



Civil, Environmental, &  
Architectural Engineering

UNIVERSITY OF COLORADO **BOULDER**

# Undergraduate Advising Guide for Architectural 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 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](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 program. A copy of the curriculum is 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

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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 educational objectives of the Architectural Engineering Bachelor of Science Degree Program are to produce graduates capable of reaching the following career goals within five years:

- Our alumni will build on the educational foundation gained through our program by establishing themselves in engineering, science, or other professional careers.
- Our alumni will begin advancing the-state-of-the-art of their profession including 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.
- Our alumni will exercise leadership in their positions.

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 reports. 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

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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, component, or process to meet desired needs within realistic constraints
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. the broad education necessary to understand the impact of engineering solutions
11. a recognition of the need for, and an ability to engage in life-long learning
12. a knowledge of contemporary issues in civil, environmental, and architectural engineering
13. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

## Accreditation and Assessment

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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 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

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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, students have access to both faculty and staff advisors. 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 **advising 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 – lighting/electrical, mechanical (HVAC), structural, or construction. Each concentration has a specific set of required upper-division courses. During the third year, each student must select one of the concentration tracks and choose a faculty advisor 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) A listing of CEAE faculty and staff with contact information can be found at <http://www.colorado.edu/ceae/people>.
- D) Block diagrams for the program are included in this guide. Each student is responsible for tracking his/her progress on the block diagram and making sure that his/her online degree audit is up-to-date. Contact the AREN Undergraduate Academic Advisor to address any discrepancies in your audit.
- E) Occasional changes to course numbers, requisites, etc. may occur after this guide has been published. The most updated block diagram is always available from the Undergraduate Academic Advisor or at <http://www.colorado.edu/ceae/current-students/undergraduate-studies/architectural-advising-curriculum>.
- F) Not all courses are offered every semester. Those that are only offered once per year are marked on the block diagram.
- G) 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.
- H) 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://www.colorado.edu/ceae/>.

## Math Placement

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Incoming freshmen are placed into their first math course based on data including the admission application, high school transcripts, and previous CU Boulder coursework, if any (students matriculating prior to Fall 2017 and then transferred into the AREN program may have taken 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 Calculus 2 during the summer after their freshman year in order to stay on schedule with the standard block diagram.

Students who cannot take Calculus 2 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

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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://www.colorado.edu/admissions/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 2017) 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., a non-CU study abroad program 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. Guidance for this process is available at <http://www.colorado.edu/ceae/current-students/undergraduate-studies/transfer-credit>.

## 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 Websites

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 guides:

Guide to Degrees & Certificates  
Enriching Your Experience

The College of Engineering & Applied Science Academic Advising website at <http://www.colorado.edu/engineering-advising/> is an excellent resource, and includes the following:

- Advisor directory
- Forms – change of major, incomplete grade, independent study, petition, and departmental course requests
- Resources – academic support & tutoring, campus resources, Engineering Ambassadors, meeting with faculty, and tips for success
- Registration information
- Degree requirements – Humanities & Social Science (HSS) requirements, Minimum Academic Preparation Standards (MAPS), and more
- Academic Expectations and Policies – course repeat policy, grade appeals, minimum GPAs, incomplete grades, independent study, residency requirement, academic standing, etc.
- Graduation requirements and ceremonies

### Career Services

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://www.colorado.edu/career/>. Career Services also maintains an office in the Engineering Center, Room ECST 128.

### Counseling and Psychiatric 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; in Wardenburg Health Center, 303-492-5654; or visit their website: <http://www.colorado.edu/health/counseling>.

