

MATERIALS ENGINEERING (BS)

Offered at: San Luis Obispo Campus

The Materials Engineering curriculum has received national recognition for its innovative structure and will provide both breadth and depth in your understanding of science and engineering principles and practices. The curriculum in materials engineering emphasizes practical applications as well as principles. The laboratories are constantly evolving, and our students benefit from frequent exposure to a wide variety of materials testing and analysis equipment. The program is accredited by the Engineering Accreditation Commission ABET (<http://www.ABET.org>). Our students have a reputation for being immediately productive in industry, and they are also actively sought by graduate programs throughout the country.

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.
8. An integrated understanding of scientific and engineering principles underlying the four major elements of the field: structure, properties, processing, and performance related to materials systems.
9. An ability to apply and integrate knowledge from each of the above four elements of the field to solve materials selection and design problems.

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 or Support 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		
MATE 1110	Introduction to Materials Engineering	1
MATE 1210	Principles of Materials Engineering for Majors	3
MATE 1215	Materials Laboratory I	1
MATE 2225	Materials Microscopy Laboratory	1
MATE 2235	Materials Spectroscopy Laboratory	1
MATE 2245	Engineering Analysis and Technical Communication	1
MATE 2280	Materials Thermodynamics and Kinetics	4
MATE 3232	Materials Ethics, Diversity, and Society (Upper-Division 4) ¹	3
MATE 3310	Polymeric Material Systems	4
MATE 3340	Electronic Materials Systems	4
MATE 3360	Metallurgical Materials Systems	4
MATE 3401	Advanced Materials Characterization	1
MATE 3403	Computational Materials Engineering	2
MATE 3480	Composite Material Systems	4
MATE 4300	Materials Selection for the Life Cycle (GWR)	3
MATE 4422	Ceramic and Glass Materials Systems	3

MATE 4461	Senior Project I	1
MATE 4462	Senior Project II	2
Design Elective		
IME 3326	Statistical Decision-Making and Quality Control	3-4
or ME 3234	Design Thinking and Creativity	
Technical Electives		
Select from the following: ²		6
BMED 4434	Micro/Nano Fabrication	
BMED 4435	Micro/Nano Fabrication Laboratory	
BMED 4460	Medical Physiology for Engineers	
BMED 5530	Advanced Issues in Biomaterials	
CE 3352	Structural Analysis	
CE 3355	Reinforced Concrete Design	
CHEM 3380	Foundations of Macromolecular Chemistry	
CHEM 4480	Polymer Synthesis and Characterization	
CHEM 4481	Polymer Synthesis and Characterization Laboratory	
ENVE 4439	Solid and Hazardous Waste Management	
IME 3303	Project Organization and Management	
IME 4401	Sales Engineering	
IME 4421	Engineering Management	
IME 4435	Reliability for Design and Testing	
ITP 3330	Packaging Fundamentals	
ITP 3341	Packaging Polymers and Processing	
ITP 4404	Lean Six Sigma Green Belt Certification Project	
ITP 4411	Packaging Sustainability	
MATE 4390	Fibrous Materials	
MATE 4400	Special Problems for Advanced Undergraduates ³	
MATE 4402	Materials Characterization Theory	
MATE 4410	Nanoscale Materials	
MATE 4420	Biotechnology for Sustainable Materials	
MATE 4425	Corrosion Engineering	
MATE 4440	Welding Metallurgy and Joining of Advanced Materials	
MATE 4450	Fracture and Failure Analysis	
MATE 4456	Materials, Design, and Sustainability of Energy Generation and Storage	
MATE 4470	Special Advanced Topics	
MATE 4471	Special Advanced Laboratory	
MATE 4481	Materials and the Environment	
MATE 4490	Solidification and Densification	
ME 3341	Fluid Mechanics	
ME 4380	Composites Manufacturing, Machining, and Testing	
PHYS 4425	Solid State Physics	
Professional Development Elective		
Select from the following: ²		3-4
BIO 2231	Human Anatomy and Physiology I	
BIO 2232	Human Anatomy and Physiology II	
BMED 2310	Introduction to Electrical Design in Biomedical Engineering	
BMED 2311	Introduction to Electrical Design in Biomedical Engineering Lab	
BMED 4434	Micro/Nano Fabrication	
BMED 4435	Micro/Nano Fabrication Laboratory	
BMED 4460	Medical Physiology for Engineers	
BMED 5530	Advanced Issues in Biomaterials	
BMED 5550	Current and Evolving Topics in Biomedical Engineering	

