

**UNDERGRADUATE
ADVISING GUIDE
FOR
ARCHITECTURAL
ENGINEERING**

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ARCHITECTURAL ENGINEERING

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OBJECTIVES

The educational objective of The Architectural Engineering Program is *to have students acquire the broad knowledge and skills necessary to successfully begin and sustain a career in the building engineering industry and in the process emphasize one of four core disciplines:*

Building electrical and lighting systems
Building heating, ventilating and air conditioning systems
Building structural systems
Construction and construction management

The areas of knowledge that define these objectives are technical and non-technical.

TECHNICAL KNOWLEDGE

A. Elementary—fundamentals for architectural engineering:

Basic science and mathematics, Building design and construction processes, Overview of building systems, Elementary principles and processes of architecture, and Laboratory measurement and data analysis.

B. Intermediate—introduction to building systems and their components: Electrical, HVAC, Lighting and Structural elements and analysis for buildings

C. Proficiency—design, integration and advanced analysis in at least two core areas of building systems are required. The core areas include: Electrical, HVAC, Lighting, Solar, and Structural system design. As well as knowing the codes and recommended practices that govern these building systems.

D. Specialization—advanced design, coupled with industry experience via internships, for one building system: Electrical, Lighting, HVAC, Structures, or Solar system design.

NON-TECHNICAL KNOWLEDGE

E. Professional life: Methods of time and resource management and Professional ethics.

F. Processes and requirements of written and oral communication

G. Broad areas in the humanities and social sciences including architectural history and Language skills.

The skills that define, in part, the objective of The Architectural Engineering Program are the following.

DESIGN SKILLS

Problem definition, Process, Application of standard practice, Application of codes, and Design practice and guiding criticism in the major building system design disciplines.

COMMUNICATION SKILLS

Written and oral communication including: Report writing, Data analysis and summary, Professional presentations, Mechanical and computer aided drawing.

PROFESSIONAL PRACTICE SKILLS

These include: Time management, Resource allocation, Planning, Team work.

IMPLEMENTING THE OBJECTIVES

The overall philosophy of the Architectural Engineering curriculum is to provide all students with a broad foundation in engineering, architecture, and architectural engineering, then to provide each student with the opportunity for in-depth study in a specific discipline within architectural engineering. As such, the program provides both *breadth* and *depth*; breadth in that each AREN student must take courses in different specialty areas as well as general architecture, engineering and AREN courses; depth in that each student must select an area for specialization and complete a core curriculum of courses for that area. The four areas that form the basis for the curriculum are:

- construction management,
- lighting and electrical systems for buildings,
- mechanical systems for buildings, and
- structural systems for buildings.

An Architectural Engineering Science option is now available for talented students who seek options in both Design and Research and Development (R&D) careers in architectural engineering and beyond.

The block diagram in this guide shows the required courses in each semester for the core curriculum, with a block of 6 Technical Electives that provide the opportunity for specialization in each of the two options.

The core curriculum requires all AREN students to complete 110 credits, 9 of which are electives in humanities and social sciences (H&SS) (9 other credits in H&SS are required for a total of 18). This leaves 18 credits of technical electives for pursuing an area of specialization. Once a student has completed 80 credits, typically after the 5th semester, he or she must declare a specialty area. Upon this declaration, an appropriate advisor is assigned to assist the student with curriculum issues as well as internships, industry contacts, etc.

Each area of specialization has a core course requirement consisting of three or four courses, with the other two or three electives being selected by the student in consultation with the advisor. These electives can provide further depth

in the area of specialty, or can be used to further broaden the student's technical background. Each student must take at least one 3-credit lab course and at least one 3-credit design course within the 18 credits of electives. Block diagrams for the final three semesters within each specialty area are included in this guide, as well as a diagram for a "General AREN" program. This option is applicable to a student interested in pursuing a career in fields such as facilities management or design/build.

GENERAL GRADUATION REQUIREMENTS

The following are the minimum requirements to be eligible for the Bachelor of Science degree in Architectural Engineering.

- A. Completion of a minimum of at least 128 semester hours as outlined in the departmental curriculum in effect at the time the student was first accepted into the program. The last 45 shall be earned after admission to the University and the College of Engineering as a degree student and must be completed in residence on the Boulder campus.
- B. Achievement of a cumulative grade point average of 2.00 or better, in all courses taken at the University of Colorado which apply toward graduation. This cumulative grade point average includes all letter grades that have been received, whether in repeated courses or not. You must also have a minimum cumulative *major* (departmental) grade point average of 2.00. This major grade point average is computed separately from your cumulative grade point average and includes only course work from your major department. A course taken for "no credit" **CANNOT** be used for fulfilling graduation requirements. Once a course has been taken for "no credit" it cannot be repeated for a grade.
- C. The departmental curriculum requirements are subject to revision and change. If a student elects to follow a revised curriculum, the entire revised curriculum must be satisfied. If there is a break in enrollment during any semester, the student may be required to meet any **new** College or Department degree requirements.
- D. It is possible to become a candidate for two Bachelor's degrees by gaining approval of both designated departments and colleges. A minimum of 30 additional semester credit hours must be earned for the second degree.
- E. An Engineering Science option in architectural engineering is offered for students who would like to have an in-depth understanding, beyond the basic curriculum, of analytical, computational and experimental tools central to technological innovations in engineering.
- F. The co-terminal BS/MS program is designed for the good student who wants greater specialization. As a co-terminal degree, it allows greater flexibility in scheduling your technical electives and graduate courses, many of which are only offered every two years. The department has also allowed some of the graduate coursework to count as technical electives toward the undergraduate degree; effectively allowing double counting of course credits between the two degrees. As a result, it is possible for a student to complete the co-terminal BS/MS in as little as one additional year beyond the conventional BS degree.

