MECHANICAL ENGINEERING (BS)(SAN LUIS OBISPO CAMPUS)

Offered at: San Luis Obispo Campus

The profession of mechanical engineering is directed toward the design, manufacture, and system integration of a very wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of central concern to mechanical engineers is the sound application of basic principles of solid mechanics, fluid mechanics and thermal sciences in the design, manufacture, and application of this equipment. Mechanical Engineering graduates obtain employment primarily with manufacturers, energy companies, consultants, and government agencies. Types of work performed by graduates include product design, mechanical design, testing, engineering management, engineering sales, design of manufacturing systems, and development of maintenance procedures. Mechanical Engineering graduates also often enhance their careers through graduate study in engineering, and some students also study engineering to build a scientific and technical foundation as a prelude to enrollment in medical, law, and business schools.

The focus of the Cal Poly Mechanical Engineering program is on education based on our "learn by doing" educational philosophy. Thus, the curriculum includes a large number of hands-on laboratories, integration of design throughout, and a senior project requirement for all students. Students are enrolled in engineering laboratories in all years of the curriculum. The program is accredited by the Engineering Accreditation Commission of ABET (https://www.abet.org/).

The Mechanical Engineering Department is the home of the Donald E. Bently Center for Engineering Innovation. The center provides support for faculty, students, and visiting scholars for the advancement of research, education, and practice in mechanical engineering. A $6 million endowment to fund three professorships supports the center.

Upper division students in the **General Curriculum** can choose professional elective courses from such courses as turbomachinery, robotics, mechatronics, composite materials, rotor dynamics, advanced mechanics, solar systems, internal combustion engines, heat and mass transfer, and courses emphasizing the petroleum, air conditioning, ventilating, and refrigeration industries. Students in the **Mechatronics Concentration** are prepared for professional practice in the design of “intelligent” products for use in factory automation, robotics, hybrid vehicles, alternative energy, and many other fields. The **Sustainable Technology for the Built Environment (HVAC&R) Concentration** prepares students for careers in the heating, ventilating, air-conditioning and refrigeration (HVAC&R) industry, with a focus on the design of mechanical systems for commercial and industrial buildings. **Manufacturing Concentration** students focus on fabrication processes, preparing them for careers designing or manufacturing a wide variety of consumer and industrial products. The **Energy Resources Concentration** prepares students for careers in renewable and nonrenewable energy companies producing electrical power, with the focus on the design, manufacture, and system integration of power and fuel plants.

There are several organized student clubs associated with the Mechanical Engineering Department, including national honor societies and student chapters of professional societies. Each of these clubs offers students active programs and leadership activities.

Concentrations

General Curriculum in Mechanical Engineering

Offered at: San Luis Obispo Campus

Upper-division students in the General Curriculum can choose professional elective courses from such courses as turbomachinery, robotics, mechatronics, composite materials, rotor dynamics, advanced mechanics, solar systems, internal combustion engines, heat and mass transfer, and courses emphasizing the petroleum, air conditioning, ventilating, and refrigeration industries.

Energy Resources

Offered at: San Luis Obispo Campus

The Energy Resources Concentration prepares students for careers in renewable and nonrenewable energy companies producing electrical power, with the focus on the design, manufacture, and system integration of power and fuel plants.

Sustainable Technology for the Built Environment (HVAC&R)

Offered at: San Luis Obispo Campus

The Sustainable Technology for the Built Environment (HVAC&R) Concentration prepares students for careers in the heating, ventilating, air-conditioning and refrigeration (HVAC&R) industry, with a focus on the design of mechanical systems for commercial and industrial buildings.

Mechatronics

Offered at: San Luis Obispo Campus

Students in the Mechatronics Concentration are prepared for professional practice in the design of “intelligent” products for use in factory automation, robotics, hybrid vehicles, alternative energy, and many other fields.

Manufacturing

Offered at: San Luis Obispo Campus

Manufacturing Concentration students focus on fabrication processes, preparing them for careers designing or manufacturing a wide variety of consumer and industrial products.

Program Learning Objectives

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/) section of this catalog, including:

- 40 units of upper-division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No Major, Support or Concentration courses may be selected as credit/no credit. In addition, no more than 12 units of cooperative or internship courses can count towards your degree requirements.

