie.liel@colorado.edu

Linden, Karl
Professor
Environmental
ECES 132, (303) 492-4798
karl.linden@colorado.edu

McCartney, John
Assistant Professor
Geotechnical
ECOT 547, (303) 492-0470
john.mccartney@colorado.edu

McKnight, Diane
Professor
Environmental
ECES 124, (303) 492-4687
diane.mcknight@colorado.edu

Molenaar, Keith
Professor, Chair
Construction
ECOT 444, (303) 735-4276
keith.molenaar@colorado.edu

Montoya, Lupita
Assistant Professor
Environmental
ECES 134, (303) 492-7137
lupita.montoya@colorado.edu

Morris, Matthew
Instructor
Construction
ECOT 516, (303) 492-0468
matthew.morris@colorado.edu

Neupauer, Roseanna
Associate Professor
Fluid Mechanics & Water Resources
ECOT 513, (303) 492-6274
roseanna.neupauer@colorado.edu

Pak, Ronald
Professor
Geotechnical
ECOT 423, (303) 492-8613
pak@colorado.edu

Pfeffer, Tad
Professor
Geotechnical
ECOT 533, (303) 735-2062
tad.pfeffer@colorado.edu

Porter, Keith
Associate Research Professor
Structures & Mechanics
ECOT 641, (303) 492-2732
keith.porter@colorado.edu

Rajaram, Harihar
Professor
Fluid Mechanics & Water Resources
ECOT 646, (303) 492-6604
hari@colorado.edu

Regueiro, Richard
Associate Professor
Geotechnical
ECOT 421, (303) 492-8026
regueiro@colorado.edu

Ren, Jason
Associate Professor
Environmental
ECES 136
zhiyong.ren@colorado.edu

Rosario-Ortiz, Fernando
Assistant Professor
Environmental
ECES 130, (303) 492-7607
fernando.rosario@colorado.edu

Ryan, Joseph
Professor
Environmental
ECES 120, (303) 492-0772
joseph.ryan@colorado.edu

Saouma, Victor
Professor
Structures & Mechanics
ECOT 450, (303) 492-1622
victor.saouma@colorado.edu

Sideris, Petros
Assistant Professor
Structures & Mechanics
Office TBA
petros.sideris@colorado.edu

Silverstein, JoAnn
Professor
Environmental
ECOT 456, (303) 492-7211
joann.silverstein@colorado.edu

Srubar, Wil
Assistant Professor
Building Systems
Contact information TBA

Sture, Stein
Professor, Vice Chancellor-Research
Geotechnical
Regent 230, (303) 492-2890
stein.sture@colorado.edu

Summers, R. Scott
Professor
Environmental
ECES 108, (303) 492-6644
summersr@colorado.edu

Vásconez, Sandra
Senior Instructor, Interim Assoc. Chair
Building Systems
ECCE 244, (303) 492-7614
sandra.vasconez@colorado.edu

Vernerey, Franck
Assistant Professor
Structures & Mechanics
ECOT 422, (303) 492-7165
franck.vernerey@colorado.edu

Xi, Yunping
Professor
Structures & Mechanics
ECOT 540, (303) 492-8991
yunping.xi@colorado.edu

Zagona, Edith
Research Professor, Director of
CADSWES
Fluid Mechanics & Water Resources
CINC 115, (303) 492-2189
zagona@colorado.edu

Zhai, John
Associate Professor
Building Systems
ECCE 249, (303) 492-4699
john.zhai@colorado.edu

Znidarcic, Dobroslav
Professor
Geotechnical
ECOT 649, (303) 492-7577
dobroslav.znidarcic@colorado.edu

CEAE Staff

Pamela Halstead Williamson
Graduate Coordinator
ECOT 425, (303) 492-7316
pamela.williamson@colorado.edu

Erin Jerick
Undergraduate Academic Advisor
ECOT 449, (303) 492-4804
erin.jerick@colorado.edu

Amanda McGrory-Dixon
Communications Specialist
ECOT 432, (303) 492-4333
amanda.dixon-1@colorado.edu

Wayne Morrison
Accounting Technician
ECOT 427, (303) 492-8518
wayne.morrison@colorado.edu

Carrie Olson
Administrative Assistant
ECES 111a, (303) 492-7651
carrie.e.olson@colorado.edu

Susan Rundell
Administrative Assistant, Receptionist
ECOT 441, (303) 492-6382
susan.rundell@colorado.edu