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. A listing is posted on the 4th floor of the Engineering Center on the wall next to the departmental office. You are free to change this advisor to better serve your needs, with the approval of the new advisor. After selecting an area of specialty, a new advisor from that area will typically be assigned. The department's undergraduate secretary can also assist you with many questions about the curriculum.

- A. It is the individual student's responsibility to secure the approval of her/his faculty advisor for the course of study for each semester. This activity occurs during the advising period in the preceding semester. Once approval has been granted, the faculty advisor will sign the pink card in your file. That will authorize the CEAE staff to remove the flag that prevents you from registering. **IT IS NOT POSSIBLE TO REGISTER BEFORE THIS FLAG IS REMOVED.**
- B. There are a number of decisions to be made concerning choice of elective courses. These decisions should be made in close consultation with the academic advisor so that the electives contribute to overall educational objectives and become part of a cohesive, rational program. The development of such an academic program is the principal purpose for meeting with the academic advisor. A second, and equally important, purpose is for the student to be able to identify a friendly, experienced, and knowledgeable person with whom s/he can discuss her/his academic progress and solve any difficulties that may possibly arise.

- C. Block diagrams and graduation planners 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 is **12** credit hours. The *maximum* course load is **21** credit hours. Deviations must be requested by petition to the college. After **18** credit hours, a tuition surcharge is applied.
- F. If problems arise the following steps are suggested:
 1. See assigned faculty advisor.
 2. See the Chair of the Operations Committee (Milan Halek).
 3. Contact the Office of the Dean of the College (ECAD 100) for questions concerning College or University rules and policies.
- A. Each student should plan to consult with her/his academic advisor one semester before the final semester in which s/he plans to graduate for a comprehensive review of graduation requirements. A certification form sheet and graduation planner should be completed at this meeting for the Operations Committee review. Changes made after the student and advisor have signed the certification form must be corrected by the student.
- B. It is the *student's* responsibility to be certain that all degree requirements have been met, to fill out a **diploma card** in the Dean's office (ECAD 100) at the **beginning** of the semester of graduation, and to keep the departmental advisor, departmental undergraduate secretary, and the Dean's office informed of any change in graduation plans.
- C. All students graduating with a BS degree must take the Fundamentals of Engineering (**FE**) examination of the National Council of Engineering Examiners prior to graduation. You must register for the FE exam with your department. Passing the FE exam is the first step toward registration as a Professional Engineer.

GRADES & PREREQUISITES

- A. The minimum passing grade for all courses except for some humanistic and social science electives and for a course that is not specifically a prerequisite for another required course is D-. The minimum passing grade for a course that is considered a prerequisite for another required course is C-. A course in which a grade of C- or better has been received may not be repeated. If a grade of D+ or lower is received in a course which is prerequisite to another, the student may not register for the subsequent course until the first grade has been raised to a C- or higher.
- B. Pass/Fail credit will be permitted only for some courses used as social-humanistic electives. Such permission requires an approved petition of the CEAE department, and in general, such approval is forthcoming only if the student has not completed the prerequisite courses.
- C. If the student takes a course before the prerequisite is taken, s/he may be denied credit for that course unless the prerequisite has been waived.
- D. All prerequisite waivers, including those for required courses taken in other departments, must be pre-approved in writing with a departmental petition signed by the advisor and the Chair (Milan Halek) of the Operations Committee.

GRADUATION CHECK LIST

TECHNICAL ELECTIVES

- A. The AREN program requires 18 credit hours of technical electives. Of these, 3 credits must be a design elective and 3 credits must be a laboratory elective. Each of the specialty areas has certain core requirements from these electives, as shown in the block diagrams. You should consult closely with your advisor in structuring your use of the technical electives to meet your educational and career objectives.
- B. Up to 3 credit hours of Independent Study, Undergraduate Research, or the following ROTC courses are acceptable for technical elective credit: AIRR 3010 or NAVR 4010. The College of Engineering's Freshman Projects course (GEEN 1400) is acceptable for technical elective credit but only if taken in the freshman year.
- C. 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.

UNDERGRADUATE RESEARCH EXPERIENCE

The Department of Civil, Environmental and Architectural Engineering of the University of Colorado at Boulder is a major research center in the U.S. Most of the CEAE

faculty members are active researchers in their field, leading interesting and challenging research projects supported by the government and industry. Students are encouraged to take advantage of such inquisitive setting to enhance their educational experience by exploring early their ability in guided or independent research. Undergraduate research assistantships are available during the academic year and the summer semester from individual faculty, the College of Engineering as well as campus's UROP program. Those who are in the new Engineering Science Track are particularly encouraged to participate in such undergraduate research activities.

