BACHELOR OF SCIENCE IN
ELECTRICAL ENGINEERING
ROADMAP – QUANTITATIVE
REASONING CATEGORY I/II
AND ENG 114

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

This roadmap is a suggested plan of study and does not replace meeting with an advisor. Please note that students may need to adjust the actual sequence of courses based on course availability. Please consult an advisor in your major program for further guidance.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>First Semester</td>
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<tr>
<td>ENG 114</td>
<td>Writing the First Year: Finding Your Voice (A2)</td>
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<tr>
<td>ENGR 100</td>
<td>Introduction to Engineering (Major Core)</td>
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<tr>
<td>MATH 226</td>
<td>Calculus I (Major Core, B4)</td>
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<tr>
<td>GE Area A: Oral Communication (A1)</td>
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<tr>
<td>GE Area B: Life Science (B2)</td>
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<td>GE Area D</td>
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<td>Second Semester</td>
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<tr>
<td>Select One (Major Core):</td>
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<tr>
<td>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry</td>
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<tr>
<td>CHEM 180</td>
<td>Chemistry for Energy and the Environment (B1, B3, ES)</td>
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<tr>
<td>MATH 227</td>
<td>Calculus II (Major Core)</td>
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<tr>
<td>PHYS 220 &amp; PHYS 222</td>
<td>General Physics with Calculus I and General Physics with Calculus I Laboratory (Major Core, B1, B3)</td>
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<td>GE Area E</td>
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<td>Third Semester</td>
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<td>ENGR 213</td>
<td>Introduction to C Programming for Engineers (Major Core)</td>
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<tr>
<td>MATH 228</td>
<td>Calculus III (Major Core)</td>
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<td>Fourth Semester</td>
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<tr>
<td>ENGR 205</td>
<td>Electric Circuits (Major Core)</td>
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<td>ENGR 206</td>
<td>Circuits and Instrumentation Laboratory (Major Core)</td>
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<td>Select One (Major Core):</td>
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<tr>
<td>ENGR 271</td>
<td>Introduction to MATLAB</td>
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<td>ENGR 294</td>
<td>Introduction to Microcontrollers</td>
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<tr>
<td>MATH 245</td>
<td>Elementary Differential Equations and Linear Algebra (Major Core)</td>
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<td>General Physics with Calculus III and General Physics with Calculus III Laboratory (Major Core)</td>
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<td>GE Area C - Take Two</td>
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<td>Fifth Semester</td>
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<td>ENGR 300</td>
<td>Engineering Experimentation (Major Core)</td>
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<td>ENGR 305 &amp; ENGR 315</td>
<td>Linear Systems Analysis and Systems Analysis Lab (Major Core)</td>
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<td>ENGR 353</td>
<td>Microelectronics (Major Core)</td>
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<td>ENGR 356 &amp; ENGR 357</td>
<td>Digital Design and Digital Design Laboratory (Major Core)</td>
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<td>GE Area F</td>
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<td>Sixth Semester</td>
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<tr>
<td>ENGR 301</td>
<td>Microelectronics Laboratory (Major Core)</td>
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<td>ENGR 306</td>
<td>Electromechanical Systems (Major Core)</td>
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<td>ENGR 442</td>
<td>Operational Amplifier Systems Design (Major Core)</td>
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<td>ENGR 451</td>
<td>Digital Signal Processing (Major Core)</td>
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<td>ENGR 478</td>
<td>Design with Microprocessors (Major Core)</td>
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<td><strong>Units</strong></td>
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**Seventh Semester**

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<tr>
<td>ENGR 446</td>
<td>Control Systems Laboratory and Control Systems (Major Core)</td>
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<tr>
<td>&amp; ENGR 447</td>
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<tr>
<td>ENGR 449</td>
<td>Communication Systems (Major Core)</td>
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<tr>
<td>ENGR 696</td>
<td>Engineering Design Project I (Major Core)</td>
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<td><strong>Mechanical Engineering Elective - Select One:</strong></td>
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<tr>
<td>ENGR 201</td>
<td>Dynamics</td>
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<td>ENGR 203</td>
<td>Materials of Electrical and Electronic Engineering</td>
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<td>ENGR 204</td>
<td>Engineering Mechanics</td>
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<td>ENGR 303</td>
<td>Engineering Thermodynamics</td>
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<td><strong>Major Upper-Division Electives - Take One:</strong></td>
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<td>GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)</td>
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**Eighth Semester**

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<tr>
<td>ENGR 350</td>
<td>Introduction to Engineering Electromagnetics (Major Core)</td>
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<td>ENGR 697GW</td>
<td>Engineering Design Project II - GWAR (Major Core)</td>
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<td><strong>Major Upper-Division Electives - Take Two:</strong></td>
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<td>GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)</td>
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</table>

**Total Units** 129-134

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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. To determine the best B4 course option, students should complete the online advising activity at mathadvising.sfsu.edu (https://mathadvising.sfsu.edu/). Questions? Contact Gator Smart Start. (https://gatorsmartstart.sfsu.edu/)

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

4. GE Area A: Critical Thinking (A3) is satisfied upon completion of ENGR 205 and ENGR 201 or ENGR 213.

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

6. Students must complete 21 units of upper-division Engineering units before registering for ENGR 696.

7. **Major Upper-Division Electives (9 units)**
   - 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 units)
   - 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 455 Power Electronics (3 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 491 Real-time Digital Signal Processing (3 units)
   - ENGR 492 Hardware for Machine Learning (3 units)
   - ENGR 498 Advanced Design with Microcontrollers (4 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 850 Digital Design Verification (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)
   - ENGR 870 Robot Control (3 units)

8. To avoid taking additional units, it is recommended that you meet U.S. and California Government (USG/CSLG) within Upper-Division GE.

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Given catalog rights, fall 2022 transfer students do not need to complete an Area F course.