Christina Vallejos
Undergraduate Coordinator
ECOT 447, (303) 492-4193
christina.vallejos@colorado.edu

Araceli Warren
Office Manager
ECOT 440, (303) 492-7427
araceli.warren@colorado.edu

AREN Block Diagram

Sem	CR						
8 SPR	17	<u>Tech Elective-3</u>	<u>Tech Elective-3</u>		AREN 4317-5 # AREN Design (ARCH 4010*)	ARCH 3214-3 # History & Theories of Architecture II	<u>HSS Elective-3</u>
7 FALL	17	<u>Concentration II</u> AREN/CVEN XXXX-3	<u>Tech Elective-3</u>		ARCH 4010-5 # Arch. Design (Open to AREN SR's only)	ARCH 3114-3 # History & Theories of Architecture I	<u>HSS Elective-3</u>
6 SPR	15	<u>Concentration I</u> AREN/CVEN XXXX-3	<u>Tech Elective-3</u>	<u>Proficiency I</u> CVEN 4545-3/4555-3 ** Struct. Des. AREN 4110-3 # HVAC Design AREN 4570-3 # Electrical Systems CVEN 3256-3 Const. Equip./Methods		<u>Proficiency II</u> CVEN 4545-3/4555-3 ** AREN 4110-3 # AREN 4570-3 # CVEN 3256-3	WRTG 3030-3 Writing on Science/Society (Jr. standing) <u>OR</u> HSS Elective***
5 FALL	15		AREN 3540-3 # Illumination 1 (GEEN 1300)	AREN 3010-3 # Mech. Systems Bldgs. (AREN 2050, 2110, 2120)	ECEN 3030-3 # Electrical Circuits (APPM 2360)	CVEN 3525-3 Structural Analysis (CVEN 3161)	<u>Free Elective-3</u>
4 SPR	16	APPM 2360-4 Introduction to Linear Algebra & Differential Equations (APPM 1360)	GEEN 1300-3 Engineering Computing	AREN 2120-3 # Fluid Mech. & Heat Transfer (APPM 2350, AREN 2110, co- req. APPM 2360)	CVEN 3246-3 Introduction to Construction (4 th -semester standing or instr. consent)	CVEN 3161-3 Mechanics of Materials I (CVEN 2121, co-req. APPM 2360)	
3 FALL	17	APPM 2350-4 Calculus III for Engineers (APPM 1360)	PHYS 1120-4 Gen. Physics II (PHYS 1110, co-req. APPM 1360)	AREN 2110-3 Thermodynamics (PHYS 1110, co- req. APPM 1360)	AREN 2050-3 # Building Materials and Systems (Sophomore standing)	CVEN 2121-3 Analytical Mechanics I (PHYS 1110, co-req. APPM 2350)	
2 SPR	17	APPM 1360-4 Calculus II for Engineers (APPM 1350)	PHYS 1110-4 Gen. Physics I (co-req. APPM 1350)		CVEN 2012-3 # Introduction to Geomatics (APPM 1350 or equiv.)	GEEN 1400-3 Engrg. Projects <u>OR</u> GEEN 1410-3 Social Innovation and Design	HSS Elective-3 <u>OR</u> HUEN 1010-3 Intro to the Humanities***
1 FALL	14	APPM 1350-4 Calculus I for Engineers (2 yr. HS alg., 1yr geom., ½ yr. trig.; or approval)	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	AREN 1316-2 # Introduction to Architectural Engineering	AREN 1027-3 Engineering Drawing <u>OR</u> AREN 1037-3	

Fall 2012/revised June 2013

- # Course is offered only once per year (FALL or SPRING as shown)
- () Prerequisite and co-requisite requirements for course listed
- * Other prerequisites: AREN 3010, AREN 3540, CVEN 3246, CVEN 3525
- ** CVEN 4545 Steel Design offered spring semester only; CVEN 4555 Reinforced Concrete Design offered fall semester only
- *** Freshmen (in their first two semesters of college) may take HUEN 1010 to fulfill the writing requirement. Students who choose this option will take another HSS elective in place of WRTG 3030.
- **** CHEN 1211 and CHEM 1221 must be taken concurrently

