MECHANICAL ENGINEERING SF SCHOLARS ROADMAP

The San Francisco State Scholars program provides undergraduate students with an accelerated pathway to a graduate degree. Students in this program pursue a bachelor's and master's degree simultaneously. This program allows students to earn graduate credit while in their junior and/or senior year, reducing the number of semesters required for completion of a master's degree.

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>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENG 114</td>
<td>Writing the First Year: Finding Your Voice (A2)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 100</td>
<td>Introduction to Engineering (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 101</td>
<td>Engineering Graphics (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>MATH 226</td>
<td>Calculus I (Major Core, B4)</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1)</td>
<td>3,4</td>
<td>3</td>
</tr>
<tr>
<td>GE Area C</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Units</strong></td>
<td><strong>17</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select One (Major Core):</td>
<td></td>
<td><strong>3-5</strong></td>
</tr>
<tr>
<td>CHEM 115</td>
<td>General Chemistry I</td>
<td></td>
</tr>
<tr>
<td>CHEM 180</td>
<td>Chemistry for Energy and the Environment (B1, B3, ES)</td>
<td></td>
</tr>
<tr>
<td>ENGR 103</td>
<td>Introduction to Computers (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 I Laboratory (Major Core, B1, B3)</td>
<td>4</td>
</tr>
<tr>
<td>GE Area E</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Units</strong></td>
<td><strong>17</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE Area C</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GE Area D</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Units</strong></td>
<td><strong>6</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 300</td>
<td>Engineering Experimentation (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 303</td>
<td>Engineering Thermodynamics (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 307</td>
<td>Systems Dynamics and Mechanical Vibrations (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 309</td>
<td>Mechanics of Solids (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>GE Area F</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Units</strong></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 302</td>
<td>Experimental Analysis (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>ENGR 304</td>
<td>Mechanics of Fluids (Major Core)</td>
<td>3</td>
</tr>
</tbody>
</table>

1. Calculus III (Major Core)
2. General Physics with Calculus II and General Physics with Calculus II Laboratory (Major Core)
3. Life Science (B2)
4. Electric Circuits and Circuits and Instrumentation Laboratory (Major Core)
5. Elementary Differential Equations and Linear Algebra (Major Core)
6. General Physics with Calculus III and General Physics with Calculus III Laboratory (Major Core)
7. Systems Dynamics and Mechanical Vibrations (Major Core)
ENGR 364 Materials and Manufacturing Processes (Major Core) 3

Select One Set of Courses (Major Emphasis Elective): 4
ENGR 410 & ENGR 411 Process Instrumentation and Control and Instrumentation and Process Control Laboratory
ENGR 447 & ENGR 446 Control Systems and Control Systems Laboratory
GE Area C 3
GE Area D 3

Units 17

Fourth Year

Summer Semester
GE Area UD-C: Upper-Division Arts and/or Humanities 7 3
GE Area UD-D: Upper-Division Social Sciences 7 3

Units 6

Fall Semester
ENGR 464 Mechanical Design (Major Core) 3
ENGR 467 Heat Transfer (Major Core) 3
ENGR 696 Engineering Design Project I (Major Core) 8
ENGR 800 Research Methodology (Graduate Core) 3
Major Upper-Division Elective - Take One 9 3
Graduate Elective - Take One 10 3

Units 16

Spring Semester
ENGR 463 Thermal Power Systems (Major Core) 3
ENGR 697GW Engineering Design Project II - GWAR (Major Core) 2
ENGR 860 Applied Engineering Analysis (Graduate Core) 3
Major Upper-Division Electives – Take Two 9 6
Graduate Elective - Take One 10 3

Units 17

Fifth Year

Fall Semester
Graduate Elective - Take Two 10 6
Select One: 3
ENGR 897 Research (if taking ENGR 898) 3

Graduate Elective (if taking ENGR 895) 10 9

Spring Semester
Graduate Elective - Take Two 10 6
Select One (Culminating Experience): 3
ENGR 895 Applied Research Project
ENGR 898 Master’s Thesis

Units 9

Total Units 161-163

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/Questions? Contact Gator Smart Start. (https://gatorsmartstart.sfsu.edu/)

3. To avoid taking additional units, it is recommended that you meet SF State Studies (AERM, GP, ES, SJ) and Ethnic Studies 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. Lower-Division Modular Electives (3 units)
ENGR 271 Introduction to MATLAB (1 units)
ENGR 272 Engineering Project Management (1 units)
ENGR 291 Introduction to Creo Parametric (1 units)
ENGR 292 Introduction to Solid Works - Level I (1 units)
ENGR 294 Introduction to Microcontrollers (1 units)
ENGR 295 Design Methodology (1 units)
Upper-Division General Education, Physical and Life Sciences (UD-B) is satisfied upon completion of ENGR 300 and one of ENGR 301 or ENGR 302.

