BS IN MECHANICAL ENGINEERING

Units required for Pre-Major: 42 plus GE/GR courses
Units required for Major: 50 plus GE/GR courses
Total units required for BS: 122

Program Description

Sequence of Study: Courses taken in the Freshman and Sophomore years, either at Sacramento State, or at a Community College or transfer college, directly contribute to the upper division (Junior-Senior) program. For example, upper division work in Computer-Aided Design (CAD) develops skills introduced in freshman graphics and CAD courses; upper division analytical courses depend on the freshman and sophomore calculus and physics courses. Communication skills learned in the lower division are developed through the writing of reports and oral presentations.

Mechanical Engineering design involves far more than solving the types of problems found in chemistry, physics, and calculus courses; design work involves a large measure of analytical and creative work. The principles of mathematics and science are extremely useful when developing a detailed design solution but contribute little to the critical issues of correctly defining the problem, specifying the solution, and locating and organizing needed information. In addition, the design cannot violate fundamental physical laws and must be built from real materials using real manufacturing methods at a reasonable cost while satisfying safety and environmental factors.

The work in the four semester design-project sequence and other courses addresses these issues by including the study of design methods, procedures for developing a design solution from concept through a fully-developed design, and construction of a prototype. The courses in mechanics, thermodynamics, manufacturing, and materials complement the design sequence. The design work includes a mixture of problem and project work in individual courses; some of the course-level projects are team projects to help the student develop the ability to efficiently and effectively work with other engineers making decisions, use the abilities of different colleagues, and distribute the work of large projects. The design sequence includes classical as well as computer aided design and analysis techniques. The work in the two-semester, capstone and senior project sequence involves team effort on a significant design problem. Students interested in furthering their skills in analysis, including finite element analysis, and dynamic modeling of systems, can choose from a number of elective courses which rely heavily on computer methods.

Advising: Each student has a faculty advisor who meets with him/her at least once a semester to discuss academic progress, plan the following semester, explain University requirements, and answer questions about the Mechanical Engineering program.

Note: Students graduating with a BS in Mechanical Engineering will not be subject to the University's Foreign Language Graduation Requirement. Students who change major may be subject to the University's Foreign Language Graduation Requirement.

Minimum Grade Requirement

A grade of "C-" or better is required in all courses applied to a Mechanical Engineering major.

Program Requirements

Code	Title	Units
Required Lower Division Courses (Pre-Major) (62 Units) [1]		
First Semester Freshman Year		
CHEM 1E	General Chemistry for Engineering	4
ENGR 6	Engineering Graphics and CADD (Computer Aided Drafting and Design) [2]	3
MATH 30	Calculus I [2]	4
Select one General Education course		3
Second Semester Freshman Year		
MATH 31	Calculus II [2]	4
ME 37	Manufacturing Processes	3
PHYS 11A	General Physics: Mechanics [2]	4
Select one General Education course		3
First Semester Sophomore Year		
ENGR 45	Engineering Materials	3
MATH 32	Calculus III	4
PHYS 11C	General Physics: Electricity and Magnetism [2]	4
Select one General Education course		3
Select one General Education/Graduation Requirement Course		3
Second Semester Sophomore Year		
ENGR 17	Introductory Circuit Analysis	3
ENGR 30	Analytic Mechanics: Statics	3
MATH 45	Differential Equations for Science and Engineering	3
ME 76	Programming and Problem Solving in Engineering	2
Select two General Education courses		6
Required Upper Division Courses (Major) (60 Units) [3]		
First Semester Junior Year		
ENGR 110	Analytic Mechanics - Dynamics	3
ENGR 112	Mechanics Of Materials	3
ENGR 124	Thermodynamics	3
ME 106	Applications of Programming in Mechanical Engineering	1
ME 108	Professional Topics for Mechanical Engineers	2
ME 116	Machinery Design I	2
ME 120	Fluid Mechanics for Mechanical Engineers	3
Second Semester Junior Year		
ME 117	Machinery Design II	2
ME 138	Concurrent Product and Process Design	3
ME 171	Modeling and Simulation of Mechatronics and Control Systems	3
ME 180	Mechanical Properties of Materials	3
Select one General Education Course		3
First Semester Senior Year		
ME 126	Heat Transfer	3
ME 128	Thermal-Fluid Systems	3
ME 172	Control System Design	3
ME 190	Project Engineering I [2]	3
Select one General Education course		3
Second Semester Senior Year		
ME 191	Project Engineering II [2]	2
Select two General Education courses		6