HUMANITIES AND SOCIAL SCIENCES REQUIREMENTS

- A. An undergraduate degree program in the College of Engineering and Applied Science requires a minimum of 18 semester credit hours taken as approved courses in the humanities and social sciences (H&SS); 6 credit hours of these must be at the 3000-level or higher. H&SS courses that can be used by engineering are listed on <http://engineering.colorado.edu/homer/fall2007.htm>.
- B. ARCH 3114 and ARCH 3214 are required courses that cover six hours of the necessary H&SS requirements in the AREN program.
- C. The course Writing on Science and Society (WRTG 3030) is required of all students with exceptions noted below. This course is considered part of the 18-semester credit hour requirement.
1. Students participating in the first full year of the Herbst Program of Humanities for Engineers 1 and 2 (HUEN 3100 and HUEN 3200) are not required to take WRTG 3030.
 2. Any other exceptions to the WRTG 3030 requirement must be approved by the Dean of Engineering (or his/her designee) in consultation with the university Writing Program.
- D. All humanities and social science elective courses must be selected from the approved list of acceptable courses for the College of Engineering and Applied Science requirements available from the Dean's office at a cost of \$.50. This list is also posted on the undergraduate bulletin board on the 4th floor. *The student is responsible for ensuring that electives taken are on the College's approved list.*
- E. The sequence of H&SS elective courses should follow a coherent plan, which reflects both breadth and depth.
- F. ROTC courses are acceptable for a total of 6 semester credit hours. They must be on the approved H&SS elective list for engineering students.
- G. Students are permitted to take appropriate honors courses for humanities and social sciences credit.
- H. Foreign language courses, if included in the college's approved list, (including 1st year courses) are acceptable up to a total of 9 credit hours for meeting the 18 credit hours of H&SS requirements.
- I. **Herbst Program of Humanities.** Courses offered by the faculty in this program provide an overview of the humanities, and are available to first year students and students with junior standing. Herbst faculty area also available for advising about other humanities courses. <http://engineering.colorado.edu/herbst> for information

TRANSFER PROCEDURES

- A. The department's transfer advisor (currently Professor Corotis) will review a student's transcript and will give preliminary, tentative approval on a departmental summary sheet for courses accepted and for the hours of credit allowed. The advisor will suggest some courses to be taken based on this tentative approval.
- B. The transfer advisor may request that catalog pages of course descriptions be furnished in cases where course titles may not be sufficiently descriptive.
- C. Normally no more credit will be allowed for transfer courses in one subject (i.e., calculus, for example) than is shown in our catalog for that subject. College policy allows only engineering drawing and surveying courses to be transferred from technical institutes or comparable programs. *It is the responsibility of the transfer student to request final validation of the transfer credits by the major department and have this validation noted in the student's college file.*
- D. The advisor may ask for a petition for transfer credit in some specific cases so that there will be no future question about credit for a specific course. This is for the student's protection and is a simple procedure which may require the approval of the Dean of the College, if it pertains to a college requirement, or it may be resolved in the department, if it is departmentally discretionary.
- E. It is in the student's best interests to have transfer credits evaluated as early as possible and to be assigned to an academic advisor in the department. The student must take the initiative to make certain that her/his dean's folder has all the information agreed upon by the transfer advisor after permanent

approval has been granted. This is the student's responsibility, not the transfer advisors.

THINGS YOU SHOULD KNOW

- A. All students are bound by the University Honor Code.
http://engineering.colorado.edu/students/honor_code.htm
- B. University policy on sexual harassment
<http://www.colorado.edu/sexualharassment>
- C. College of Engineering grading policies
<http://engineering.colorado.edu/students/advising.htm>
- D. Registration Handbook and Schedule of Courses is online and has the information you need to register for courses. <http://plus.colorado.edu/planner/>
- E. Graduation Requirements for the Bachelor of Science in Architectural Engineering:
 - a. Completion of the graduation requirements of the College of Engineering
<http://engineering.colorado.edu/students/advising.htm>
 - b. Completion of the prescribed and elective work in the Architectural Engineering Curriculum
 - c. You must take the Fundamentals of Engineering Examination

ADDITIONAL RESOURCES

- A. College of Engineering Advising. Guides such as this one are available from all departments in the College of Engineering, along with other information at: <http://engineering.colorado.edu/students/advising.htm>
- B. Engineering Peer Advocates Office provides a broad program of academic assistance to engineering students.
<http://ecadw.colorado.edu/engineering/academics/support.htm>
<http://www.colorado.edu/sasc/tutors.html>
- C. Career Services offers guidance and assistance with job placement, internships, and coop opportunities.
http://engineering.colorado.edu/prospective/career_services.htm
- D. The Women in Engineering Program offers resources and community to women in any of the College of Engineering degree programs.
<http://engineering.colorado.edu/wiep/>
- E. Department of Civil, Environmental, and Architectural Engineering website.
<http://ceae.colorado.edu>