## 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 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 apply for graduation online, 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 via CU Boulder coursework only, and while rostered in the College of Engineering and Applied Science**.
2. A minimum cumulative grade point average of 2.250 for all courses attempted and for all courses that count toward graduation requirements, excluding P grades for courses taken Pass/Fail (Pass/Fail courses do not count for graduation credit).
3. A minimum cumulative grade point average of 2.250 for all CEAE course work. This "Major GPA" is computed separately from the student's cumulative grade point average and includes only AREN and CVEN courses.
4. Successful completion of all Minimum Academic Preparation Standards (MAPS) requirements of the College.
5. Successful completion of a college-approved writing course (WRTG 3030, HUEN 1010, HUEN 3100, WRTG 3035, or PHYS 3050). Any exceptions to the writing requirement must be approved via petition by the Assistant Dean for Students.
6. Completion of the Fundamentals of Engineering (FE) Examination during the student's senior year. 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 graduation application, online via MyCUInfo.
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 the Undergraduate Academic Advisor 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 ADVISOR, AND PETITION FOR APPROVAL OF **ANY** PROGRAM DEVIATIONS.

## **Grades and Prerequisites/Co-requisites**

The minimum passing grade for prerequisite and co-requisite courses is C-. The minimum passing grade for all other courses is D-.

Pass/fail courses do not count toward graduation. Students must petition to take a course pass/fail or for no credit.

All prerequisite/co-requisite waivers, including those for required courses taken in other departments, must be petitioned and approved by the course instructor, the instructor(s) of any “upstream” course(s) affected by the waiver, and the CEAE Department Operations Committee.

## **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. Any upper-division AREN/CVEN course may be counted as a technical elective. Some students choose to take additional technical electives in their area of concentration; others choose to take technical electives from concentrations outside their own. Technical electives should be chosen in conjunction with your faculty advisor based on your individual interests and career plans.

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. 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 list of potential technical electives for CEAE students can be found at <http://www.colorado.edu/ceae/node/111/attachment>.

## **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 chemistry/physics, etc.), and cannot be similar to courses used toward graduation requirements (non-calculus-based physics, etc.).

## **AREN Basic Engineering Elective Requirements**

Students who do not take GEEN 1400 may substitute any 3-credit technical course given in the engineering college with a designator ASEN, AREN, APPM, CHEN, COEN, CVEN, CSCI, ECEN, EMEN, EVEN, GEEN, or MCEN; or any other course approved by the CEAE Curriculum Committee. Remedial courses or courses approved as HSS electives may not be used.

## **Humanities and Social Science (HSS) Elective Requirements**

All engineering students must complete the minimum HSS requirements listed at [www.colorado.edu/engineering/academics/policies/HSS](http://www.colorado.edu/engineering/academics/policies/HSS). ENVD 3114 and ENVD 3134 are required courses that fulfill the 6 credit hours of upper-division HSS electives. The remaining 9 credit hours of HSS electives may be fulfilled with either upper- or lower-division courses from the approved list.

## Student Enrichment

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The Department of Civil, Environmental and Architectural Engineering strives to develop holistic engineers. The purpose of the Student Enrichment and Internship Program is to give EVERY student the chance to participate in activities that give them a complete educational experience. By 2018, our goal is to have 95% of our undergraduates take part in at least one enrichment opportunity:

- Internship with an owner, engineering firm or contractor.
- Research opportunity with one of our more than 35 faculty members across 13 disciplines.
- Service-learning experience, such as Bridges to Prosperity or Engineers Without Borders.
- Studying abroad through the Office of International Education.

For more information about student enrichment, visit <http://www.colorado.edu/ceae/enrichment>.

## Internships

Corporate internships give students the opportunity to practice their professional engineering skills and contribute to their community. Plus, it helps them make connections that will be invaluable as they enter the workforce.

We believe a successful internship allows a student to:

- Perform the job responsibilities of the position
- Develop professional competencies
- Build a meaningful work experience
- Positively contribute to the employer's business objectives

Information about the CEAE Internship Program and CEAE career fairs is available at <http://www.colorado.edu/ceae/internships>.

## Learning Through Service

We don't just provide service learning opportunities for students – we pioneer them. Professor Bernard Amadei is the founder of Engineers without Borders - USA, and alumna Avery Bang (MCivEngr'09) is CEO of Bridges to Prosperity.

