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<th>Sem.</th>
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<td>8</td>
<td>17</td>
<td>Tech Elective-3</td>
<td>Free Elective-3</td>
<td>Tech Elective-3 From reverse</td>
<td>AREN 4317-2 # AREN Design</td>
<td>HSS Elective-3 Upper-division</td>
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<td>7</td>
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<td>Tech Elective-3</td>
<td>AREN 4570-3 # Electrical Systems</td>
<td>Tech Elective-3 From reverse</td>
<td>AREN 4316-3 # Senior Design Project: Sys. 1 (See notes****)</td>
<td>ARCH 4010-2 # Arch. Design</td>
<td>HSS Elective-3</td>
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<td>6</td>
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<td>AREN 3040-3 # Electrical Circuits (APPM 2360, PHYS 1120)</td>
<td>CVEN 3256-3 Construction Equip. &amp; Methods (CVEN 3246)</td>
<td>Structural Design-3 CVEN 4545 or 4555** (CVEN 3525)</td>
<td>ARCH 3214-3 # History and Theory of Arch. 2</td>
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<td>AREN 4550-3 # Illumination 2 (AREN 3540)</td>
<td>AREN 3010-3 # Energy Efficient Buildings (AREN 2050, 2110, 2120)</td>
<td>CVEN 3246-3 Introduction to Construction (Junior standing)</td>
<td>CVEN 3525-3 Structural Analysis (CVEN 3161)</td>
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<td>College-Appr. Writing Course-3****</td>
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<td>APPM 2360-4 Introduction to Linear Algebra &amp; Diff. Equations (APPM 1360)</td>
<td>AREN 3540-3 # Illumination 1 (CSCI 1320, APPM 2350)</td>
<td>AREN 2120-3 # Fluid Mech. &amp; Heat Transfer (AREN 2110, co-req. APPM 2350 and 2360)</td>
<td>CVEN 3161-3 Mechanics of Materials I (CVEN 2121, co-req. APPM 2360)</td>
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<td>ARCH 3010-3 # Arch. Studio</td>
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<td>APPM 2350-4 Calculus III for Engineers (APPM 1360)</td>
<td>PHYS 1120-4 Gen. Physics II (PHYS 1110, co-req. APPM 1360)</td>
<td>AREN 2110-3 Thermodynamics (PHYS 1110, co-req. APPM 1360)</td>
<td>AREN 2050-3 # Building Materials and Systems (Soph. standing)</td>
<td>CVEN 2121-3 Analytical Mechanics I (PHYS 1110, co-req. APPM 2350*)</td>
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<td>APPM 1360-4 Calculus II for Engineers (APPM 1350)</td>
<td>PHYS 1110-4 Gen. Physics I (co-req. APPM 1350)</td>
<td>CSCI 1320-4† Computer Sci. 1 (co-req. APPM 1350)</td>
<td>GEEN 1400-3 Engrg. Projects OR Basic Engineering Elective</td>
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<td>APPM 1350-4 Calculus I for Engineers (APPM 1235 or placement)</td>
<td>CHEN 1211-4 Gen. Chem. for Engineers (1 yr. HS chem. or CHEM 1021)</td>
<td>CHEM 1221-1 General Chemistry Lab for Engineers (co-req. CHEN 1211)</td>
<td>AREN 1316-1 # Introduction to Architectural Engineering</td>
<td>AREN 1027-3 Engineering Drawing</td>
<td>HSS Elective-3****</td>
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</table>

# Course is offered only once per year (FALL or SPRING as shown)  
() Prerequisite and co-requisite requirements for course listed.  
* Co-requisite APPM 2350; OR co-requisite APPM 1360 and prerequisite GEEN 3830 Engineering Math.  
** CVEN 4545 Steel Design offered SPRING only; CVEN 4555 Reinforced Concrete Design offered FALL only.  
*** College-approved writing courses: HUEN 1010 (first-year students only); or ENLP 3100, HUEN 3100, WRTG 3030, WRTG 3035, or PHYS 3050 (junior standing). AREN students are encouraged to take HUEN 1010 in their first year.  
**** Prerequisites for AREN 4316: AREN 4110, AREN 4550, CVEN 3256, and CVEN 4545 or 4555. Co-requisite: AREN 4570.  
† Starting Fall 2019, CSCI 1320 is restricted to aerospace majors only. Contact the AREN advisor for alternative courses.  

Fall 2018/revised January 2020
AREN ELECTIVES AND OPPORTUNITIES FOR SPECIALIZATION

Courses may be chosen from any AREN emphasis area. At least two technical electives must be selected from this list. Some technical electives are offered intermittently, and are not guaranteed to be offered every year.

**STRUCTURAL SYSTEMS**

Technical Electives –
- AREN 4315 Masonry Design (CVEN 3525)
- AREN 4830 Special Topics: Sustainable Materials & Structures
- CVEN 4161 Mechanics of Materials II (CVEN 3161)
- CVEN 4545 Steel Design* (CVEN 3525)
- CVEN 4555 Reinforced Concrete Design* (CVEN 3525)
- CVEN 4565 Design of Wood Structures (CVEN 3525)

**MECHANICAL SYSTEMS**

Technical Electives –
- AREN 4010 HVAC System Modeling & Control (AREN 4110)
- AREN 4830 Special Topics: Computer Simulation of Building Systems
- AREN 4830 Special Topics: Building Energy Audits
- AREN 4890 Sustainable Building Design (AREN 3010)
- AREN 4990 Computational Fluid Dynamics (CFD) Analysis (AREN 2120, APPM 2360)

**LIGHTING/ELECTRICAL SYSTEMS**

Technical Electives –
- AREN 4130 Optical Design (AREN 3540)
- AREN 4530 Advanced Lighting Design (AREN 3540, 4550)
- AREN 4560 Luminous Radiative Transfer (AREN 3540)
- AREN 4580 Daylighting (AREN 3540)
- AREN 4830 Special Topics: Lighting Controls

**CONSTRUCTION ENGINEERING & MANAGEMENT**

Technical Electives –
- AREN 4315 Masonry Design (CVEN 3525)
- AREN 4506 Pre-construction Estimating & Scheduling (CVEN 3246) – **strongly recommended**
- AREN 4606 Construction Project Execution & Control (CVEN 3246, AREN 4506) – **strongly recommended**
- CVEN 3708 Geotechnical Engineering 1 (CVEN 3161)
- CVEN 3718 Geotechnical Engineering 2 (CVEN 3708)
- CVEN 4565 Design of Wood Structures (CVEN 3525)

Basic or Free Elective – CVEN 2012 Introduction to Geomatics

*Can only be taken as a technical elective if not used to fulfill the Structural Design requirement.

**ELECTIVE REQUIREMENTS**

**Basic Engineering Elective** – 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 other 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 [https://www.colorado.edu/ceae/node/111/attachment](https://www.colorado.edu/ceae/node/111/attachment) for a list of approved technical electives for AREN students.