ARCHITECTURAL ENGINEERING BLOCK DIAGRAM

CONVENTIONAL OPTION

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE – 3 Design	TECHNICAL ELECTIVE - 3 Lab	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only) #	ARCH 3114-3 History & Theories of Architecture I #	WRTG 3030-3 Writing on Sci/Soc. (Jr. standing)	TECHNICAL ELECTIVE –3	TECHNICAL ELECTIVE – 3	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 pre-req); CVEN 3246 rec. #	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	TECHNICAL ELECTIVE - 3	TECHNICAL ELECTIVE - 3	AREN 4570-3 Electrical Systems (ECEN 3030) #
5	15		CVEN 3246-3 Introduction to Construction (Jr. level or Instr. Consent)	CVEN 3525-3 Structural Analysis Pre-req (CVEN 3161)	AREN 3540-3 Illumination 1 Pre-req (GEEN 1300) #	AREN 3010-3 Mech. Systems for Bldgs. (AREN 2050, 2110, 2120) #	ECEN 3030-3 Electrical Circuits (APPM 2350) #
4	16	APPM 2360-4 Introduction to Linear Algebra & Differential Equations	AREN 3406-3 Intro to Building Construction #	CVEN 3161-3 Mechanics of Materials I (pre-req CVEN 2121) (co-req. APPM 2360)		AREN 2120-3 Fluid mechanics & Heat transfer (pre-req AREN 2110) (Co-req APPM 2360) #	GEEN 1300-3 Intro Engr. Computing (APPM 1350 co-req) #
3	17	APPM 2350-4 Calculus III for Engineers (APPM 1360 or MATH 2300)	PHYS 1120-4 (PHYS 1110 co- req. MATH 2300 or APPM 1360)	CVEN 2121-3 Analytical Mechanics I (PHYS 1110 co- req. APPM 2350)		AREN 2110-3 Thermodynamic Pre-reqs (APPM 1360, PHYS 1110) #	AREN 2050-3 Engineering Systems for Buildings (AREN 1017) #
2	16	APPM 1360-4 Calculus II for Engineers (APPM 1350 or MATH 1300)	PHYS 1110-4 Gen. Physics I (co-req. APPM 1350 Or MATH 1300)	CVEN 2012-3 Intro to Geomatics (APPM 1350)	AREN 1027-2 Descriptive Geometry (CAD) (AREN 1017 or equiv.) #		SOC-HUM Elective - 3
1	15	APPM 1350-4 Calculus I for Engineers (2 yr. HS Alg. 1yr Geom. ½ yr. Trig. or approval by faculty advisor)	CHEN 1211-3 Gen. Chem. for Engineers * (1 yr. HS CHEM or CHEM 1001 or 1021 & HS Alg; co-req. CHEN 1211)	CHEM 1221-2 General Chemistry Lab for Engineers \$	AREN 1017-2 Engineering Drawing	AREN 1316-1 Introduction to Architectural Engineering #	SOC-HUM Elective - 3

Course is offered only in the semester shown.

() Pre-requisite and Co-requisite requirements for course listed.

* CHEM 1211 and CHEN 1221 must be taken concurrently.

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

ARCHITECTURAL ENGINEERING BLOCK DIAGRAM

ENGINEERING SCIENCE OPTION

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE – 3 Design	TECHNICAL ELECTIVE - 3 Lab	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only) #	ARCH 3114-3 History & Theories of Architecture I #	WRGT 3030-3 Writing on Sci/Soc. (Jr. standing)	APPM 4120-3 Operation Res. Or CVEN 4537-3 Finite Diff. Meth.	APPM 4350-3 Methods in Applied Math. or Equivalent #	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 pre-req); CVEN 3246 rec. #	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	TECHNICAL ELECTIVE - 3	TECHNICAL ELECTIVE - 3	AREN 4570-3 Electrical Systems (ECEN 3030) #
5	15		CVEN 3246-3 Introduction to Construction (Jr. level or Instr. Consent)	CVEN 3525-3 Structural Analysis Pre-req (CVEN 3161)	AREN 3540-3 Illumination 1 pre req (GEEN 1300) #	AREN 3010-3 Mech. Systems for Bldgs. pre-reqs (AREN 2050, 2110, 2120) #	ECEN 3030-3 Electrical Circuits Pre-req (APPM 2350) #
4	16	APPM 2360-4 Introduction to Linear Algebra & Differential Equations	AREN 3406-3 Intro to Building Construction #	CVEN 3161-3 Mechanics of Materials I (pre-req CVEN 2121) (co-req. APPM 2360)		AREN 2120-3 Fluid mechanics & Heat transfer (pre-req AREN 2110) (Co-req APPM 2360) #	GEEN 1300-3 Intro Engr. Computing (APPM 1350 co-req) #
3	17	APPM 2350-4 Calculus III for Engineers (APPM 1360 or MATH 2300)	PHYS 1120-4 (pre-req PHYS 1110) co-req. MATH 2300 or APPM 1360)	CVEN 2121-3 Analytical Mechanics I (pre-req PHYS 1110) (co-req. APPM 2350)		AREN 2110-3 Thermodynamic Pre-reqs (APPM 1360, PHYS 1110) #	AREN 2050-3 Engineering Systems for Buildings (AREN 1017) #
2	16	APPM 1360-4 Calculus II for Engineers (APPM 1350 or MATH 1300)	PHYS 1110-4 Gen. Physics I (co-req. APPM 1350 Or MATH 1300)	CVEN 2012-3 Intro to Geomatics (APPM 1350)	AREN 1027-2 Descriptive Geometry (CAD) (AREN 1017 or equiv.) #		SOC-HUM Elective - 3
1	15	APPM 1350-4 Calculus I for Engineers (2 yr. HS Alg. 1yr Geom. ½ yr. Trig. or approval by faculty advisor)	CHEN 1211-3 Gen. Chem. for Engineers * (1 yr. HS CHEM or CHEM 1001 or 1021 & HS Alg; co-req. CHEN 1211)	CHEM 1221-2 General Chemistry Lab for Engineers \$	AREN 1017-2 Engineering Drawing	AREN 1316-1 Introduction to Architectural Engineering #	SOC-HUM Elective - 3

Course is offered only in the semester shown.