To get involved with one of our service-learning groups, please visit the following:

- Engineers without Borders - <http://www.colorado.edu/engineering/ewb>
- Bridges to Prosperity Student Chapter - <https://www.facebook.com/CUB2P>
- Habitat for Humanity CU Campus Chapter - <https://www.facebook.com/CUHabitat/>

## **Study Abroad**

Study abroad, usually taken in the junior year, can be an enriching experience. The largest engineering firms earn 50-75 percent of their income from international projects, and it's not unusual for projects to involve teams from around the globe. Studying abroad gives you a worldview that will open up new career opportunities and make you a true citizen of the world.

Information about this unique opportunity can be obtained from the Office of International Education, Center for Community (C4C) Suite S355, (303) 492-7741, <http://studyabroad.colorado.edu/>.

An Architectural Engineering Study Abroad Guide is also available at [https://studyabroad.colorado.edu/index.cfm?FuseAction=PublicDocuments.View&File\\_ID=46826](https://studyabroad.colorado.edu/index.cfm?FuseAction=PublicDocuments.View&File_ID=46826).

Students interested in studying abroad for a semester (or longer) should start the planning process as soon as possible – the study abroad guide is intended to assist in this process. However, students should also consult with their academic advisor and the Study Abroad Office early and often during the planning process. Courses must be pre-approved by the CEAE Study Abroad Advisor to guarantee that they will count toward the AREN degree.

Many summer study abroad opportunities are also available for students not able to spend an entire semester overseas.

## **Undergraduate Research and Independent Study**

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 engaging in guided or independent research. 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. 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://www.colorado.edu/engineering/activelearning/discovery>.

### Independent Study

An Independent Study is normally supervised by a CEAE faculty member. A total of six (6) semester credit hours of Independent Study may be applied to the BS degree requirements, with a maximum of three (3) semester credit hours of Independent Study used for Technical Electives.

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 website <http://www.colorado.edu/engineering-advising/forms> or the AREN Undergraduate Academic Advisor.

## **Additional Educational Opportunities**

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### **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 3.250 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 (by petition or after surpassing 145 credit hours).

### **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](mailto:pak@colorado.edu)).

### **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 and Certificates**

Numerous minor and certificate opportunities exist that would satisfy humanities/social science electives, technical electives, and/or free electives. Many require little additional course work beyond the minimum BS requirements. For more information on minor opportunities and requirements, visit:

- Arts & Sciences minors: <http://www.colorado.edu/advising/programs-requirements>
- Engineering Minors: <http://www.colorado.edu/engineering/academics/guide-degrees-certificates/minors>
- Engineering Certificates: <http://www.colorado.edu/engineering/academics/guide-degrees-certificates/certificates>
- Environmental Design (Architecture) Minor: <http://www.colorado.edu/envd/program-information/curriculum/certificates-minors/environmental-design-minor>
- Business Minor: <http://www.colorado.edu/business/academic-programs/minor-business#overview>

### **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.

### **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), Architectural Engineering Institute (AEI), American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Associated General Contractors (AGC), Illumination Engineering Society (IES), and Engineers without Borders (EWB-CU).

Visit <http://www.colorado.edu/ceae/student-enrichment/student-organizations> for student organization contact information.

## 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.

## AREN Block Diagrams

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The block diagrams on the following pages are current as of the date this guide was published. However, some things may change between now and when you graduate, such as:

- Course number and/or title
- Course prerequisites/co-requisites
- The semester(s) a particular course is offered
- Concentration and proficiency course options

When any changes are made, an updated block diagram will be posted at <http://www.colorado.edu/ceae/current-students/undergraduate-studies/architectural-advising-curriculum>. Always refer to the most updated version of the block diagram (for the year you entered the AREN program) when planning your course schedule.



