The number of network systems, or multimedia systems.

...breadth or in-depth knowledge in one of three areas: embedded systems,...

...students to adapt and extend their knowledge and skills more easily...

...this broad foundation enables...

...a rich set of hardware and software subjects to give students a broad...

...the underlying analysis and modeling tools and physical...

...the first two years of the program are designed to build a strong...

...mathematics and science to provide a basis for...

...the first two years cover a rich set of hardware and software subjects to...

...the number of units required for graduation (http://bulletin.sfsu.edu/undergraduate-education/#Major) and the GE requirements (http://bulletin.sfsu.edu/undergraduate-education/general-education/) are...
CSC 413  Software Development  3
ENGR 100  Introduction to Engineering  1
ENGR 121  Gateway to Computer Engineering  1
ENGR 205  Electric Circuits  3
ENGR 206  Circuits and Instrumentation Laboratory  1
ENGR 212  Introduction to Unix and Linux for Engineers  2
ENGR 213  Introduction to C Programming for Engineers  3
ENGR 300  Engineering Experimentation  3
ENGR 301  Microelectronics Laboratory  1
ENGR 305  Linear Systems Analysis  3
ENGR 353  Microelectronics  3
ENGR 356  Digital Design  3
ENGR 357  Digital Design Laboratory  1
ENGR 451  Digital Signal Processing  4
ENGR 476  Computer Communications Networks  3
ENGR 478  Design with Microprocessors  4
ENGR 378  Digital Systems Design  3
ENGR 456  Computer Systems  3
ENGR 696  Engineering Design Project I  1
ENGR 697GW  Engineering Design Project II - GWAR  2
MATH 227  Calculus II  4
MATH 226  Calculus I  4
MATH 228  Calculus III  4
MATH 245  Elementary Differential Equations and Linear Algebra  3
PHYS 220  General Physics with Calculus I  4
& PHYS 222  and General Physics with Calculus I Laboratory  4
PHYS 230  General Physics with Calculus II  4
& PHYS 232  and General Physics with Calculus II Laboratory  4

**Upper-Division Electives (6-7 units)**

Choice of upper-division electives must demonstrate a clearly identifiable educational objective and have an advisor’s approval. A study plan of intended upper-division electives must be approved by the student’s advisor and the program coordinator prior to registering for ENGR 696.

A total of 6 units from the following list of courses is required. Students with a GPA of 3.0 or better and the required prerequisites may take graduate courses (numbered 800 and above) with the approval of their advisor or the program coordinator.

### General Education Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Course Level</th>
<th>Units</th>
<th>Area Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>LD</td>
<td>3</td>
<td>A1</td>
</tr>
<tr>
<td>Written English</td>
<td>LD</td>
<td>3</td>
<td>A2</td>
</tr>
<tr>
<td>Communication I</td>
<td>LD</td>
<td>3</td>
<td>A3</td>
</tr>
<tr>
<td>Critical Thinking</td>
<td>LD</td>
<td>3</td>
<td>B1</td>
</tr>
<tr>
<td>Physical Science</td>
<td>LD</td>
<td>3</td>
<td>B2</td>
</tr>
<tr>
<td>Life Science</td>
<td>LD</td>
<td>3</td>
<td>B3</td>
</tr>
<tr>
<td>Lab Science</td>
<td>LD</td>
<td>1</td>
<td>B4</td>
</tr>
<tr>
<td>Mathematics/</td>
<td>LD</td>
<td>3</td>
<td>B4</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts</td>
<td>LD</td>
<td>3</td>
<td>C1</td>
</tr>
<tr>
<td>Humanities</td>
<td>LD</td>
<td>3</td>
<td>C2</td>
</tr>
<tr>
<td>Arts or Humanities</td>
<td>LD</td>
<td>3</td>
<td>C1 or C2</td>
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<td>Social Sciences</td>
<td>LD</td>
<td>3</td>
<td>D1</td>
</tr>
<tr>
<td>Social Sciences:</td>
<td>LD</td>
<td>3</td>
<td>D2</td>
</tr>
<tr>
<td>US History</td>
<td>LD</td>
<td>3</td>
<td>D3</td>
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<tr>
<td>Social Sciences:</td>
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<tr>
<td>US &amp; CA Government</td>
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<tr>
<td>Lifelong Learning and</td>
<td>LD</td>
<td>3</td>
<td>E</td>
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<tr>
<td>Self-Development (LLD)</td>
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<tr>
<td>Physical and/or Life</td>
<td>UD</td>
<td>3</td>
<td>UD-B</td>
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<tr>
<td>Science</td>
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<td></td>
<td></td>
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<tr>
<td>Arts and/or Humanities</td>
<td>UD</td>
<td>3</td>
<td>UD-C</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>UD</td>
<td>3</td>
<td>UD-D</td>
</tr>
</tbody>
</table>

### SF State Studies

Courses certified as meeting the SF State Studies requirements may be upper or lower division in General Education (GE), a major or minor, or an elective.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Course Level</th>
<th>Units</th>
<th>Area Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Ethnic and Racial</td>
<td>LD or UD</td>
<td>3</td>
<td>AERM</td>
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<tr>
<td>Minorities</td>
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<td></td>
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</tr>
<tr>
<td>Environmental Sustainability</td>
<td>LD or UD</td>
<td>3</td>
<td>ES</td>
</tr>
</tbody>
</table>