Select two of the following: [4]		6
ME 114	Vibrations	
ME 115	Dynamics of Machinery and Multi-Body Systems	
ME 121	Solar Thermal and Energy Storage Systems	
ME 122	Geothermal and Bioenergy Systems	
ME 123	Wind, Hydro and Ocean Energy	
ME 136	Numerical Control Programming	
ME 137	Product Design for Manufacturing and Automation	
ME 140	Introduction to Motors and Actuators	
ME 141	Introduction to Tolerance Analysis	
ME 143	Vehicle Dynamics and Design	
ME 151	Fundamentals of Combustion	
ME 152	Turbomachinery Design	
ME 153	Thermodynamics of Combustion Engines	
ME 154	Alternative Energy Systems	
ME 155	Gas Dynamics	
ME 156	Heating and Air Conditioning Systems	
ME 157	Solar Energy Engineering	
ME 159	High Efficiency HVAC	
ME 164	Introduction to Test Automation	
ME 165	Introduction To Robotics	
ME 173	Applications of Finite Element Analysis	
ME 176	Product Design & CAD	
ME 177	Product Design and 3D Parametric Solid Modeling	
ME 182	Introduction to Composite Materials	
ME 184	Corrosion and Wear	
ME 186	Fracture Mechanics in Engineering Design	
Total Units		**122**

[1] Lower division requirements are essentially common for Civil, Electrical and Electronic, and Mechanical Engineering.
Note: Courses are listed in a recommended sequence, and may be interchanged among semesters to accommodate the student's schedule, as long as prerequisites are met.

[2] Course also satisfies General Education (GE)/Graduation Requirement.
Note: A second year foreign language course may also satisfy 3 units of GE when the course is being taken to comply with the Sacramento State foreign language requirement. Students should consult with an advisor for exact GE eligibility of these courses.

[3] Students are allowed to enroll in upper division Engineering or Mechanical Engineering courses with the Department's approval. Pre-Major students must complete a Change of Major form and submit it to the Mechanical Engineering Department Office during the application filing period.

[4] An upper division course in Engineering, Mathematics, and Science may be selected with prior approval of the student's advisor.

Note: All elective courses are NOT offered every semester. The Mechanical Engineering Department Office maintains a listing showing when particular courses will be offered.

General Education Requirements [1]

Code	Title	Units
Area A: Basic Subjects (9 Units)		
A1 - Oral Communication		3
A2 - Written Communication		3
A3 - Critical Thinking		3
Area B: Physical Universe and Its Life Forms (3 Units)		
B1 - Physical Science [2]		0
B2 - Life Forms		3
B3 - Lab (Note: Lab experience to be taken with one of the following: B1, B2 or B5 [2]		0
B4 - Math Concepts [2]		0
B5 - Additional Course (Any B to reach 12 units) - Take upper-division course to complete Area & upper division requirements. [2]		0
Area C: Arts and Humanities (12 Units)		
C1 - Arts		3
C2 - Humanities		3
C1/C2 - Area Course C		3
C1/C2 - Area C Course - Take upper-division course to complete Area & upper division requirements.		3
Area D: The Individual and Society (9 Units)		
Area D Course		3
Area D Course		3
Area D Course - Take upper-division course to complete Area & upper division requirements.		3
Area E: Understanding Personal Development		
Area E Course [2]		0
Area F: Ethnic Studies (3 Units)		
Area F Course		3
Total Units		**36**

[1] To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (https://catalog.csus.edu/colleges/academic-affairs/general-education/).
Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (http://www.csus.edu/acad/), by phone (916) 278-1000, or email (advising@csus.edu).

[2] Required in Major; also satisfies GE.

Graduation Requirements [1]

Code	Title	Units
Graduation Requirements (required by CSU) (9 Units)		
American Institutions: U.S. History		3
American Institutions: U.S. Constitution & CA Government		3
Writing Intensive (WI)		3
Graduation Requirements (required by Sacramento State) (6 Units)		
English Composition II		3
Race and Ethnicity in American Society (RE)		3
Foreign Language Proficiency Requirement [2]		0

[1] To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (https://catalog.csus.edu/colleges/academic-affairs/general-education/).
Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (http://www.csus.edu/acad/), by phone (916) 278-1000, or email (advising@csus.edu).

[2] If not satisfied before entering Sacramento State, it may be satisfied in General Education Area C2 (Humanities). "C- or better required." The alternative methods for satisfying the Foreign Language Proficiency Requirement are described here: https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html
Note: Students with a declared major of BS in Mechanical Engineering are exempt from the Foreign Language Graduation Requirement.