AREN Block Diagram – Engineering Science Option

Sem	CR						
8 SPR	17	<u>Tech Elective-3</u>	APPM 4120-3 Ops. Research <u>OR</u> CVEN 4537-3 Num. Methods		AREN 4317-5 # AREN Design (ARCH 4010*)	ARCH 3214-3 # History & Theories of Architecture II	<u>HSS Elective-3</u>
7 FALL	17	<u>Concentration II</u> AREN/CVEN XXXX-3	APPM 4350-3 Methods in Applied Math or equivalent		ARCH 4010-5 # Arch. Design (Open to AREN SR's only)	ARCH 3114-3 # History & Theories of Architecture I	<u>HSS Elective-3</u>
6 SPR	15	<u>Concentration I</u> AREN/CVEN XXXX-3	<u>Tech Elective-3</u>	<u>Proficiency I</u> CVEN 4545-3/4555-3 ** Struct. Des. AREN 4110-3 # HVAC Design AREN 4570-3 # Electrical Systems CVEN 3256-3 Const. Equip./Methods		<u>Proficiency II</u> CVEN 4545-3/4555-3 ** AREN 4110-3 # AREN 4570-3 # CVEN 3256-3	
5 FALL	15		AREN 3540-3 # Illumination 1 (GEEN 1300)	AREN 3010-3 # Mech. Systems Bldgs. (AREN 2050, 2110, 2120)	ECEN 3030-3 # Electrical Circuits (APPM 2360)	CVEN 3525-3 Structural Analysis (CVEN 3161)	<u>Free Elective-3</u>
4 SPR	16	APPM 2360-4 Introduction to Linear Algebra & Differential Equations (APPM 1360)	GEEN 1300-3 Engineering Computing	AREN 2120-3 # Fluid Mech. & Heat Transfer (APPM 2350, AREN 2110, co- req. APPM 2360)	CVEN 3246-3 Introduction to Construction (4 th -semester standing or instr. consent)	CVEN 3161-3 Mechanics of Materials I (CVEN 2121, co-req. APPM 2360)	
3 FALL	17	APPM 2350-4 Calculus III for Engineers (APPM 1360)	PHYS 1120-4 Gen. Physics II (PHYS 1110, co-req. APPM 1360)	AREN 2110-3 Thermodynamics (PHYS 1110, co- req. APPM 1360)	AREN 2050-3 # Building Materials and Systems (Sophomore standing)	CVEN 2121-3 Analytical Mechanics I (PHYS 1110, co-req. APPM 2350)	
2 SPR	17	APPM 1360-4 Calculus II for Engineers (APPM 1350)	PHYS 1110-4 Gen. Physics I (co-req. APPM 1350)		CVEN 2012-3 # Introduction to Geomatics (APPM 1350 or equiv.)	GEEN 1400-3 Engrg. Projects <u>OR</u> GEEN 1410-3 Social Innovation and Design	<u>HSS Elective-3</u> <u>OR</u> HUEN 1010-3 Intro to the Humanities***
1 FALL	14	APPM 1350-4 Calculus I for Engineers (2 yr. HS alg., 1yr geom., ½ yr. trig.; or approval)	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	AREN 1316-2 # Introduction to Architectural Engineering	AREN 1027-3 Engineering Drawing <u>OR</u> AREN 1037-3	

Fall 2012/ revised June 2013

Course is offered only once per year (FALL or SPRING as shown)

() Prerequisite and co-requisite requirements for course listed

* Other prerequisites: AREN 3010, AREN 3540, CVEN 3246, CVEN 3525

** CVEN 4545 Steel Design offered spring semester only; CVEN 4555 Reinforced Concrete Design offered fall semester only

*** Freshmen (in their first two semesters of college) may take HUEN 1010 to fulfill the writing requirement. Students who choose this option will take another HSS elective in place of WRTG 3030.