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

7. Upper-Division Major Electives (9 units)
Choice of upper-division electives must present a clearly identifiable educational objective and ensure that the program requirements in engineering science and design are met by all students. Distribution of credit units among engineering science and design is given in the Advising Guide. A study plan of intended upper-division electives must be approved by the student’s advisor and the program coordinator at the seventh semester of the engineering program. A total of 9 units from the following list of courses is required, subject to the minimum number of units specified for each group. Courses selected for the controls (emphasis) elective may not be double-counted as upper-division electives.
ENGR 306 Electromechanical Systems (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 432 ( units)
ENGR 441 Fundamentals of Composite Materials (3 units)
ENGR 446 Control Systems Laboratory (1 units) (Hidden Prerequisite for ENGR 447)
ENGR 447 Control Systems (3 units)
ENGR 465 Principles of HVAC (3 units)
ENGR 466 Gas Dynamics and Boundary Layer Flow (3 units)
ENGR 468 ( units)
ENGR 469 Alternative and Renewable Energy Systems (3 units)
ENGR 470 Biomechanics (3 units)
ENGR 610 Engineering Cost Analysis (3 units)
ENGR 699 Independent Study (1-3 units)
ENGR 820 Energy Resources and Sustainability (3 units)
ENGR 860 Applied Engineering Analysis (3 units)
ENGR 863 Advanced Thermal-Fluids (3 units)
ENGR 864 Transport Phenomena (3 units)
ENGR 865 Energy-Efficient Buildings (3 units)
ENGR 866 Air Quality Engineering (3 units)
ENGR 867 Energy Auditing and Measurement and Verification (3 units)
ENGR 868 Advanced Control Systems (3 units)
ENGR 869 Robotics (3 units)
ENGR 870 Robot Control (3 units)
ENGR 871 Advanced Electrical Power Systems (3 units)

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

**Graduate Electives (15-21 units total)**

Elective courses must be selected in consultation with a faculty advisor. Representative engineering elective courses are listed below. Up to 6 units of graduate or upper-division courses outside of ENGR may be used with approval of the faculty advisor. Up to 9 units of undergraduate courses are allowed, if not used to satisfy undergraduate degree program requirements. Total number of Engineering Elective units will depend on which Culminating Experience option the student chooses. Speak with an advisor for more information.

ENGR 415 Mechatronics (4 units)
ENGR 441 Fundamentals of Composite Materials (3 units)
ENGR 451 Digital Signal Processing (4 units)
ENGR 461 Structural Dynamics (3 units)
ENGR 463 Thermal Power Systems (3 units)
ENGR 465 Principles of HVAC (3 units)
ENGR 466 Gas Dynamics and Boundary Layer Flow (3 units)
ENGR 468 ( units)
ENGR 469 Alternative and Renewable Energy Systems (3 units)
ENGR 470 Biomechanics (3 units)
ENGR 478 Design with Microprocessors (4 units)
ENGR 492 Hardware for Machine Learning (3 units)
ENGR 801 Engineering Management (3 units)
ENGR 820 Energy Resources and Sustainability (3 units)
ENGR 845 Neural-Machine Interfaces: Design and Applications (3 units)
ENGR 863 Advanced Thermal-Fluids (3 units)
ENGR 865 Energy-Efficient Buildings (3 units)
ENGR 866 Air Quality Engineering (3 units)
ENGR 867 Energy Auditing and Measurement and Verification (3 units)
ENGR 868 Advanced Control Systems (3 units)
ENGR 869 Robotics (3 units)
ENGR 871 Advanced Electrical Power Systems (3 units)

*± Given catalog rights, fall 2023 transfer students do not need to complete an Area F course.*