The following roadmaps are sample planning resources. Please consult your academic advisor and Academic Catalog for graduation requirements as you develop your individualized academic plan.

Mechanical Engineering, BS: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
CHEM 1E	General Chemistry for Engineering	4
ENGR 6	Engineering Graphics and CADD (Computer Aided Drafting and Design)	3
MATH 30	Calculus I	4
GE Area 3A - Arts [2]		3
	Units	**14**
Second Semester		
MATH 31	Calculus II	4
ME 37	Manufacturing Processes	3
PHYS 11A	General Physics: Mechanics	4
GE Area 1A - English Composition [2]		3
GE Area 6 - Ethnic Studies [2]		3
	Units	**17**
Year 2		
First Semester		
ENGR 45	Engineering Materials	3
MATH 32	Calculus III	4
PHYS 11C	General Physics: Electricity and Magnetism	4
GE Area 1C - Oral Communication [2]		3
GE Area 5B - Biological Science [2]		3
	Units	**17**
Second Semester		
ENGR 17	Introductory Circuit Analysis	3
ENGR 30	Analytic Mechanics: Statics	3
ENGL 20	College Composition II	3
MATH 45	Differential Equations for Science and Engineering	3
ME 76	Programming and Problem Solving in Engineering	2
GR American Institutions (US History) [2]		3
	Units	**17**
Year 3		
First Semester		
ENGR 110	Analytic Mechanics - Dynamics	3
ENGR 112	Mechanics Of Materials	3
ME 106	Applications of Programming in Mechanical Engineering	1
ME 108	Professional Topics for Mechanical Engineers	2
ME 116	Machinery Design I	2
ME 120	Fluid Mechanics for Mechanical Engineers	3
	Units	**14**
Second Semester		
ENGR 124	Thermodynamics	3
ME 117	Machinery Design II	2
ME 138	Concurrent Product and Process Design	3
ME 171	Modeling and Simulation of Mechatronics and Control Systems	3
ME 180	Mechanical Properties of Materials	3
GE Area 3B - Humanities [2]		3
	Units	**17**
Year 4		
First Semester		
ME 126	Heat Transfer	3
ME 172	Control System Design	3
ME 190	Project Engineering I	3
Upper Division GE Area 4 - Social & Behavioral Sciences + American Institutions (GOVT) [2]		3
GE Area 4 - Social & Behavioral Sciences [2]		3
	Units	**15**
Second Semester		
ME 128	Thermal-Fluid Systems	3
ME 191	Project Engineering II	2
ME Elective [3]		3
ME Elective [3]		3
Upper Division GE Area 3 - Arts or Humanities + Writing Intensive [2]		3
	Units	**14**
	Total Units	**125**

Mechanical Engineering, BS: 2-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
ENGR 112	Mechanics Of Materials	3
ME 106	Applications of Programming in Mechanical Engineering	1
ME 108	Professional Topics for Mechanical Engineers	2
ME 116	Machinery Design I	2
Upper Division GE Area 4 - Social & Behavioral Sciences [2]		3
GR American Institutions (US History) [2]		3
	Units	**14**
Second Semester		
ENGR 110	Analytic Mechanics - Dynamics	3
ENGR 124	Thermodynamics	3
ME 117	Machinery Design II	2
ME 120	Fluid Mechanics for Mechanical Engineers	3
ME 138	Concurrent Product and Process Design	3

GR American Institutions (GOVT) [2]		3
	Units	**17**
Year 2		
First Semester		
ME 126	Heat Transfer	3
ME 171	Modeling and Simulation of Mechatronics and Control Systems	3
ME 180	Mechanical Properties of Materials	3
ME 190	Project Engineering I	3
Upper Division GE Area 3 - Arts or Humanities + Writing Intensive [2]		3
	Units	**15**
Second Semester		
ME 128	Thermal-Fluid Systems	3
ME 172	Control System Design	3
ME 191	Project Engineering II	2
ME Elective [3]		3
ME Elective [3]		3
	Units	**14**
	Total Units	**60**

1. Any course not completed in the first semester should be taken in the second or a later semester.
2. Please see General Education/Graduation Requirement **course options (https://catalog.csus.edu/colleges/engineering-computer-science/engineering-civil/bs-in-civil-engineering/colleges/academic-affairs/general-education/)**.
3. Please see an academic advisor for elective options.