Code	Title	Units
MAJOR COURSES		
ME 1125	Introduction to Mechanical Engineering	1
ME 1148	Engineering Design Communication [1]	2
ME 2212	Engineering Dynamics	3
ME 2240	Applied Programming for Mechanical Engineering	1
ME 2248	Design Using Solid Modeling	1
ME 3234	Design Thinking and Creativity (Upper-Division 4) [2]	3
ME 3236	Engineering Measurement and Data Analysis (Upper-Division 2/5) [2]	3
ME 3302	Thermodynamics	3
ME 3328	Design for Strength and Stiffness	4
ME 3329	Mechanical Systems Design	3
ME 3341 & ME 3342	Fluid Mechanics and Fluid Mechanics Laboratory [3]	4
ME 3343	Heat Transfer	4
ME 4440	Thermal System Design	3
General Curriculum in Mechanical Engineering or Concentration		
(See General Curriculum in Mechanical Engineering and list of Concentrations below)		22-23
SUPPORT COURSES		
Select from the following: (5B) [2]		3
BIO 1111	General Biology	
BIO 2213	Life Science for Engineers	
BIO 2215	Biodiversity of California	
BIO 2217	Wildlife Conservation Biology	
CHEM 1120	Fundamentals of Chemical Structure and Properties (5A & 5C) [2]	4

EE 2115 & 2115L	Circuits & Electronics for Non-Majors and Circuits & Electronics Laboratory for Non-Majors	4
ENGR 2211	Introduction to Mechanics	4
IME 1141	Introduction to Metal Casting and Prototyping	1
or IME 1142	Materials Joining	
or IME 1149	Introduction to Manufacturing Processes: Metal Casting and Joining	
IME 1143	Introduction to Design and Manufacturing	2
MATE 1220 & MATE 1215	Principles of Materials Engineering for Non-Majors and Materials Laboratory I	3
MATH 1261	Calculus I (2) [2]	4
MATH 1262	Calculus II	4
MATH 2263	Calculus III	3
MATH 2341	Linear Analysis	4
PHYS 1141	General Physics I	4
PHYS 1143	General Physics II	4
GENERAL EDUCATION (GE)		
(See GE program requirements below)		27
FREE ELECTIVES		
Free Electives		0
Total Units		**128-129**

1 ME 1148 and IME 1143 intended to be taken concurrently in the same term.
2 Required in Major or Support; also satisfies General Education (GE) requirement.
3 ME 3341 and ME 3342 intended to be taken concurrently in the same term.

Concentrations

General Curriculum

Code	Title	Units
REQUIRED COURSES		
ME 3317	Vibrations and System Modeling	4
ME 4417	Mechanical Controls and Implementations	3
ME 4460	Senior Design Project I [1]	2
ME 4461	Senior Design Project II [1]	2
Technical Electives		
Select from the following: [2,3,4]		11-12
Select 8-12 units from the following ME courses:		
ME 3305	Mechatronics I	
ME 3313	Intermediate Dynamics	
ME 3315	Energy Conversion	
ME 3355	Introduction to Sustainable Energy Usage in Buildings	
Any ME 4000 or 5000 level course with the exception of required (major) and senior project courses.		
Select 0 - 4 units from:		
Any 3000-4000 level or 5000 level course in the College of Engineering with the exception of GE Upper-Division 2 or 5, ENGR 3301, senior project, thesis, special problems, and co-op courses.		
Total Units		**22-23**

1 ENGR 4460 and ENGR 4461 (4), or ENGR 4463 and ENGR 4464 (4) may substitute for ME 4460 and ME 4461 (4).
2 Consultation with advisor is recommended prior to selecting Technical Electives. 3000 level Technical Electives cannot be used for graduate credit in the blended BS+MS Mechanical Engineering program.
3 ME 4470, ME 4471, ME 5570, and ME 5571 are variable topic courses and may or may not count as ME Technical Electives. Contact the instructor for additional information. A course substitution form may be required.
4 ME 4400 and ME 5500 are independent study courses and may be acceptable for Technical Elective credit. A course substitution form is required.

Energy Resources

Code	Title	Units
REQUIRED COURSES		
ME 3315	Energy Conversion	3
ME 3317	Vibrations and System Modeling	4
ME 4417	Mechanical Controls and Implementations	3
ME 4460	Senior Design Project I	2
ME 4461	Senior Design Project II	2
Technical Electives		
Select from the following:		8-9
EE 3255 & 3255L	Electric Machines and Power Systems and Electric Machines and Power Systems Laboratory	
EE 4420	Sustainable Energy Generation	
ME 4437	Nuclear Energy Power Generation	
ME 4438	Nuclear Power Plant Design and Operation	
ME 4439	Nuclear Energy Resources	
ME 4443	Turbomachinery	
ME 4444	Design and Analysis of Internal Combustion Engines	
ME 4450	Solar Thermal Power Systems	
ME 4455	Building Energy Performance and Modeling	
ME 4488	Wind Power Engineering	
ME 5541	Advanced Thermodynamics	
Total Units		**22-23**