## AREN Block Diagram

Sem	CR						
8 SPR	17	<u>Tech Elective-3</u>	<u>Tech Elective-3</u>		<b>AREN 4317-5 #</b> AREN Design (ARCH 4010*)	<b>ENVD 3134-3 #</b> History and Theory of ENVD: Precincts	<u>HSS Elective-3</u>
7 FALL	17	<u>Concentration II</u> AREN/CVEN XXXX-3***	<u>AREN/CVEN</u> <u>Tech Elective-3</u>		<b>ARCH 4010-5 #</b> Arch. Design (Senior standing)	<b>ENVD 3114-3 #</b> History and Theory of ENVD: Buildings	<u>HSS Elective-3</u>
6 SPR	15	<u>Concentration I</u> AREN/CVEN XXXX-3***	<u>AREN/CVEN</u> <u>Tech Elective-3</u>	<u>Proficiency I***</u> <b>CVEN 4545/4555-3</b> Structural Design <b>AREN 4110-3</b> HVAC Design <b>AREN 4550/4560/4570-3</b> Light./Elec. <b>CVEN 3256-3</b> Const. Equip./Methods		<u>Proficiency II***</u>	<u>College-Appr.</u> <u>Writing</u> <u>Course-3**</u>
5 FALL	15		<b>AREN 3540-3 #</b> Illumination 1 (CSCI 1320, APPM 2350)	<b>AREN 3010-3 #</b> Mech. Systems (AREN 2050, 2110, 2120)	<b>ECEN 3030-3 #</b> Electrical Circuits (APPM 2360)	<b>CVEN 3525-3</b> Structural Analysis (CVEN 3161)	<u>Free Elective-3</u>
4 SPR	17	<b>APPM 2360-4</b> Introduction to Linear Algebra & Differential Equations (APPM 1360)	<b>CSCI 1320-4</b> Computer Sci. 1: Eng. Applications (co-req. APPM 1350)	<b>AREN 2120-3 #</b> Fluid Mech. & Heat Transfer (APPM 2350, AREN 2110, co- req. APPM 2360)	<b>CVEN 3246-3</b> Introduction to Construction (4 <sup>th</sup> -semester standing)	<b>CVEN 3161-3</b> Mechanics of Materials I (CVEN 2121, co- req. APPM 2360)	
3 FALL	17	<b>APPM 2350-4</b> Calculus III for Engineers (APPM 1360)	<b>PHYS 1120-4</b> Gen. Physics II (PHYS 1110, co- req. APPM 1360)	<b>AREN 2110-3</b> Thermodynamics (PHYS 1110, co- req. APPM 1360)	<b>AREN 2050-3 #</b> Building Materials and Systems (Soph. standing)	<b>CVEN 2121-3</b> Analytical Mechanics I (PHYS 1110, co- req. APPM 2350)	
2 SPR	14	<b>APPM 1360-4</b> Calculus II for Engineers (APPM 1350)	<b>PHYS 1110-4</b> Gen. Physics I (co-req. APPM 1350)		<b>AREN 1027-3</b> Engineering Drawing	<b>GEEN 1400-3</b> Engrg. Projects <u>OR</u> <b>Basic Engineering Elective</b>	
1 FALL	16	<b>APPM 1350-4</b> Calculus I for Engineers (APPM 1235 or placement)	<b>CHEN 1211-4</b> Gen. Chem. for Engineers (1 yr. HS chem. or CHEM 1021)	<b>CHEM 1221-1</b> General Chemistry Lab for Engineers (co-req. CHEN 1211)	<b>AREN 1316-1 #</b> Introduction to Architectural Engineering	<b>CVEN 2012-3 #</b> Introduction to Geomatics	<u>HSS Elective-3**</u>

Fall 2017/ revised August 2017

# 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, ECEN 3030.

\*\* College-approved writing courses: HUEN 1010 (taken in first two semesters of college only); or HUEN 3100, WRTG 3030, WRTG 3035, or PHYS 3050 (junior standing).

\*\*\* Some Proficiency and Concentration courses are offered in different semesters (fall and/or spring) than shown on the block diagram. See reverse.