() Pre-requisite and Co-requisite requirements for course listed

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

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

ARCHITECTURAL ENGINEERING BLOCK DIAGRAM

CONSTRUCTION MANAGEMENT OPTION

Conventional Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE - 3 Design	TECHNICAL ELECTIVE - 3 Lab	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WR TG 3030-3 Writing on Sci./Soc. (JR. Standing)	CVEN 4087-3 Engineering Contracts	AREN 4466-3 Construction Planning & Scheduling	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 \pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	CVEN 3708-3 Geotechnical Engineering I	TECHNICAL ELECTIVE - 3	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible lab electives include: Geotechnical engineering II, Illumination lab, Building energy lab

Possible design electives include: Design of masonry structures, Concrete design, Steel design, Foundation eng.

Engineering Science Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE - 3 Design	TECHNICAL ELECTIVE - 3 Lab	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WR TG 3030-3 Writing on Sci./Soc. (JR. Standing)	CVEN 4087-3 Engineering Contracts	APPM 4350-3 Methods in Applied Math. or Equivalent #	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 \pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	CVEN 3708-3 Geotechnical Engineering I	APPM 4120-3 Operation Res. Or CVEN 4537-3 Finite Diff. Meth	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible lab electives include: Geotechnical engineering II, Illumination lab, Building energy lab

Possible design electives include: Design of masonry structures, Concrete design, Steel design, Foundation eng.

ARCHITECTURAL ENGINEERING BLOCK DIAGRAM

ELECTRICAL / LIGHTING SYSTEMS OPTION

Conventional Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN capstone) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE - 3	TECHNICAL ELECTIVE - 3	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WR TG 3030-3 Writing on Sci./Soc. (JR. Standing)	AREN 4560-3 Luminous Radiative Transfer (AREN 3540) #	TECHNICAL ELECTIVE - 3	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	AREN 3140-3 Illumination Lab [3 cr lab] (AREN 3540) #	AREN 4550-3 Illumination 2 [3 cr design] (AREN 3540) #	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible electives include: Daylighting, Exterior lighting systems, Luminaire design, Advanced lighting systems, Psychology of perception, Theater lighting

Engineering Science Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN capstone) #	ARCH 3214-3 History & Theories of Architecture II #		APPM 4120-3 Operation Res. Or CVEN 4537-3 Finite Diff. Me	AREN 3140-3 Illumination Lab [3 cr lab] (AREN 3540) #	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WR TG 3030-3 Writing on Sci./Soc. (JR. Standing)	AREN 4560-3 Luminous Radiative Transfer (AREN 3540) #	APPM 4350-3 Methods in Applied Math. or Equivalent #	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	AREN 3140-3 Illumination Lab [3 cr lab] (AREN 3540) #	AREN 4550-3 Illumination 2 [3 cr design] (AREN 3540) #	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible electives include: Daylighting, Exterior lighting systems, Luminaire design, Advanced lighting systems, Psychology of perception, Theater lighting, Advanced Radiative Heat Transfer, Power Distribution Systems, Intro. Finite Element Analy.

ARCHITECTURAL ENGINEERING BLOCK DIAGRAM

MECHANICAL SYSTEMS OPTION Conventional Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE - 3	TECHNICAL ELECTIVE - 3	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WRTG 3030-3 Writing on Sci./Soc. (JR. Standing)	TECHNICAL ELECTIVE - 3	TECHNICAL ELECTIVE - 3	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 \pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	AREN 3130-3 Building Energy Lab [3 cr lab] (AREN 3010) #	AREN 4110-3 HVAC Design [3 cr design] (AREN 3010) #	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible electives include: HVAC system controls, Daylighting, Building energy audits, Sustainable building design, Advanced solar design

Engineering Science Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE - 3	AREN 3130-3 Building Energy Lab [3 cr lab] (AREN 3010) #	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WRTG 3030-3 Writing on Sci./Soc. (JR. Standing)	TECHNICAL ELECTIVE - 3	APPM 4350-3 Methods in Applied Math. or Equivalent #	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 \pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	APPM 4120-3 Operation Res. Or CVEN 4537-3 Finite Diff. Meth	AREN 4110-3 HVAC Design [3 cr design] (AREN 3010) #	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible electives include: HVAC system controls, Daylighting, Building energy audits, Sustainable building design, Advanced solar design, HVAC System Controls, Thermal Analysis of Bldgs, Power Distribution Systems, Intro. Finite Element Analy.

ARCHITECTURAL ENGINEERING BLOCK DIAGRAM

STRUCTURAL SYSTEMS OPTION Conventional Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE - 3	TECHNICAL ELECTIVE - 3 Lab	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WRTG 3030-3 Writing on Sci./Soc. (JR. Standing)	CVEN 4545-3 or CVEN 4555 Structural Design (CVEN 3525)	TECHNICAL ELECTIVE - 3	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	CVEN 3708-3 Geotechnical Engineering I	TECHNICAL ELECTIVE - 3	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible electives include: Geotechnical engineering II (Lab), Analytical mechanics II, Mechanics of materials II, Matrix analysis, Design of masonry structures, Design of timber structures

Engineering Science Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE - 3	TECHNICAL ELECTIVE - 3 Lab	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WRTG 3030-3 Writing on Sci./Soc. (JR. Standing)	CVEN 4545-3 or CVEN 4555 Structural Design (CVEN 3525)	APPM 4350-3 Methods in Applied Math. or Equivalent #	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	CVEN 3708-3 Geotechnical Engineering I	APPM 4120-3 Operation Res. Or CVEN 4537-3 Finite Diff. Meth	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible electives include: Geotechnical engineering II (Lab), Analytical mechanics II, Mechanics of materials II, Matrix analysis, Design of masonry structures, Design of timber structures, Intro. to Struct. Dynamics, Continuum Mechanics, Advanced Mech. of Mat'ls, Intro. Finite Element Analy.