Sustainable Technology for the Built Environment (HVAC&R)

Code	Title	Units
REQUIRED COURSES		
ME 3317	Vibrations and System Modeling	4
ME 4417	Mechanical Controls and Implementations	3
ME 3355	Introduction to Sustainable Energy Usage in Buildings	3
ME 4455	Building Energy Performance and Modeling	3
ME 4456	HVAC&R Air and Water Distribution for Sustainable Building Environments	3
ME 4457	Environmentally Efficient and Sustainable Refrigeration Systems	3
ME 4465	HVAC&R Senior Design Project I	2
ME 4466	HVAC&R Senior Design Project II	2
Total Units		**23**

Mechatronics

Code	Title	Units
REQUIRED COURSES		
ME 3305	Mechatronics I	4
ME 3319	Introduction to System Dynamics	4
ME 4305	Mechatronics II	3
ME 4419	Advanced Control Systems	3
ME 4460	Senior Design Project I	2
ME 4461	Senior Design Project II	2
Technical Electives		
Select from the following:		4-5
ME 3313	Intermediate Dynamics	
ME 4423	Robotics: Fundamentals and Applications	
ME 4452	Machine Learning in Mechanical Engineering	
ME 5305	Mechatronics III	

ME 5506	System Dynamics	
Total Units		**22-23**

Manufacturing

Code	Title	Units
REQUIRED COURSES		
ME 3317	Vibrations and System Modeling	4
ME 4417	Mechanical Controls and Implementations	3
ME 4460	Senior Design Project I	2
ME 4461	Senior Design Project II	2
IME 3327	Test Design and Analysis in Manufacturing Engineering	4
IME 3330	Fundamentals of Manufacturing Engineering	4
Manufacturing Electives		
Select from the following:		3-4
IME 3331	Intermediate Metal Casting	
IME 3336	Advanced Computer Aided Manufacturing	
IME 3356	Manufacturing and Process Automation	
IME 4418	Product and Process Development	
IME 4428	Engineering Metrology	
IME 4432	Additive Manufacturing	
IME 4435	Reliability for Design and Testing	
IME 4450	Computer-Aided Manufacturing and Process Analysis	
IME 5543	Applied Human Factors	
MATE 4434 & MATE 4435	Micro/Nano Fabrication and Micro/Nano Fabrication Laboratory	
ME 3305	Mechatronics I	
ME 4380	Composites Manufacturing, Machining, and Testing	
ME 4480	Composite Materials Analysis and Design	
Total Units		**22-23**

General Education (GE) Requirements

- 43 units required, 16 of which are specified in Major and/or Support.
- If any of the remaining 27 Units is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.
- See the complete GE course listing (https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/#generaleducationtext).
- A grade of C- or better is required in one course in each of the following GE Areas: 1A (English Composition), 1B (Critical Thinking), 1C (Oral Communication), and 2 (Mathematics and Quantitative Reasoning).

Lower-Division General Education

Area 1	**English Communication and Critical Thinking**	
1A	Written Communication	3
1B	Critical Thinking	3
1C	Oral Communication	3
Area 2	**Mathematics and Quantitative Reasoning**	
2	Mathematics and Quantitative Reasoning (3 units in Support) [1]	0
Area 3	**Arts and Humanities**	
3A	Arts	3
3B	Humanities: Literature, Philosophy, Languages other than English	3
Area 4	**Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.)**	
4A	American Institutions (Title 5, Section 40404 Requirement)	3
4B	Social and Behavioral Sciences	3

Area 5	**Physical and Life Sciences**	
5A	Physical Sciences (3 units in Support) [1]	0
5B	Life Sciences (3 units in Support) [3]	0
5C	Laboratory (may be embedded in a 5A or 5B course) (1 units in Support) [1]	0
Area 6	**Ethnic Studies**	
6	Ethnic Studies	3
Upper-Division General Education		
Upper-Division 2/5	Mathematics and Quantitative Reasoning or Physical and Life Sciences (3 units in Major) [1]	0
Upper-Division 3	Arts and Humanities	3
Upper-Division 4	Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.) (3 units in Major) [1]	0
Total Units		**27**

[1] Required in Major or Support; also satisfies General Education (GE) requirement.

Coming soon