## **ARCHITECTURAL ENGINEERING CONCENTRATIONS**

**At least one concentration must be completed in its entirety, including all fundamental, proficiency, and concentration courses.**

**Fundamental** – All students take the fundamental courses in all **four** concentration areas.

**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.

### **STRUCTURAL SYSTEMS**

**Fundamental** – CVEN 3525 Structural Analysis (CVEN 3161) – **Fall and Spring**

**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) – **Fall**  
**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) – **Fall**

**Proficiency** – AREN 4110 HVAC Design (AREN 3010) – **Spring**

**Concentration** – AREN 4830 Computer Simulation of Building Systems – **Spring (every other year)**  
AREN 4890 Sustainable Building Design (AREN 3010) – **Fall**

### **LIGHTING/ELECTRICAL SYSTEMS**

**Fundamental** – ECEN 3030 Electrical Circuits (APPM 2360) – **Fall**  
**and** AREN 3540 Illumination I (CHEN 1310, APPM 2350) – **Fall**

**Proficiency** – AREN 4550 Illumination II (AREN 3540) – **Spring**  
or AREN 4560 Luminous Radiative Transfer (AREN 3540) – **Spring**  
or AREN 4570 Electrical Systems (ECEN 3030) – **Fall**

**Concentration** – AREN 4550, 4560, 4570 (whichever two not selected as proficiency)

### **CONSTRUCTION ENGINEERING & MANAGEMENT**

**Fundamental** – CVEN 3246 Introduction to Construction (4<sup>th</sup>-semester standing) – **Fall and Spring**

**Proficiency** – CVEN 3256 Construction Equipment & Methods (CVEN 3246) – **Fall and Spring**

**Concentration** – AREN 4506 Project Management I (CVEN 3246) – **Fall and Spring**  
AREN 4606 Project Management II (CVEN 3246, AREN 4506) – **Spring**

## **ELECTIVE REQUIREMENTS**

**Basic Engineering Elective** – Students who do not take GEEN 1400 may substitute any 3-credit technical course given in the engineering college with a designator ASEN, AREN, APPM, CHEN, COEN, CVEN, CSCI, ECEN, EMEN, EVEN, GEEN, or MCEN, or other course approved by the CEAE Curriculum Committee. Remedial courses (precalculus, etc.) or courses approved as HSS electives may not be used.

**Free Elective** – Any college-level course, except: cannot be remedial courses needed to fulfill deficiencies (algebra, trigonometry, precalculus, introductory chemistry, etc.) and cannot be similar to courses used toward graduation requirements (algebra-based physics, etc.).

**Humanities and Social Science (HSS) Elective** – See the College requirements and list of approved courses at [www.colorado.edu/engineering/academics/policies/HSS](http://www.colorado.edu/engineering/academics/policies/HSS).

**Technical Elective** – Generally, an upper-division (3000+) science or engineering course with technical content. All upper-division AREN/CVEN courses are technical electives; up to 6 credits outside of AREN/CVEN may be selected with faculty advisor consent. Up to 3 credits of independent study, undergraduate research, or the following ROTC courses are acceptable as technical elective credit: AIRR 3010 or NAVR 4010. See the CEAE website for a list of approved technical electives for AREN students.

