

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

Undergraduate Programs in Engineering

Freshman applicants have completed four years of high school mathematics, one year of high school chemistry, and one year of high school physics. Students are also encouraged to include courses in mechanical drawing and computer programming.

Community college transfers should complete the sequence of mathematics, chemistry, physics, and engineering courses listed in freshman and sophomore years under the "sample sequence of courses," if available at the community college.

The Bachelors of Science in Civil, Computer, Electrical, and Mechanical Engineering require – 127, 128, 129, and 129-semester units, respectively. A minimum of 30 units must be earned in residence at SF State. Of these units, 24 must be upper division courses, and 12 of these upper division units must be in the major. Major requirements, including mathematics, chemistry, and physics prerequisites, comprise – 93 units for civil engineering, 94 for computer engineering, 95 for electrical engineering, and 95 units for mechanical engineering. For civil engineering, 50 of the required units are lower division and 43 units are upper division. For mechanical engineering, 51 of the required units are lower division and 44 units are upper division. For electrical engineering, 50 of the required units are lower division and 45 units are upper division. For computer engineering, 49 of the required units are lower division and 45 units are upper division. The remaining 33 units satisfy the balance of the university requirements including communication skills and general education in humanities and social sciences. Students are advised that, except for some general education (G.E.) courses, all courses which are to be counted toward completion of an engineering degree must be taken for a letter grade; the CR/NC option may not be used in this context.

Mechanical Engineering

The required courses provide a thorough grounding in the essentials of mechanical engineering. Elective courses taken as part of one of the areas of emphasis allow for specialization. The areas of emphasis currently offered are mechanical design, thermal-fluid systems, and robotics and controls. Graduates of the mechanical engineering program are expected to have, within a few years of graduation:

- Established themselves as practicing professionals or engaged in graduate study in mechanical engineering or a related area.
- Demonstrated an ability to be productive and responsible professionals.
- Acted as representatives of their profession in their communities.

The number of units required for graduation and the G.E. requirements are described in the Undergraduate Education section of this *Bulletin*. For information common to all engineering students, see Undergraduate Programs in Engineering above.

Courses are scheduled during the day as well as in the late afternoon and evening. Other information and assistance in selecting courses can be obtained from a major advisor in the School of Engineering, or by calling (415) 338-1174, by email to engrassst@sfsu.edu, or by writing to:

School of Engineering
San Francisco State University

Science Building
1600 Holloway Avenue
San Francisco, CA 94132.

General Education Requirements Met in the Engineering Major (All Concentrations)

The requirements below are deemed "met in the major" upon completion of the courses listed (even though the courses and their prerequisites are not approved for GE). This is true whether or not the student completes the major.

- Area A3 (Critical Thinking) is satisfied upon completion of [ENGR 205](#) and one of [ENGR 201](#) or [ENGR 213](#).
- 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](#).

Mechanical Engineering (B.S.) – 93 units minimum

Required Courses (77-79 Units)

Code	Title	Units
CHEM 115	General Chemistry I: Essential Concepts of Chemistry	3-5
or CHEM 180	Chemistry for the Energy and the Environment	
ENGR 100	Introduction to Engineering	1
ENGR 101	Engineering Graphics	1
ENGR 102	Statics	3
ENGR 103	Introduction to Computers	1
ENGR 200	Materials of Engineering	3
ENGR 201	Dynamics	3
ENGR 205	Electric Circuits	3
ENGR 206	Circuits and Instrumentation Laboratory	1
ENGR 300	Engineering Experimentation	3
ENGR 302	Experimental Analysis	1
ENGR 303	Engineering Thermodynamics	3
ENGR 304	Mechanics of Fluids	3
ENGR 305	Linear Systems Analysis	3
ENGR 309	Mechanics of Solids	3
ENGR 364	Materials and Manufacturing Processes	3
ENGR 463	Thermal Power Systems	3
ENGR 464	Mechanical Design	3
ENGR 467	Heat Transfer	3
ENGR 696	Engineering Design Project I	1
ENGR 697GW	Engineering Design Project II - GWAR	2
MATH 226	Calculus I	4
MATH 227	Calculus II	4
MATH 228	Calculus III	4
MATH 245	Elementary Differential Equations and Linear Algebra	3
PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory	4
PHYS 230 & PHYS 232	General Physics with Calculus II and General Physics with Calculus II Laboratory	4

