ELECTRICAL ENGINEERING AND MS IN ELECTRICAL AND COMPUTER 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
First Year		
Fall Semester		
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)	
ENG 114	Writing the First Year: Finding Your Voice (A2) [1]	3
ENGR 100	Introduction to Engineering (Major Core) [2]	3
ENGR 212	Introduction to Unix and Linux for Engineers (Major Core)	2
MATH 226	Calculus I (Major Core, B4) [3]	4
	Units	**15-17**
Spring Semester		
ENGR 213	Introduction to C Programming for Engineers (Major Core) [4]	3
ENGR 214	C Programming Laboratory (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 A: Oral Communication (A1) [5]		3
GE Area C		3
	Units	**18**
Second Year		
Fall Semester		
ENGR 221	Data Structures and Algorithms in Python (Major Core)	4
ENGR 281	Probability and Statistics for Engineers (Major Core)	2
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
	Units	**17**
Spring Semester		
ENGR 205	Electric Circuits (Major Core) [4]	3
ENGR 206	Circuits and Instrumentation Laboratory (Major Core)	1
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
GE Area C		3
GE Area D		3
	Units	**17**
Third Year		
Summer Semester		
GE Area D		3
GE Area UD-B: Upper-Division Physical and/or Life Sciences [6]		3
	Units	**6**
Fall Semester		
ENGR 301	Microelectronics Laboratory (Major Core)	1

ENGR 305	Linear Systems Analysis (Major Core)	3
ENGR 353	Microelectronics (Major Core)	3
ENGR 356	Digital Design (Major Core)	3
ENGR 357	Digital Design Laboratory (Major Core)	1
GE Area F [±]		3
	Units	**14**
Spring Semester		
ENGR 306	Electromechanical Systems (Major Core)	3
ENGR 442	Operational Amplifier Systems Design (Major Core)	3
ENGR 446	Control Systems Laboratory (Major Core)	1
ENGR 447	Control Systems (Major Core)	3
ENGR 478	Design with Microprocessors (Major Core)	4
GE Area C		3
	Units	**17**
Fourth Year		
Summer Semester		
GE Area UD-C: Upper-Division Arts and/or Humanities [6]		3
GE Area UD-D: Upper-Division Social Sciences [6]		3
	Units	**6**
Fall Semester		
ENGR 350	Introduction to Engineering Electromagnetics (Major Core)	3
ENGR 449	Communication Systems (Major Core)	3
ENGR 451	Digital Signal Processing (Major Core)	4
ENGR 696	Engineering Design Project I (Major Core)	1
ENGR 844	Embedded Systems (Graduate Core)	3
Graduate Elective - Take One [7]		3
	Units	**17**
Spring Semester		
ENGR 697GW	Engineering Design Project II - GWAR (Major Core)	2
ENGR 852	Advanced Digital Design (Graduate Core)	3
Major Upper-Division Electives - Take Two [8]		6
Graduate Elective - Take One [7]		3
	Units	**14**
Fifth Year		
Fall Semester		
ENGR 845	Neural-Machine Interfaces: Design and Applications (Graduate Core)	3
Select One:		3
ENGR 897	Research (if selecting Culminating Experience Option A)	
Graduate Elective (if selecting Culminating Experience Option B) [7]		
Graduate Elective - Take One [7]		3
	Units	**9**
Spring Semester		
ENGR 850	Digital Design Verification (Graduate Core)	3
Select One (Culminating Experience):		3
ENGR 895	Applied Research Project (if selecting Culminating Experience Option B)	
ENGR 898	Master's Thesis (if selecting Culminating Experience Option A)	
Graduate Elective [7]		3
	Units	**9**
	Total Units	**159-161**

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 GE Area E (Lifelong Learning and Self-Development) is satisfied upon completing ENGR 100.

3 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/)

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

5 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.

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

7 **Graduate Engineering Electives (12-15 units)***
ENGR 415 Mechatronics (4 units)

ENGR 445 Analog Integrated Circuit Design (4 units)
ENGR 446 Control Systems Laboratory (1 unit)
& ENGR 447 Control Systems (3 units)
ENGR 449 Communication Systems (3 units)
ENGR 451 Digital Signal Processing (4 units)
ENGR 453 Digital Integrated Circuit Design (4 units)
ENGR 454 Application Specific Integrated Circuit Design (4 units)
ENGR 456 Computer Systems (3 units)
ENGR 476 Computer Communications Networks (3 units)
ENGR 478 Design with Microprocessors (4 units)
ENGR 492 Hardware for Machine Learning (3 units)
ENGR 498 Advanced Design with Microcontrollers (4 units)
ENGR 800 Research Methodology (3 units)
ENGR 801 Engineering Management (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 853 Advanced Topics in Computer Communication and Networks (3 units)
ENGR 856 Nanoscale Circuits and Systems (3 units)
ENGR 868 Advanced Control Systems (3 units)
ENGR 869 Robotics (3 units)
ENGR 890 Static Timing Analysis for Nanometer Designs (3 units)
ENGR 897 Research (3 units)
ENGR 899 Independent Study (1-3 units)

[8] **Major Upper-Division Electives (6 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 6 units of upper-division engineering electives from the following list of courses is required. Students with a GPA of at least 3.0 and the required prerequisites may take graduate courses (numbered 800 and above) with the approval of their advisor or the program coordinator.
ENGR 378 Digital Systems Design (3 units)
ENGR 410 Process Instrumentation and Control (3 units)
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 492 Hardware for Machine Learning (3 units)
ENGR 498 Advanced Design with Microcontrollers (4 units)
ENGR 610 Engineering Cost Analysis (3 units)
ENGR 844 Embedded Systems (3 units)
ENGR 845 Neural-Machine Interfaces: Design and Applications (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 856 Nanoscale Circuits and Systems (3 units)
ENGR 858 Hardware Security and Trust (3 units)
ENGR 859 On-Device Machine Learning (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)
ENGR 890 Static Timing Analysis for Nanometer Designs (3 units)

* The total number of units required will depend on the Culminating Experience option selected.

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