# Bachelor of Science in Electrical Engineering - Quantitative Reasoning

## Category III/IV and Stretch English

129 Total Units Required  
Minimum Number of Units in Major: 95

### Course

#### First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 104</td>
<td>Writing the First Year: Finding Your Voice Stretch I</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 100</td>
<td>Introduction to Engineering (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>MATH 197</td>
<td>Prelude to Calculus I (Prerequisite for MATH 226)</td>
<td>3</td>
</tr>
</tbody>
</table>

GE Area A: Oral Communication (A1)  
GE Area D  

#### Second Semester

Select One (Major Core):  
3-5

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 180</td>
<td>Chemistry for the Energy and the Environment (B1, B3, ES)</td>
<td>3</td>
</tr>
<tr>
<td>ENG 105</td>
<td>Writing the First Year: Finding Your Voice Stretch II (A2)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 198</td>
<td>Prelude to Calculus II (Prerequisite for MATH 226, B4)</td>
<td>3</td>
</tr>
</tbody>
</table>

GE Area B: Life Science (B2)  
GE Area C  

#### Third Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 226</td>
<td>Calculus I (Major Core, B4)</td>
<td>4</td>
</tr>
</tbody>
</table>

GE Area C  
GE Area D - Take Two  
GE Area E  

#### Fourth Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 213</td>
<td>Introduction to C Programming for Engineers (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 290</td>
<td>Modular Elective (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>MATH 227</td>
<td>Calculus II (Major Core)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 220 &amp; PHYS 222</td>
<td>General Physics with Calculus I and General Physics with Calculus II Laboratory (Major Core, B1, B3)</td>
<td>4</td>
</tr>
</tbody>
</table>

GE Area C  

#### Fifth Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 228</td>
<td>Calculus III (Major Core)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 230 &amp; PHYS 232</td>
<td>General Physics with Calculus II and General Physics with Calculus II Laboratory (Major Core)</td>
<td>4</td>
</tr>
</tbody>
</table>

GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)  
GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)  

#### Sixth Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>ENGR 205</td>
<td>Electric Circuits (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 206</td>
<td>Circuits and Instrumentation Laboratory (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>MATH 245</td>
<td>Elementary Differential Equations and Linear Algebra (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 240 &amp; PHYS 242</td>
<td>General Physics with Calculus III and General Physics with Calculus III Laboratory (Major Core)</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Seventh Semester

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<thead>
<tr>
<th>Course</th>
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<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENGR 300</td>
<td>Engineering Experimentation (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 305</td>
<td>Linear Systems Analysis (Major Core)</td>
<td>3</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENGR 306</td>
<td>Electromechanical Systems (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 315</td>
<td>Systems Analysis Lab (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>ENGR 353</td>
<td>Microelectronics (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 356</td>
<td>Digital Design (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 357</td>
<td>Digital Design Laboratory (Major Core)</td>
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</table>

**Eighth Semester**

<table>
<thead>
<tr>
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<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 301</td>
<td>Microelectronics Laboratory (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>ENGR 350</td>
<td>Introduction to Engineering Electromagnetics (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 442</td>
<td>Operational Amplifier Systems Design (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 451</td>
<td>Digital Signal Processing (Major Core)</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 478</td>
<td>Design with Microprocessors (Major Core)</td>
<td>4</td>
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**Total Units:** 17

**Ninth Semester**

<table>
<thead>
<tr>
<th>Course</th>
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<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENGR 446</td>
<td>Control Systems Laboratory (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>ENGR 447</td>
<td>Control Systems (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 449</td>
<td>Communication Systems (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 696</td>
<td>Engineering Design Project I (Major Core)</td>
<td>1</td>
</tr>
</tbody>
</table>

**Upper-Division Engineering Electives (9 units) - Take Two**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENGR 201</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 203</td>
<td>Materials of Electrical and Electronic Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 204</td>
<td>Engineering Mechanics</td>
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</tr>
<tr>
<td>ENGR 303</td>
<td>Engineering Thermodynamics</td>
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</table>

**Units:** 14

**Tenth Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENGR 697GW</td>
<td>Engineering Design Project II - GWAR (Major Core)</td>
<td>2</td>
</tr>
</tbody>
</table>

**Upper-Division Engineering Electives (9 units) - Take Two**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
</table>

**Units:** 8

**Total Units:** 138-140

1. ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

2. Depending on courses completed through Early Start, students in Pathway/Category III or IV may be required to enroll in a support course to complement their Quantitative Reasoning/B4 requirement. There are multiple course options for this pathway. Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center. Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website.

3. QR Category III students with a grade of B or higher in high school pre-calculus in the past year may be able to enroll in MATH 226. Please see a department advisor.

4. To avoid taking additional units, it is recommended that you meet SF State Studies requirements (AERM, GP, ES, SJ) within your GE or major.

5. GE Area A: Critical Thinking (A3) is satisfied upon completion of ENGR 205 and ENGR 213 or ENGR 213.

6. Upper-Division General Education, Physical and Life Sciences (UD-B) is satisfied upon completion of ENGR 300 and either ENGR 301 or ENGR 302.

7. Students must complete 21 units of upper-division Engineering units before registering for ENGR 696.
**Major Upper-Division Electives**

- ENGR 378 Digital Systems Design (3 units)
- ENGR 410 Process Instrumentation and Control (3 units) (Hidden Prerequisite for ENGR 411)
- ENGR 411 Instrumentation and Process Control Laboratory (1 unit)
- ENGR 415 Mechatronics (4 units)
- ENGR 445 Analog Integrated Circuit Design (4 units)
- ENGR 448 Electrical Power Systems (3 units)
- ENGR 453 Digital Integrated Circuit Design (4 units)
- ENGR 454 Application Specific Integrated Circuit Design (4 units)
- ENGR 455 Power Electronics (4 units)
- ENGR 456 Computer Systems (3 units)
- ENGR 458 Renewable Electrical Power Systems and Smart Grid (3 units)
- ENGR 476 Computer Communications Networks (3 units)
- ENGR 610 Engineering Cost Analysis (3 units)
- ENGR 699 Independent Study (1-3 units)
- ENGR 844 Embedded Systems (3 units)
- ENGR 848 Digital VLSI Design (3 units)
- ENGR 849 Advanced Analog IC Design (3 units)
- ENGR 851 Advanced Microprocessor Architectures (3 units)
- ENGR 852 Advanced Digital Design (3 units)
- ENGR 853 Advanced Topics in Computer Communication and Networks (3 units)
- ENGR 854 Wireless Data Communication Standards (3 units)
- ENGR 856 Nanoscale Circuits and Systems (3 units)
- ENGR 868 Advanced Control Systems (3 units)
- ENGR 869 Robotics (3 units)