<u>PHYS 240</u>	General Physics with Calculus III	3
<u>PHYS 242</u>	General Physics with Calculus III Laboratory	1

Lower-Division Modular Electives (3 units)

Select a total of 3 units from:

Code	Title	Units
<u>ENGR 271</u>	Introduction to MATLAB	1
<u>ENGR 272</u>	Engineering Project Management	1
<u>ENGR 291</u>	Introduction to Creo Parametric	1
<u>ENGR 292</u>	Introduction to Solid Works - Level I	1
<u>ENGR 294</u>	Introduction to Microcontrollers	1
<u>ENGR 295</u>	Design Methodology	1

Emphasis Elective (4 Units)

Units selected from the following, depending on the area of emphasis:

Code	Title	Units
<u>ENGR 410</u>	Process Instrumentation and Control	3
<u>ENGR 411</u>	Instrumentation and Process Control Laboratory	1
<u>ENGR 447</u> & <u>ENGR 446</u>	Control Systems and Control Systems Laboratory	4

Upper-Division Engineering 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 nine 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.

Code	Title	Units
<u>ENGR 306</u>	Electromechanical Systems	3
<u>ENGR 410</u>	Process Instrumentation and Control	3
<u>ENGR 411</u>	Instrumentation and Process Control Laboratory	1
<u>ENGR 415</u>	Mechatronics	3
<u>ENGR 416</u>	Mechatronics Lab	1
<u>ENGR 432</u>	Finite Element Methods in Structural and Continuum Mechanics	3
<u>ENGR 441</u>	Fundamentals of Composite Materials	3
<u>ENGR 446</u>	Control Systems Laboratory	1
<u>ENGR 447</u>	Control Systems	3
<u>ENGR 461</u>	Mechanical and Structural Vibrations	3
<u>ENGR 465</u>	Principles of HVAC	3
<u>ENGR 466</u>	Gas Dynamics and Boundary Layer Flow	3
<u>ENGR 468</u>	Applied Fluid Mechanics and Hydraulics	3
<u>ENGR 469</u>	Alternative and Renewable Energy Systems	3
<u>ENGR 610</u>	Engineering Cost Analysis	3
<u>ENGR 699</u>	Independent Study	1-2
<u>ENGR 820</u>	Energy Resources and Sustainability	3
<u>ENGR 863</u>	Advanced Thermal-Fluids	3

<u>ENGR 865</u>	Energy-Efficient Buildings	3
<u>ENGR 866</u>	Air Quality Engineering	3
<u>ENGR 867</u>	Energy Auditing and Measurement and Verification	3
<u>ENGR 871</u>	Advanced Electrical Power Systems	3

General Education Requirements

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

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.

<u>American Ethnic and Racial Minorities</u>	LD or UD	3	AERM
<u>Environmental Sustainability</u>	LD or UD	3	ES
<u>Global Perspectives</u>	LD or UD	3	GP
<u>Social Justice</u>	LD or UD	3	SJ

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

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.

Pathway	QR Cat I/II	QR Cat III/IV
ENG 114	Roadmap A	Roadmap C
ENG 104/ENG 105	Roadmap B	Roadmap D

*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.

General Advising Information for Transfer Students

1. Before transfer, complete as many lower-division requirements or electives for this major 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.
 - a course in U.S. History
 - a course in U.S. & California Government

For information about satisfying the requirements described in (1) and (2) above at a California Community College (CCC), please visit <http://www.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;
- Which courses at a CCC satisfy CSU GE, US History, and US & CA Government.

Remedial courses are not transferable and do not apply to the minimum 60 units/90 quarters 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 (GE 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 <http://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](#).

- 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.