## Modified AREN Block Diagram with Precalculus

Sem	CR						
8 SPR	17	Proficiency/ Concentration/ Tech Elective – 3 <sup>+</sup>	Proficiency/ Concentration/ Tech Elective – 3 <sup>+</sup>	Proficiency/ Concentration/ Tech Elective – 3 <sup>+</sup>	<b>AREN 4317-5 #</b> AREN Design (ARCH 4010*)	Proficiency/ Concentration/ Tech Elective – 3 <sup>+</sup>	
7 FALL	17	Proficiency/ Concentration/ Tech Elective – 3 <sup>+</sup>	Proficiency/ Concentration/ Tech Elective – 3 <sup>+</sup>	<b>AREN 3010-3 #</b> Mech. Systems Bldgs. (AREN 2050, 2110, 2120)	<b>ARCH 4010-5 #</b> Arch. Design (Senior standing)	<b>ECEN 3030-3 #</b> Electrical Circuits (APPM 2360)	
6 SPR	18	Proficiency/ Concentration/ Tech Elective – 3 <sup>+</sup>	Proficiency/ Concentration/ Tech Elective – 3 <sup>+</sup>	<b>AREN 2120-3 #</b> Fluid Mech. & Heat Transfer (APPM 2350, AREN 2110, co- req. APPM 2360)	<b>ENVD 3134-3 #</b> History and Theory of ENVD: Precincts	<b>CVEN 3525-3</b> Structural Analysis (CVEN 3161)	<u>College-Appr. Writing Course-3**</u>
5 FALL	16	<b>APPM 2360-4</b> Introduction to Linear Algebra & Diff. Equations (APPM 1360)	<b>AREN 3540-3 #</b> Illumination 1 (COEN 1300, APPM 2350)		<b>ENVD 3114-3 #</b> History and Theory of ENVD: Buildings	<b>CVEN 3161-3</b> Mechanics of Materials I (CVEN 2121, co- req. APPM 2360)	<u>HSS Elective-3</u>
4 SPR	17	<b>APPM 2350-4</b> Calculus III for Engineers (APPM 1360)	<b>CSCI 1320-4</b> Computer Sci. 1: Eng. Applications (co-req. APPM 1350)		<b>CVEN 3246-3</b> Introduction to Construction (4 <sup>th</sup> -semester standing)	<b>CVEN 2121-3</b> Analytical Mechanics I (PHYS 1110, co- req. APPM 2350)	<u>HSS Elective-3</u>
3 FALL	17	<b>APPM 1360-4</b> Calculus II for Engineers (APPM 1350)	<b>PHYS 1120-4</b> Gen. Physics II (PHYS 1110, co- req. APPM 1360)	<b>AREN 2110-3</b> Thermodynamics (PHYS 1110, co- req. APPM 1360)	<b>AREN 2050-3 #</b> Building Materials and Systems (Soph. standing)		<u>Free Elective-3</u>
2 SPR	14	<b>APPM 1350-4</b> Calculus I for Engineers (APPM 1235)	<b>PHYS 1110-4</b> Gen. Physics I (co-req. APPM 1350)		<b>AREN 1027-3</b> Engineering Drawing	<b>GEEN 1400-3</b> Engrg. Projects OR <b>Basic Engineering Elective</b>	
1 FALL	16	<b>APPM 1235-4</b> Pre-Calculus for Engineers (Placement)	<b>CHEN 1211-4</b> Gen. Chem. for Engineers (1 yr. HS chem. or CHEM 1021)	<b>CHEM 1221-1</b> General Chemistry Lab for Engineers (co-req. CHEN 1211)	<b>AREN 1316-1 #</b> Introduction to Architectural Engineering	<b>CVEN 2012-3 #</b> Introduction to Geomatics	<u>HSS Elective-3**</u>

Fall 2017/updated August 2017

# 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, ECEN 3030.

\*\* College-approved writing courses: HUEN 1010 (taken in first two semesters of college only); or HUEN 3100, WRTG 3030, WRTG 3035, or PHYS 3050 (junior standing).

+ Semesters in which proficiencies/concentrations/tech electives are taken will vary by concentration.

## **ARCHITECTURAL ENGINEERING CONCENTRATIONS**

**At least one concentration must be completed in its entirety, including all fundamental, proficiency, and concentration courses.**

**Fundamental** – All students take the fundamental courses in all **four** concentration areas.

**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.

### **STRUCTURAL SYSTEMS**

**Fundamental** – CVEN 3525 Structural Analysis (CVEN 3161) – **Fall and Spring**

**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) – **Fall**  
**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) – **Fall**

**Proficiency** – AREN 4110 HVAC Design (AREN 3010) – **Spring**

**Concentration** – AREN 4830 Computer Simulation of Building Systems - **Spring**  
AREN 4890 Sustainable Building Design (AREN 3010) - **Fall**

### **LIGHTING/ELECTRICAL SYSTEMS**

**Fundamental** – ECEN 3030 Electrical Circuits (APPM 2360) – **Fall**  
**and** AREN 3540 Illumination I (CHEN 1310, APPM 2350) – **Fall**

**Proficiency** – AREN 4550 Illumination II (AREN 3540) – **Spring**  
or AREN 4560 Luminous Radiative Transfer (AREN 3540) – **Spring**  
or AREN 4570 Electrical Systems (ECEN 3030) – **Fall**