**** CHEN 1211 and CHEM 1221 must be taken concurrently

Modified AREN Block Diagram

8 SPR	17	Proficiency/ Concentration/ Tech Elective-3 ⁺	Proficiency/ Concentration/ Tech Elective-3 ⁺	Proficiency/ Concentration/ Tech Elective-3 ⁺	AREN 4317-5 # AREN Design (ARCH 4010*)	Proficiency/ Concentration/ Tech Elective-3 ⁺	
7 FALL	17	Proficiency/ Concentration/ Tech Elective-3 ⁺	Proficiency/ Concentration/ Tech Elective-3 ⁺	AREN 3010-3 # Mech. Systems Bldgs. (AREN 2050, 2110, 2120)	ARCH 4010-5 # Arch. Design (Open to AREN SR's only)	ECEN 3030-3 # Electrical Circuits (APPM 2360)	
6 SPR	18	Proficiency/ Concentration/ Tech Elective-3 ⁺	Proficiency/ Concentration/ Tech Elective-3 ⁺	AREN 2120-3 # Fluid Mech. & Heat Transfer (APPM 2350, AREN 2110, co- req. APPM 2360)	ARCH 3214-3 # History & Theories of Architecture II	CVEN 3525-3 Structural Analysis (CVEN 3161)	WRTG 3030-3 Writing on Sci./Soc. (Jr. standing) <u>OR</u> HSS Elective***
5 FALL	16	APPM 2360-4 Introduction to Linear Algebra & Differential Equations (APPM 1360)	AREN 3540-3 # Illumination 1 (GEEN 1300)		ARCH 3114-3 # History & Theories of Architecture I	CVEN 3161-3 Mechanics of Materials I (CVEN 2121, co-req. APPM 2360)	<u>HSS Elective-3</u>
4 SPR	16	APPM 2350-4 Calculus III for Engineers (APPM 1360)	GEEN 1300-3 Engineering Computing		CVEN 3246-3 Introduction to Construction (4 th -semester standing or instr. consent)	CVEN 2121-3 Analytical Mechanics I (PHYS 1110, co-req. APPM 2350)	<u>HSS Elective-3</u>
3 FALL	17	APPM 1360-4 Calculus II for Engineers (APPM 1350)	PHYS 1120-4 Gen. Physics II (PHYS 1110, co-req. APPM 1360)	AREN 2110-3 Thermodynamics (PHYS 1110, co- req. APPM 1360)	AREN 2050-3 # Building Materials and Systems (Sophomore standing)		<u>Free Elective-3</u>
2 SPR	16 or 17	APPM 1350-4 Calculus I for Engineers <u>OR</u> APPM 1345-3 Calculus 1b with Algebra	PHYS 1110-4 Gen. Physics I (co-req. APPM 1350)		CVEN 2012-3 # Introduction to Geomatics (APPM 1350 or equiv.)	GEEN 1400-3 Engrg. Projects <u>OR</u> GEEN 1410-3 Social Innovation and Design	HSS Elective-3 <u>OR</u> HUEN 1010-3 Intro to the Humanities***
1 FALL	13 or 14	GEEN 1235-4 Pre-Calculus for Engineers <u>OR</u> APPM 1340-3 Calculus 1a with Algebra	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	AREN 1316-2 # Introduction to Architectural Engineering	AREN 1027-3 Engineering Drawing <u>OR</u> AREN 1037	

Fall 2012/ revised June 2013

Course is offered only once per year (FALL or SPRING as shown)

() Prerequisite and co-requisite requirements for course listed

* Other prerequisites: AREN 3010, AREN 3540, CVEN 3246, CVEN 3525

** CVEN 4545 offered spring semester only; CVEN 4555 offered fall semester only

*** Freshmen (in their first two semesters of college) may take HUEN 1010 to fulfill the writing requirement. Students who choose this option will take another HSS elective in place of WRTG 3030.

**** CHEN 1211 and CHEM 1221 must be taken concurrently

+ Semesters in which proficiencies/concentrations/tech electives are taken will vary by concentration. A complete block diagram for each concentration is available from the AREN undergraduate advisor.

ARCHITECTURAL ENGINEERING CONCENTRATIONS

Fundamental – All students take the fundamental courses in all **four** concentration areas, as already shown on the block diagram.

Proficiency – Students choose **two** of the four areas in which to take a second proficiency-level course.

Concentration – Students choose **one** area in which to take two additional concentration-level courses.

Note: Concentrations do not appear on transcripts or diplomas.

STRUCTURAL SYSTEMS

- Fundamental** – CVEN 3525 Structural Analysis (CVEN 3161)
Proficiency – CVEN 4545 Steel Design (CVEN 3525) – **Spring**
or CVEN 4555 Reinforced Concrete Design (CVEN 3525) – **Fall**
Concentration – CVEN 4161 Mechanics of Materials II (CVEN 3161)
and one of the following:
CVEN 4545 or 4555 (whichever not selected as proficiency)

MECHANICAL SYSTEMS

- Fundamental** – AREN 3010 Mechanical Systems for Buildings (AREN 2050, 2110, 2120)
Proficiency – AREN 4110 HVAC Design (AREN 3010) – **Spring**
Concentration – AREN 4830 Computer Simulation of Building Systems
AREN 4890 Sustainable Building Design (AREN 3010)