ARCHITECTURAL ENGINEERING BLOCK DIAGRAM

GENERAL ARCHITECTURAL ENGINEERING OPTION Conventional Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		TECHNICAL ELECTIVE - 3	TECHNICAL ELECTIVE - 3 Lab	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WRTG 3030-3 Writing on Sci./Soc. (JR. Standing)	CVEN 4466-3 Construction Planning & Scheduling	TECHNICAL ELECTIVE - 3	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	AREN 4110-3 HVAC Design (AREN 3010) #	AREN 4550-3 Illumination 2 (AREN 3540) #	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible lab electives include: Illumination lab, Building energy lab

GENERAL ARCHITECTURAL ENGINEERING OPTION Engineering Science Option

Sem	Credits						
8	16	AREN 4317-4 AREN Design (ARCH 4010; other AREN design course) #	ARCH 3214-3 History & Theories of Architecture II #		APPM 4120-3 Operation Res. Or CVEN 4537-3 Finite Diff. Meth	TECHNICAL ELECTIVE - 3 Lab	SOC-HUM Elective - 3
7	18	ARCH 4010-6 Architectural Design (Open to AREN SR's only)	ARCH 3114-3 History & Theories of Architecture I #	WRTG 3030-3 Writing on Sci./Soc. (JR. Standing)	CVEN 4466-3 Construction Planning & Scheduling	APPM 4350-3 Methods in Applied Math. or Equivalent #	
6	15		AREN 4420-3 Cost Enginrng. (AREN 3406 pre-req); CVEN 3246 rec	CVEN 4545-3 or CVEN 4555 Structural Design ** (CVEN 3525)	AREN 4110-3 HVAC Design (AREN 3010) #	AREN 4550-3 Illumination 2 (AREN 3540) #	AREN 4570-3 Electrical Systems (ECEN 3030) #

Possible lab electives include: Illumination lab, Building energy lab

ARCHITECTURAL ENGINEERING
GRADUATION PLANNER
Conventional Option

Student _____
 Student Number _____

Advisor _____
 Transfer credits approved
 by: _____

Expected date of graduation:

Mathematics (16)

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

Basic Science (13)

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

Core Courses (60)

AREN 1316-1 _____
 AREN 1017-2 _____
 AREN 1027-2 _____
 AREN 2110-3 _____
 AREN 2120-3 _____
 AREN 2050-3 _____
 GEEN 1300-3 _____
 AREN 3540-3 _____
 AREN 3406-3 _____
 AREN 3010-3 _____
 AREN 4317-4 _____
 AREN 4420-3 _____
 AREN 4570-3 _____
 ARCH 4010-6 _____
 CVEN 2012-3 _____
 CVEN 2121-3 _____
 CVEN 3161-3 _____
 CVEN 3525-3 _____
 CVEN 4545-3 _____
 OR
 CVEN 4555-3 _____
 CVEN 3246-3 _____
 ECEN 3030-3 _____

Humanities & Social Sciences (9)

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

H&SS Electives (9 credits)

Technical Electives (18 credits)

**Specialty: E/L - MECH - CONST
 STRUCTURAL - GENERAL AREN**

Design _____
 Lab _____

ACTUAL CREDITS:

Total M. & B.S. _____ Total Engr. Sci. _____ Total S-H _____ Total Design _____ Total Tech. _____ = 128 hrs.

ARCHITECTURAL ENGINEERING
GRADUATION PLANNER
Engineering Science Option

Student _____ **Advisor** _____ **Expected date of graduation:** _____
 Student Number _____ Transfer credits approved _____
 by: _____

Mathematics (19)

APPM 1350-4 _____
 APPM 1360-4 _____
 APPM 2350-4 _____
 APPM 2360-4 _____
 APPM 4350-3 _____
 OR EQUIVALENT

Basic Science (13)

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

Core Courses (63)

AREN 1316-1 _____
 AREN 1017-2 _____
 AREN 1027-2 _____
 AREN 2110-3 _____
 AREN 2120 3 _____
 AREN 2050-3 _____
 GEEN 1300-3 _____
 AREN 3540-3 _____
 AREN 3406-3 _____
 AREN 3010-3 _____
 AREN 4317-4 _____
 AREN 4420-3 _____
 AREN 4570-3 _____
 ARCH 4010-6 _____
 CVEN 2012-3 _____
 CVEN 2121-3 _____
 CVEN 3161-3 _____
 CVEN 3525-3 _____
 CVEN 4545-3 _____
 OR
 CVEN 4555-3 _____
 CVEN 3246-3 _____
 CVEN 4537-3 _____
 OR EQUIVALENT
 ECEN 3030-3 _____

Humanities & Social Sciences (9)

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

H&SS Electives (9 credits)

Technical Electives (15 credits)

**Specialty: E/L - MECH - CONST
 STRUCTURAL - GENERAL AREN**

Design _____
 Lab _____

ACTUAL CREDITS:

Total M. & B.S. _____ Total Engr. Sci. _____ Total S-H _____ Total Design _____ Total Tech. _____ = 128 hrs.