**Concentration** – AREN 4550, 4560, 4570 (whichever two not selected as proficiency)

### **CONSTRUCTION ENGINEERING & MANAGEMENT**

**Fundamental** – CVEN 3246 Introduction to Construction (4<sup>th</sup>-semester standing) – **Fall and Spring**

**Proficiency** – CVEN 3256 Construction Equipment & Methods (CVEN 3246) – **Fall and Spring**

**Concentration** – AREN 4506 Project Management I (CVEN 3246) – **Fall and Spring**  
AREN 4606 Project Management II (CVEN 3246, AREN 4506) - **Spring**

## **ELECTIVE REQUIREMENTS**

**Basic Engineering Elective** – Students who do not take GEEN 1400 may substitute any 3-credit technical course given in the engineering college with a designator ASEN, AREN, APPM, CHEN, COEN, CVEN, CSCI, ECEN, EMEN, EVEN, GEEN, or MCEN, or other course approved by the CEAE Curriculum Committee. Remedial courses (precalculus, etc.) or courses approved as HSS electives may not be used.

**Free Elective** – Any college-level course, except: cannot be remedial courses needed to fulfill deficiencies (algebra, trigonometry, precalculus, introductory chemistry, etc.) and cannot be similar to courses used toward graduation requirements (algebra-based physics, etc.).

**Humanities and Social Science (HSS) Elective** – See the College requirements and list of approved courses at [www.colorado.edu/engineering/academics/policies/HSS](http://www.colorado.edu/engineering/academics/policies/HSS).

**Technical Elective** – Generally, an upper-division (3000+) science or engineering course with technical content. All upper-division AREN/CVEN courses are technical electives; up to 6 credits outside of AREN/CVEN may be selected with faculty advisor consent. Up to 3 credits of independent study, undergraduate research, or the following ROTC courses are acceptable as technical elective credit: AIRR 3010 or NAVR 4010. See the CEAE website for a list of approved technical electives for AREN students.

## AREN Block Diagram – Engineering Science Track

Sem	CR						
8 SPR	17	APPM 4120-3 Ops. Research <u>OR</u> CVEN 4537-3	APPM 4350-3 Methods in APPM <u>OR</u> equivalent		AREN 4317-5 # AREN Design (ARCH 4010*)	ENVD 3134-3 # History and Theory of ENVD: Precincts	<u>HSS Elective-3</u>
7 FALL	17	<u>Concentration II</u> AREN/CVEN XXXX-3***	<u>AREN/CVEN</u> <u>Tech Elective-3</u>		ARCH 4010-5 # Arch. Design (Senior standing)	ENVD 3114-3 # History and Theory of ENVD: Buildings	<u>HSS Elective-3</u>
6 SPR	15	<u>Concentration I</u> AREN/CVEN XXXX-3***	<u>AREN/CVEN</u> <u>Tech Elective-3</u>	<u>Proficiency I***</u> CVEN 4545/4555-3 Structural Design AREN 4110-3 HVAC Design AREN 4550/4560/4570-3 Light./Elec. CVEN 3256-3 Const. Equip./Methods		<u>Proficiency II***</u>	<u>College-Appr.</u> <u>Writing</u> <u>Course-3**</u>
5 FALL	15		AREN 3540-3 # Illumination 1 (CSCI 1320, APPM 2350)	AREN 3010-3 # Mech. Systems (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	17	APPM 2360-4 Introduction to Linear Algebra & Differential Equations (APPM 1360)	CSCI 1320-4 Computer Sci. 1: Eng. Applications (co-req. APPM 1350)	AREN 2120-3 # Fluid Mech. & Heat Transfer (APPM 2350, AREN 2110, co- req. APPM 2360)	CVEN 3246-3 Introduction to Construction (4 <sup>th</sup> -semester standing)	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 (Soph. standing)	CVEN 2121-3 Analytical Mechanics I (PHYS 1110, co- req. APPM 2350)	
2 SPR	14	APPM 1360-4 Calculus II for Engineers (APPM 1350)	PHYS 1110-4 Gen. Physics I (co-req. APPM 1350)		AREN 1027-3 Engineering Drawing	GEEN 1400-3 Engrg. Projects <u>OR</u> Basic Engineering Elective	
1 FALL	16	APPM 1350-4 Calculus I for Engineers (APPM 1235 or placement)	CHEN 1211-4 Gen. Chem. for Engineers (1 yr. HS chem. or CHEM 1021)	CHEM 1221-1 General Chemistry Lab for Engineers (co-req. CHEN 1211)	AREN 1316-1 # Introduction to Architectural Engineering	CVEN 2012-3 # Introduction to Geomatics	<u>HSS Elective-3**</u>

