

# COMPUTER 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
<b>First Year</b>		
<b>Fall 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)	
ENG 114	Writing the First Year: Finding Your Voice (A2) <sup>1</sup>	3
ENGR 100	Introduction to Engineering (Major Core)	1
ENGR 121	Gateway to Computer Engineering (Major Core)	1
ENGR 212	Introduction to Unix and Linux for Engineers (Major Core)	2
MATH 226	Calculus I (Major Core, B4) <sup>2</sup>	4
GE Area A: Oral Communication (A1) <sup>3,4</sup>		3
		<b>Units 17-19</b>
<b>Spring Semester</b>		
ENGR 213	Introduction to C Programming for Engineers (Major Core) <sup>4</sup>	3
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
GE Area E		3
		<b>Units 17</b>
<b>Second Year</b>		
<b>Fall Semester</b>		
CSC 210	Introduction to Computer Programming (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
GE Area C		3
		<b>Units 17</b>
<b>Spring Semester</b>		
CSC 220	Data Structures (Major Core)	3
CSC 230	Discrete Mathematical Structures for Computer Science (Major Core)	3
ENGR 205	Electric Circuits (Major Core) <sup>4</sup>	3
ENGR 206	Circuits and Instrumentation Laboratory (Major Core)	1
MATH 245	Elementary Differential Equations and Linear Algebra (Major Core)	3
GE Area D		3
		<b>Units 16</b>
<b>Third Year</b>		
<b>Fall Semester</b>		
ENGR 300	Engineering Experimentation (Major Core) <sup>5</sup>	3
ENGR 301	Microelectronics Laboratory (Major Core) <sup>5</sup>	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
<b>GE Area F <sup>±</sup></b>		<b>3</b>
<b>Units</b>		<b>17</b>

**Spring Semester**

CSC 340	Programming Methodology (Major Core)	3
ENGR 451	Digital Signal Processing (Major Core)	4
ENGR 476	Computer Communications Networks (Major Core)	3
ENGR 478	Design with Microprocessors (Major Core)	4
<b>GE Area D</b>		<b>3</b>
<b>Units</b>		<b>17</b>

**Fourth Year**

**Summer Semester**

GE Area C		3
GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course) <sup>6</sup>		3
GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course) <sup>6</sup>		3
<b>Units</b>		<b>9</b>

**Fall Semester**

CSC 413	Software Development (Major Core)	3
ENGR 456	Computer Systems (Major Core)	3
ENGR 696	Engineering Design Project I (Major Core) <sup>7</sup>	1
ENGR 844	Embedded Systems (Graduate Core)	3
<b>Major Upper-Division Electives - Take One <sup>8</sup></b>		<b>3</b>
<b>Graduate Elective - Take One <sup>9</sup></b>		<b>3</b>
<b>Units</b>		<b>16</b>

**Spring Semester**

ENGR 378	Digital Systems Design (Major Core)	3
ENGR 697GW	Engineering Design Project II - GVAR (Major Core)	2
ENGR 852	Advanced Digital Design (Graduate Core)	3

<b>Major Upper-Division Electives - Take One <sup>8</sup></b>		<b>3</b>
<b>Graduate Elective - Take One <sup>9</sup></b>		<b>3</b>
<b>Units</b>		<b>14</b>

**Fifth Year**

**Fall Semester**

ENGR 845	Neural-Machine Interfaces: Design and Applications (Graduate Core)	3
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<b>Select One:</b>		<b>3</b>
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ENGR 897	Research (if selecting Culminating Experience Option A)	
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<b>Graduate Elective (if selecting Culminating Experience Option B) <sup>9</sup></b>		<b>3</b>
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<b>Graduate Elective - Take One <sup>9</sup></b>		<b>3</b>
<b>Units</b>		<b>9</b>

**Spring Semester**

ENGR 850	Digital Design Verification (Graduate Core)	3
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<b>Select One (Culminating Experience)</b>		<b>3</b>
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ENGR 895	Applied Research Project (if selecting Culminating Experience Option B)	
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ENGR 898	Master's Thesis (if selecting Culminating Experience Option A)	
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<b>Graduate Elective - Take One <sup>9</sup></b>		<b>3</b>
<b>Units</b>		<b>9</b>

**Total Units 158-160**

<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 either ENGR 201 or ENGR 213.

<sup>5</sup> GE Area UD-B: Upper-Division Physical and/or Life Sciences is satisfied upon completion of ENGR 300 and either ENGR 301 or ENGR 302.

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

<sup>7</sup> Students must complete 21 units of upper-division Engineering units before registering for ENGR 696.

<sup>8</sup> **Major Electives (6-7 units)**

CSC 415 Operating System Principles (3 units) (CSC 256 and MATH 324 are hidden prerequisites for this course)  
CSC 510 Analysis of Algorithms I (3 units) (MATH 324 is a hidden prerequisite for this course)  
CSC 645 Computer Networks (3 units) (CSC 415 is a hidden prerequisite for this course)  
CSC 648 Software Engineering (3 units)  
CSC 667 Internet Application Design and Development (3 units)  
CSC 668 Advanced Object Oriented Software Design and Development (3 units)  
ENGR 306 Electromechanical Systems (3 units)  
ENGR 350 Introduction to Engineering Electromagnetics (3 units) (PHYS 240 is a hidden prerequisite for this course)  
ENGR 442 Operational Amplifier Systems Design (3 units)  
ENGR 446 Control Systems Laboratory (1 unit) (ENGR 447 is a hidden prerequisite for this course)  
ENGR 447 Control Systems (3 units)  
ENGR 449 Communication Systems (3 units)  
ENGR 453 Digital Integrated Circuit Design (4 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 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 854 Wireless Data Communication Standards (3 units)  
ENGR 855 Advanced Wireless Communication Technologies (3 units)  
ENGR 856 Nanoscale Circuits and Systems (3 units)  
ENGR 858 Hardware Security and Trust (3 units)  
ENGR 868 Advanced Control Systems (3 units)  
ENGR 869 Robotics (3 units)  
ENGR 870 Robot Control (3 units)  
ENGR 890 RF Devices and Transceiver Principles and Design (3 units)

<sup>9</sup> **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 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 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 854 Wireless Data Communication Standards (3 units)  
ENGR 855 Advanced Wireless Communication Technologies (3 units)  
ENGR 856 Nanoscale Circuits and Systems (3 units)  
ENGR 868 Advanced Control Systems (3 units)  
ENGR 869 Robotics (3 units)  
ENGR 890 RF Devices and Transceiver Principles and Design (3 units)  
ENGR 897 Research (3 units)  
ENGR 899 Independent Study (1-3 units)

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

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