ARCHITECTURAL ENGINEERING

AREN & CVEN COURSE LISTING

Course Listing-Architectural Engineering
(See University of Colorado Catalog for descriptions)

Course Listing-Civil Engineering
(continued)

Course #	Course	Tech Elective	Design
AREN 1017-2	Engineering Drawing		
AREN 1027-2	Descriptive Geometry		
AREN 1316-1	Intro to Arch Engrn'g		
AREN 2050-3	Engineering Systems for Bldgs		
AREN 2110-3	Thermodynamic		
AREN 2120-3	Fluid Mechanics & Heat Transfer		
AREN 2300-3	Introduction to Engineering Computing		
AREN 3010-3	Mechanical Sys for Bldgs	TE	S
AREN 3050-3	Environmntl Sys for Bldg 1	TE	
AREN 3060-3	Environmntl Sys for Bldg 2	TE	
AREN 3130-3	Bldg Energy Laboratory	TE	
AREN 3140-3	Illumination Laboratory	TE	
AREN 3406-3	Intro to Bldg Constr	TE	
AREN 3540-3	Illumination I	TE	S
AREN 4035-3	Arch Structures 1	TE	
AREN 4045-3	Arch Structures 2	TE	
AREN 4110-3	HVAC Design 1	TE (Cap)	L
AREN 4315-2	Design of Masonry Struc	TE	L
AREN 4317-3	AREN Design.	TE (Cap)	L
AREN 4416-3	Constm Costs, Estimating	TE	
AREN 4466-3	Constm Planning & Schdlg	TE	M
AREN 4540-3	Exterior Ltg. Systems	TE	L
AREN 4550-3	Illumination 2	TE (Cap)	L
AREN 4560-3	Luminous Radiative Trans	TE	S
AREN 4570-3	Electrical Systems	TE	L
AREN 4580-3	Daylighting	TE	
AREN 4590-3	Comp Graphics in Ltg Engr	TE	
AREN 4830 through 4839 (1-3)	Special Tpcs	TE	
AREN 4849-4840- 1-3	Independent Study	TE	

Course Listing-Civil Engineering
(See University of Colorado Catalog for descriptions)

CVEN 1317-1	Int Civil & Environmntl Engr'g		
CVEN 2012-3	Plane Surveying		
CVEN 2121-3	Analytical Mechanics 1		
CVEN 3022-3	Construction Surveying	TE	S
CVEN 3032-3	Photogrammetry	TE	
CVEN 3111-3	Analytical Mechanics 2	TE	
CVEN 3161-3	Mechanics of Materials I	TE	
CVEN 3207-2	City Planning	TE	L
CVEN 3227-3	Prob Stat & Dec for Civil Engr	TE	M
CVEN 3246-3	Introduction to Construction	TE	S
CVEN 3256-3	Const. Equipment/Methods	TE	S
CVEN 3313-3	Theoretical Fluid Mechanics	TE	
CVEN 3323-3	Hydraulic Engineering	TE	L
CVEN 3414-3	Fundamentals Env Engr	TE	

Course #	Course	Tech Elective	Design
CVEN 3424-3	Water & Wastewater Treatment	TE	L
CVEN 3434-3	Intro to Applied Ecology	TE	
CVEN 3454-4	Water Chemistry	TE	
CVEN 3525-3	Structural Analysis	TE	M
CVEN 3602-3	Transportation Systems	TE	M
CVEN 3698-3	Engineering Geology	TE	
CVEN 3708-3	Geotechnical Engineering 1	TE	
CVEN 3718-3	Geotechnical Engineering 2	TE	M
CVEN 4039-1	Senior Seminar	TE	
CVEN 4087-3	Engineering Contracts	TE	
CVEN 4147-3	Engrg Economy & Sys Design	TE	S
CVEN 4161-3	Adv Mechanics of Materials I	TE	
CVEN 4266-3	Project Administration	TE	
CVEN 4323-3	Water Resources Engr Dsgn	TE (Cap)	L
CVEN 4333-3	Engineering Hydrology	TE	M
CVEN 4353-3	Groundwater Engineering	TE	M
CVEN 4424-3	Aquatic Organic Contaminants	TE	
CVEN 4434-3	Environmental Engrg Design	TE (Cap)	L
CVEN 4474-3	Hzrds & Indstr'l Wste Mgt	TE	S
CVEN 4484-3	Env. Microbiology	TE	
CVEN 4511-3	Intro Finite Element Analy	TE	
CVEN 4525-3	Analysis of Framed Structures	TE	
CVEN 4545-3	Steel Design	TE (Cap)	L
CVEN 4555-3	Reinforced Concrete Design	TE (Cap)	L
CVEN 4565-2	Timber Design	TE	L
CVEN 4728-3	Foundation Engineering	TE (Cap)	L
CVEN 4830-4839- 1-3	Special Topics	TE	
CVEN 4840-4878 (1-3)	Indep Study	TE	
CVEN 5010-3	HVAC Systems Controls	TE	
CVEN 5020-3	Bldg Ergy Audits	TE	
CVEN 5030-3	Lighting Equip Design	TE	L
CVEN 5040-3	Lighting Systems Engineering	TE	S
CVEN 5050-3	Advanced Solar Design	TE	
CVEN 5060-3	Advanced Passive Solar Design	TE	
CVEN 5070-3	Thermal Analysis of Buildings	TE	
CVEN 5080-3	Cmptr Simul of Bldg Ergy Sys	TE	
CVEN 5110-3	HVAC System Design	TE	
*CVEN 5111-3	Intro to Structural Dynamics	TE	
CVEN 5131-3	Contium Mech & Elasticity	TE	
CVEN 5147-3	Engrg Economics & Sys Dsgn	TE	
*CVEN 5161-3	Adv Mechanics of Materials	I	TE
CVEN 5206-3	Design Development	TE	S
CVEN 5226-3	Quality & Safety	TE	
CVEN 5230-3	Acoustic Room Design	TE	
CVEN 5236-3	Constr Plan/Scheduling	TE	M
CVEN 5246-3	Legal Aspects Construction	TE	