Fall 2017/ revised August 2017

# 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, ECEN 3030.

\*\* College-approved writing courses: HUEN 1010 (taken in first two semesters of college only); or HUEN 3100, WRTG 3030, WRTG 3035, or PHYS 3050 (junior standing).

\*\*\* Some Proficiency and Concentration courses are offered in different semesters (fall and/or spring) than shown on the block diagram. See reverse.

# **ARCHITECTURAL ENGINEERING CONCENTRATIONS**

**At least one concentration must be completed in its entirety, including all fundamental, proficiency, and concentration courses.**

**Fundamental** – All students take the fundamental courses in all **four** concentration areas.

**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.

## **STRUCTURAL SYSTEMS**

**Fundamental** – CVEN 3525 Structural Analysis (CVEN 3161) – **Fall and Spring**

**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) – **Fall**  
**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) – **Fall**

**Proficiency** – AREN 4110 HVAC Design (AREN 3010) – **Spring**

**Concentration** – AREN 4830 Computer Simulation of Building Systems – **Spring (every other year)**  
AREN 4890 Sustainable Building Design (AREN 3010) – **Fall**

## **LIGHTING/ELECTRICAL SYSTEMS**

**Fundamental** – ECEN 3030 Electrical Circuits (APPM 2360) – **Fall**  
and AREN 3540 Illumination I (CHEN 1310, APPM 2350) – **Fall**

**Proficiency** – AREN 4550 Illumination II (AREN 3540) – **Spring**  
or AREN 4560 Luminous Radiative Transfer (AREN 3540) – **Spring**  
or AREN 4570 Electrical Systems (ECEN 3030) – **Fall**

**Concentration** – AREN 4550, 4560, 4570 (whichever two not selected as proficiency)

## **CONSTRUCTION ENGINEERING & MANAGEMENT**

**Fundamental** – CVEN 3246 Introduction to Construction (4<sup>th</sup>-semester standing) – **Fall and Spring**

**Proficiency** – CVEN 3256 Construction Equipment & Methods (CVEN 3246) – **Fall and Spring**

**Concentration** – AREN 4506 Project Management I (CVEN 3246) – **Fall and Spring**  
AREN 4606 Project Management II (CVEN 3246, AREN 4506) – **Spring**

# **ELECTIVE REQUIREMENTS**

**Basic Engineering Elective** – Students who do not take GEEN 1400 may substitute any 3-credit technical course given in the engineering college with a designator ASEN, AREN, APPM, CHEN, COEN, CVEN, CSCI, ECEN, EMEN, EVEN, GEEN, or MCEN, or other course approved by the CEAE Curriculum Committee. Remedial courses (precalculus, etc.) or courses approved as HSS electives may not be used.

**Free Elective** – Any college-level course, except: cannot be remedial courses needed to fulfill deficiencies (algebra, trigonometry, precalculus, introductory chemistry, etc.) and cannot be similar to courses used toward graduation requirements (algebra-based physics, etc.).

**Humanities and Social Science (HSS) Elective** – See the College requirements and list of approved courses at [www.colorado.edu/engineering/academics/policies/HSS](http://www.colorado.edu/engineering/academics/policies/HSS).

**Technical Elective** – Generally, an upper-division (3000+) science or engineering course with technical content. All upper-division AREN/CVEN courses are technical electives; up to 6 credits outside of AREN/CVEN may be selected with faculty advisor consent. Up to 3 credits of independent study, undergraduate research, or the following ROTC courses are acceptable as technical elective credit: AIRR 3010 or NAVR 4010. See the CEAE website for a list of approved technical electives for AREN students.