# AREN Block Diagram – Fall 2018 freshmen (graduating May 2022 or later)

<table>
<thead>
<tr>
<th>Sem.</th>
<th>CR</th>
<th>Tech Elective-3</th>
<th>Free Elective-3</th>
<th>Tech Elective-3</th>
<th>AREN 4317-2</th>
<th>HSS Elective-3</th>
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<tbody>
<tr>
<td>8 SPR</td>
<td>17</td>
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<td></td>
<td>Arend Design</td>
<td>Upper-division</td>
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<td>(AREN 4316,</td>
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<td>ARCH 4010)</td>
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<td>7 FALL</td>
<td>17</td>
<td>Tech Elective-3</td>
<td>Are 4570-3 # Electrical Systems for Buildings (ECEN 3030)</td>
<td>Tech Elective-3</td>
<td>Arend Design</td>
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<td>Are 4110-3 # HVAC Design (AREN 3010)</td>
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<td>(AREN 4316-3 # Senior Design Project: Sys. 1 (See notes****)</td>
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<td>6 SPR</td>
<td>15</td>
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<td>Are 3040-3 # Electrical Circuits (APPM 2360, PHYS 1120)</td>
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<td>Arend Design</td>
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<td>(AREN 3050-3 # Illumination 2 (AREN 3540)</td>
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<td>5 FALL</td>
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<td>Are 4550-3 # Energy Efficient Buildings (AREN 2050, 2110, 2120)</td>
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<td>4 SPR</td>
<td>16</td>
<td>APPM 2360-4 Introduction to Linear Algebra &amp; Diff. Equations (APPM 1360)</td>
<td>Are 3540-3 # Illumination 1 (CSCI 1320, APPM 2350)</td>
<td>Arend Design</td>
<td>CVEN 3246-3 Introduction to Construction (4th-semester standing)</td>
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<td>3 FALL</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>Arend Design</td>
<td>CVEN 3246-3 Structural Analysis (CVEN 3161)</td>
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<td>2 SPR</td>
<td>15</td>
<td>APPM 1360-4 Calculus II for Engineers (APPM 1350)</td>
<td>Phys 1110-4 Gen. Physics I (co-req. APPM 1350)</td>
<td>Arend Design</td>
<td>CVEN 3161-3 Mechanics of Materials I (CVEN 2121, co-req. APPM 2360)</td>
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<td>1 FALL</td>
<td>16</td>
<td>APPM 1350-4 Calculus I for Engineers (APPM 1235 or placement)</td>
<td>Ch 1211-4 Gen. Chem. for Engineers (1 yr. HS chem. or CHEM 1021)</td>
<td>Arend Design</td>
<td>CVEN 1400-3 Engr. Projects OR Basic Engineering Elective</td>
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Fall 2018/revised June 2018

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# 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 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.
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 4830 Special Topics: Computational Fluid Dynamics
AREN 4890 Sustainable Building Design (AREN 3010)

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)
AREN 4606 Construction Project Execution & Control (CVEN 3246, AREN 4506)
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

*The course used to fulfill the Structural Design requirement may not also be applied elsewhere.

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.

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 for a list of approved technical electives for AREN students.