ARCHITECTURAL ENGINEERING

TECHNICAL ELECTIVES

Course Listing-Civil Engineering
(continued)

Course Listing-Civil Engineering
(continued)

Course #	Course	Tech Elective	Design
CVEN 5256-3	Strategic Issues/Constr	TE	
CVEN 5276-3	Engr. Risk Dec. Analysis	TE	
CVEN 5286-3	Design Construction Operations	TE	
*CVEN 5296-3	Construction Engineering 2	TE	
CVEN 5306-3	Building Reuse & Retrofit	TE	S
CVEN 5313-3	Environ Fluid Mechanics	TE	
CVEN 5316-3	Constr Acct & Fin Mgmt	TE	
CVEN 5323-3	Applied Stream Ecology	TE	
CVEN 5326-3	Construction Project Controls	TE	
CVEN 5333-3	Hydrology	TE	
CVEN 5336-3	Const Project Delivery	TE	
CVEN 5343-3	Trans/Dispersion Surface Water	TE	S
*CVEN 5353-3	Groundwater Hydrology	TE	
CVEN 5363-3	Modeling of Hydrologic Sys	TE	
CVEN 5373-3	Water Law, Pol, Inst	TE	
CVEN 5383-3	Applied Groundwater Modeling	TE	
*CVEN 5393-3	Water Res Dev & Mgt	TE	
CVEN 5404-3	Environmental Engr Chemistry	TE	
CVEN 5414-3	Water Chemistry Lab	TE	
CVEN 5423-3	Water Resources Engr Design	TE	
CVEN 5424-3	Aquatic Organic Contaminants	TE	
CVEN 5434-3	Enviro Engineering Design	TE	
CVEN 5454-3	Quantitative Methods	TE	
CVEN 5474-3	Hzrds & Indust Wste Mgmt	TE	S
CVEN 5484-3	Envrmntl Microbiology	TE	
CVEN 5494-3	Surface Water Quality Modeling	TE	
CVEN 5511-3	Intro Finite Element Analy	TE	
CVEN 5514-3	Bioremediation	TE	
CVEN 5525-3	Analysis of Framed Structures	TE	
CVEN 5534-3	Wastewater Treatment	TE	S
CVEN 5540-3	Exterior Ltg. Systems	TE	L
CVEN 5544-3	Solid Waste	TE	M
CVEN 5555-3	Structural Reliability	TE	
CVEN 5565-3	Life-Cycle Engineering	TE	
CVEN 5575-3	Adv Topics in Steel Design	TE	L
CVEN 5585-3	Adv Tpc in Reinfor Concr Dsgn	TE	L
CVEN 5678-3	Soil Improvement & Reinfmrt	TE	L
CVEN 5688-3	Environmental Geotechnics	TE	L
*CVEN 5708-3	Soil Mechanics	TE	
CVEN 5728-3	Foundation Engineering	TE	L
*CVEN 5738-3	Applied Geotechnical Anal	TE	
CVEN 5758-3	Flow Processes In Soils	TE	
*CVEN 5768-3	Intro to Rock Mechanics	TE	
CVEN 5798-3	Dynamics of Soils & Foundtns	TE	
CVEN 5820-3	Special Topics	TE	
CVEN 5830 through 5839 (1-3)	Special Tpcs	TE	
CVEN 5849 (1-6)	Indep Study	TE	
CVEN 6161-3	Adv Mech Materials II		
CVEN 6323-3	Urban Stormwater Infrastructure Sys		
CVEN 6333-3	Scaling in Hydrology		

Course#	Course	Tech Elective	Design
CVEN 7141-3	Plates and Shells		
CVEN 7161-3	Buckling in Structures		
CVEN 7511-3	Computatnl Mech of Solids & Struc		
CVEN 7545-3	Structural Optimization		
CVEN 7565-3	Inelastic Theory of Structures		
CVEN 7718-3	Engrg Properties of Soils		
CVEN 6404-3	Advanced Aquatic Chem		
CVEN 6414-3	Aquatic Surfaces & Particles		
CVEN 6525-3	Finite Element Anal of Struc		
CVEN 6595-3	Earthquake Engineering		

*FOR WELL QUALIFIED UNDERGRADUATES ONLY.

ARCHITECTURAL ENGINEERING

TECHNICAL ELECTIVES

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Pak, Ronald Professor
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Porter, Keith Research Professor
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Ryan, Joseph Professor
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Saouma, Victor Professor
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ARCHITECTURAL ENGINEERING

TECHNICAL ELECTIVES

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Sivaselvan, Mettupalayam Assist Prof.
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Strzepek, Kenneth Professor
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ECOT 549 (303)492-7111
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Sture, Stein, Professor
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Summers, R. Scott Professor
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Vasconez, Sandra Sr. Instr
Building Systems
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CIVL & ARCHITECTURAL ENGINEERING FACULTY