

# 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.**

Course	Title	Units
<b>First Year</b>		
<b>Fall Semester</b>		
ENG 114	Writing the First Year: Finding Your Voice (A2) <sup>1</sup>	3
ENGR 100	Introduction to Engineering (Major Core)	1
ENGR 101	Engineering Graphics (Major Core)	1
MATH 226	Calculus I (Major Core, B4) <sup>2</sup>	4
GE Area A: Oral Communication (A1) <sup>3,4</sup>		3
GE Area C		3
<b>Units</b>		<b>15</b>
<b>Spring Semester</b>		
Select One (Major Core): 3-5		
CHEM 115	General Chemistry I: Essential Concepts of Chemistry	
CHEM 180	Chemistry for Energy and the Environment (B1, B3, ES)	
ENGR 103	Introduction to Computers (Major Core)	1
MATH 227	Calculus II (Major Core)	4
PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory (Major Core, B1, B3)	4
GE Area C		3
<b>Units</b>		<b>15-17</b>
<b>Second Year</b>		
<b>Fall Semester</b>		
ENGR 102	Statics (Major Core)	3

ENGR 200	Materials of Engineering (Major Core)	3
MATH 228	Calculus III (Major Core)	4
PHYS 230 & PHYS 232	General Physics with Calculus II and General Physics with Calculus II Laboratory (Major Core)	4
GE Area B: Life Science (B2)		3
<b>Units</b>		<b>17</b>
<b>Spring Semester</b>		
ENGR 201	Dynamics (Major Core) <sup>4</sup>	3
ENGR 205 & ENGR 206	Electric Circuits and Circuits and Instrumentation Laboratory (Major Core) <sup>4</sup>	4
MATH 245	Elementary Differential Equations and Linear Algebra (Major Core)	3
PHYS 240 & PHYS 242	General Physics with Calculus III and General Physics with Calculus III Laboratory (Major Core)	4
Modular Elective - Take Three <sup>5</sup>		3
<b>Units</b>		<b>17</b>
<b>Third Year</b>		
<b>Summer Semester</b>		
GE Area D		3
<b>Units</b>		<b>3</b>
<b>Fall Semester</b>		
ENGR 300	Engineering Experimentation (Major Core) <sup>6</sup>	3
ENGR 303	Engineering Thermodynamics (Major Core)	3
ENGR 307	Systems Dynamics and Mechanical Vibrations (Major Core)	3
ENGR 309	Mechanics of Solids (Major Core)	3
GE Area F <sup>±</sup>		3
<b>Units</b>		<b>15</b>
<b>Spring Semester</b>		
ENGR 302	Experimental Analysis (Major Core) <sup>6</sup>	1

ENGR 304	Mechanics of Fluids (Major Core)	3
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
<b>Units</b>		<b>17</b>

**Fourth Year**

**Summer Semester**

GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course) <sup>7</sup>	3	
GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course) <sup>7</sup>	3	
<b>Units</b>		<b>6</b>

**Fall Semester**

ENGR 464	Mechanical Design (Major Core)	3
ENGR 467	Heat Transfer (Major Core)	3
ENGR 696	Engineering Design Project I (Major Core) <sup>8</sup>	1
ENGR 800	Research Methodology (Graduate Core)	3
Major Upper-Division Elective - Take One <sup>9</sup>		3
Graduate Elective - Take One <sup>10</sup>		3
<b>Units</b>		<b>16</b>

**Spring Semester**

ENGR 463	Thermal Power Systems (Major Core)	3
ENGR 697GW	Engineering Design Project II - GVAR (Major Core)	2
ENGR 860	Applied Engineering Analysis (Graduate Core)	3
Major Upper-Division Electives – Take Two <sup>9</sup>		6
Graduate Elective - Take One <sup>10</sup>		3
<b>Units</b>		<b>17</b>

**Fifth Year**

**Fall Semester**

Graduate Elective - Take Two <sup>10</sup>	6
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Select One:	3	
ENGR 897	Research (if taking ENGR 898)	
Graduate Elective (if taking ENGR 895) <sup>10</sup>		
<b>Units</b>		<b>9</b>
<b>Spring Semester</b>		
Graduate Elective - Take Two <sup>10</sup>	6	
Select One (Culminating Experience):	3	
ENGR 895	Applied Research Project	
ENGR 898	Master's Thesis	
<b>Units</b>		<b>9</b>
<b>Total Units</b>		<b>156-158</b>

- <sup>1</sup> 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.
- <sup>2</sup> 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/>)
- <sup>3</sup> 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.
- <sup>4</sup> GE Area A: Critical Thinking (A3) is satisfied upon completion of ENGR 205 and ENGR 201 or ENGR 213.
- <sup>5</sup> **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)
- <sup>6</sup> 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.
- <sup>7</sup> To avoid taking additional units, it is recommended that you meet **U.S. and California Government** (USG/CSLG) within Upper-Division GE.

**8 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 prior to 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 Finite Element Methods in Structural and Continuum Mechanics (3 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 Applied Fluid Mechanics and Hydraulics (3 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)

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

**10 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 Mechanical and Structural Vibrations (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 Applied Fluid Mechanics and Hydraulics (3 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 2022 transfer students do not need to complete an Area F course.