ELECTRICAL/LIGHTING SYSTEMS

- Fundamental** – ECEN 3030 Electrical Circuits (APPM 2360) and AREN 3540 Illumination I (GEEN 1300)
Proficiency – AREN 4570 Electrical Systems (ECEN 3030) – **Spring**
Concentration – AREN 4550 Illumination II (AREN 3540) – **Spring**
AREN 4560 Luminous Radiative Transfer (AREN 3540) – **Spring**

CONSTRUCTION ENGINEERING AND MANAGEMENT

- Fundamental** – CVEN 3246 Introduction to Construction
Proficiency – CVEN 3256 Construction Equipment & Methods (CVEN 3246)
Concentration – AREN 4506 Project Management I (CVEN 3246)
AREN 4606 Project Management II: Project Execution and Control (CVEN 3246, 4506)

GRADUATION PLANNER

ARCHITECTURAL ENGINEERING

FALL 2013

Student _____
SID # _____

ADVISOR _____
Transfer credits approved
by: _____

Expected date of graduation: _____

Mathematics (16)

APPM 1350-4 _____
APPM 1360-4 _____
APPM 2350-4 _____
APPM 2360-4 _____

Core Courses (51)

ARCH 4010-5 _____
AREN 1027-3 _____
AREN 1316-2 _____
AREN 2050-3 _____
AREN 2110-3 _____
AREN 2120-3 _____
AREN 3010-3 _____
AREN 3540-3 _____
AREN 4317-5 _____
CVEN 2012-3 _____
CVEN 2121-3 _____
CVEN 3161-3 _____
CVEN 3246-3 _____
CVEN 3525-3 _____
ECEN 3030-3 _____
GEEN 1300-3 _____

Humanities & Social Sciences (9)

ARCH 3114-3 _____
ARCH 3214-3 _____
WRTG 3030-3 _____

Basic Science (13)

CHEM 1211-3 _____
CHEM 1221-2 _____
PHYS 1110-4 _____
PHYS 1120-4 _____

H&SS Electives (9 credits)

Free Elective (3 credits)

Basic Engineering Elective (3)

GEEN 1400 _____

Concentrations (6 credits)

Circle Selection:
Const Struct Mech E/L

Proficiency (6)

Choose 2 of 4
CVEN 4545-3 or 4555-3 _____
AREN 4110-3 _____
AREN 4420-3 _____
AREN 4570-3 _____

Technical Electives (12 credits)

NOTE: A maximum of 6 hours of technical electives may be taken outside the department, with advisor approval.

ACTUAL CREDITS:

Total M. & B.S. _____

Total Core Courses _____

Total H-S _____

Total Tech. _____ = 128 hrs.
8/12

GRADUATION PLANNER

ARCHITECTURAL ENGINEERING

FALL 2013

Engineering Science Option

Student _____

SID # _____

ADVISOR _____

Transfer credits approved by: _____

Expected date of graduation: _____

Mathematics (16)

APPM 1350-4 _____
APPM 1360-4 _____
APPM 2350-4 _____
APPM 2360-4 _____

Core Courses (51)

AREN 1316-2 _____
AREN 1027-3 _____
AREN 2110-3 _____
AREN 2120-3 _____
AREN 2050-3 _____
GEEN 1300-3 _____
AREN 3540-3 _____
AREN 3010-3 _____
AREN 4317-5 _____
ECEN 3030-3 _____
ARCH 4010-5 _____
CVEN 2012-3 _____
CVEN 2121-3 _____
CVEN 3161-3 _____
CVEN 3246-3 _____
CVEN 3525-3 _____

Humanities & Social Sciences (9)

ARCH 3114-3 _____
ARCH 3214-3 _____
WRITG 3030-3 _____

H&SS Electives (9)

Basic Science (13)

CHEM 1211-3 _____
CHEM 1221-2 _____
PHYS 1110-4 _____
PHYS 1120-4 _____

Free Elective (3)

Concentration (6)

Circle Selection:
Const Struct Mech E/L

Basic Engineering Elective (3)

GEEN 1400 _____

Proficiency (6)

Take 2 of the 5 courses

CVEN 4545-3 _____
CVEN 4555-3 _____
AREN 4420-3 _____
AREN 4110-3 _____
AREN 4570-3 _____

Technical Electives (9)

Engineering Science (6)

APPM 4350-3 _____
APPM 4120-3 or CVEN 4537-3 _____

NOTE: A maximum of 6 hours of technical electives may be taken outside the department, with advisor approval.

ACTUAL CREDITS:

Total M. & B.S. _____

Total Core Courses _____

Total H-S _____

Total Tech. _____ = 128 hrs.