### Code  Title  Units
CSC 415  Operating System Principles  3
CSC 510  Analysis of Algorithms I  3
CSC 645  Computer Networks  3
CSC 648  Software Engineering  3
CSC 667  Internet Application Design and Development  3
CSC 668  Advanced Object Oriented Software Design and Development  3
ENGR 306  Electromechanical Systems  3
ENGR 350  Introduction to Engineering Electromagnetics  3
ENGR 442  Operational Amplifier Systems Design  3
ENGR 446  Control Systems Laboratory  1
ENGR 447  Control Systems  3
ENGR 449  Communication Systems  3
ENGR 453  Digital Integrated Circuit Design  4
ENGR 610  Engineering Cost Analysis  3
ENGR 844  Embedded Systems  3
ENGR 848  Digital VLSI Design  3
ENGR 849  Advanced Analog IC Design  3
ENGR 851  Advanced Microprocessor Architectures  3
ENGR 852  Advanced Digital Design  3
ENGR 853  Advanced Topics in Computer Communication and Networks  3
ENGR 854  Wireless Data Communication Standards  3
ENGR 856  Nanoscale Circuits and Systems  3
ENGR 868  Advanced Control Systems  3
ENGR 869  Robotics  3
First-Time Student Roadmap (4 Year)

Find the correct roadmap (A, B, C, or D):

1. Select the row that matches your English Course choice for A2.*
2. Select the column that matches your QR Category (found at your student center under Math Alert).
3. Click the Roadmap that lines up with your row and column.

For example, if you are taking ENG 104 as your first English course and your student center math alert says you are QR Category III, you should choose Roadmap D.

<table>
<thead>
<tr>
<th>Pathway</th>
<th>QR Cat I/II</th>
<th>QR Cat III/IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 114</td>
<td>Roadmap A</td>
<td>Roadmap C</td>
</tr>
<tr>
<td>ENG 104/ENG 105</td>
<td>Roadmap B</td>
<td>Roadmap D</td>
</tr>
</tbody>
</table>

*Composition for Multilingual Students: If taking ENG 209 as your first English course, choose the ENG 114 row. If taking ENG 204 for your first English course, choose the ENG 104/ENG 105 row.

SF State Scholars

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 will open in a new tab. (http://bulletin.sfsu.edu/colleges/science-engineering/engineering/bs-computer-engineering/scholars-roadmap/)

General Advising Information for Transfer Students

1. Before transfer, complete as many lower-division requirements as possible.
2. The following courses are not required for admission but are required for graduation. Students are strongly encouraged to complete these units before transfer; doing so will provide more flexibility in course selection after transfer.

Global Perspectives

<table>
<thead>
<tr>
<th></th>
<th>LD or UD</th>
<th>GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD or UD</td>
<td>3</td>
<td>SJ</td>
</tr>
</tbody>
</table>

Note: LD = Lower-Division; UD = Upper-Division.

For information about satisfying the requirements described in (1) and (2) above at a California Community College (CCC), please visit http://www.assist.org (http://assist.org). Check any geographically accessible CCCs; sometimes options include more than one college. Use ASSIST to determine:

- Which courses at a CCC satisfy any lower-division major requirements for this major;

Remedial courses are not transferable and do not apply to the minimum 60 semester units/90 quarter units required for admission.

Additional units for courses that are repeated do not apply to the minimum 60 units required for upper-division transfer (for example, if a course was not passed on the first attempt or was taken to earn a better grade).

Before leaving the last California Community College of attendance, obtain a summary of completion of lower-division General Education units (IGETC or CSU GE Breadth). This is often referred to as a GE certification worksheet. SF State does not require delivery of this certification to Admissions, but students should retain this document for verifying degree progress after transfer.

Credit for Advanced Placement, International Baccalaureate, or College-Level Examination Program courses: AP/IB/CLEP credit is not automatically transferred from the previous institution. Units are transferred only when an official score report is delivered to SF State. Credit is based on the academic year during which exams were taken. Refer to the University Bulletin in effect during the year of AP/IB/CLEP examination(s) for details regarding the award of credit for AP/IB/CLEP.

Students pursuing majors in science, technology, engineering, and mathematics (STEM) disciplines often defer 6-9 units of lower-division General Education in Areas C and D until after transfer to focus on preparation courses for the major. This advice does not apply to students pursuing associate degree completion before transfer.

Transferring From Institutions Other Than CCCs or CSUs

Review SF State's lower-division General Education requirements. Note that, as described below, the four basic skills courses required for admission meet A1, A2, A3, and B4 in the SF State GE pattern. Courses that fulfill the remaining areas of SF State's lower-division GE pattern are available at most two-year and four-year colleges and universities.

Of the four required basic skills courses, a course in critical thinking (A3) may not be widely offered outside the CCC and CSU systems. Students should attempt to identify and take an appropriate course no later than the term of application to the CSU. To review more information about the A3 requirement, please visit bulletin.sfsu.edu/undergraduate-education/general-education/lower-division/#AAEL.

Waiting until after transfer to take a single course at SF State that meets both US and CA/local government requirements may be an appropriate option, particularly if transferring from outside of California.
All Students Must Meet the Transfer Eligibility Requirements Outlined Below for Admission.

For more information, visit the Undergraduate Admissions section (http://bulletin.sfsu.edu/undergraduate-admissions/).

- Complete 60 or more transferable semester units or 90 or more quarter units.
- Earn a college grade point average of 2.0 or better in all transferable courses. Non-local area residents may be held to a higher GPA standard.
- Be in good standing at the last college or university attended.
- Complete 30-semester units (45-quarter units) of General Education, including four basic skills courses:
  a. One course in oral communication (same as CSU GE Area A1)
  b. One course in written composition (same as CSU GE Area A2)
  c. One course in critical thinking (same as CSU GE Area A3)
  d. One course in mathematics or quantitative reasoning (same as CSU GE Area B4)
- The four basic skills courses and a minimum of 60 transferable semester units (90-quarter units) must be completed by the spring semester prior to fall admission, or by the fall semester prior to spring admission. Earn a C- or better grade in each basic skills course.