BUS 2207	Legal Responsibilities of Business	
BUS 2212	Financial Accounting for Nonbusiness Majors	
BUS 3302	International and Cross Cultural Management	
CE 2259	Civil Engineering Materials	
CE 3352	Structural Analysis	
CHEM 3380	Foundations of Macromolecular Chemistry	
CHEM 4480	Polymer Synthesis and Characterization	
CHEM 4481	Polymer Synthesis and Characterization Laboratory	
COMS 3301	Business and Professional Communication	
COMS 3395	Science Communication	
ECON 2030	Microeconomics	
ECON 3015	Programming for Economics and Analytics	
ENVE 2331	Fundamentals of Environmental Engineering	
ENVE 3309	Noise Control and Occupational Safety and Health	
IME 2315	Financial Decision Making for Engineers	
IME 4401	Sales Engineering	
IME 4421	Engineering Management	
IME 4435	Reliability for Design and Testing	
ITP 2211	Industrial Safety and Maintenance	
ITP 2234	Packaging Design Fundamentals	
ITP 3303	Lean Six Sigma Green Belt	
ITP 3330	Packaging Fundamentals	
ITP 3341	Packaging Polymers and Processing	
ITP 3371	Supply Chain Management in Manufacturing and Services	
ITP 4404	Lean Six Sigma Green Belt Certification Project	
ITP 4411	Packaging Sustainability	
MATE 2190	Materials Science of Sports, Food, and Functional Clothing	
MATE 4390	Fibrous Materials	
MATE 4400	Special Problems for Advanced Undergraduates ³	
MATE 4402	Materials Characterization Theory	
MATE 4410	Nanoscale Materials	
MATE 4420	Biotechnology for Sustainable Materials	
MATE 4425	Corrosion Engineering	
MATE 4440	Welding Metallurgy and Joining of Advanced Materials	
MATE 4450	Fracture and Failure Analysis	
MATE 4456	Materials, Design, and Sustainability of Energy Generation and Storage	
MATE 4470	Special Advanced Topics	
MATE 4471	Special Advanced Laboratory	
MATE 4481	Materials and the Environment	
MATE 4490	Solidification and Densification	
MATH 2263	Calculus III	
ME 2212	Engineering Dynamics	
ME 2240	Applied Programming for Mechanical Engineering	
ME 3341	Fluid Mechanics	
ME 4380	Composites Manufacturing, Machining, and Testing	
ME 4451	Engineering, Design, and Social Justice	
STAT 3800	Introduction to Statistical Computing with SAS and SQL	
SUPPORT COURSES		
CHEM 1120	Fundamentals of Chemical Structure and Properties (5A & 5C) ¹	4
CHEM 1122	Fundamentals of Chemical Reactivity	4
or CHEM 2240	Organic Chemistry: Fundamentals and Applications	
EE 2201	Electric Circuits for Non-Majors	2

EE 2241	Electric Circuit Analysis Laboratory I	1
ENGL 1148	Critical Thinking for Technical Writers (1B) ¹	3
ENGR 2211	Introduction to Mechanics	4
IME 1140	Technical Graphics Communication for Design and Manufacturing	1
IME 1142	Materials Joining	1
MATH 1261	Calculus I (2) ¹	4
MATH 1262	Calculus II	4
MATH 2341	Linear Analysis	4
PHYS 1141	General Physics I	4
PHYS 1143	General Physics II	4
STAT 3210	Engineering Statistics (Upper-Division 2/5) ¹	3
GENERAL EDUCATION (GE)		
(See GE program requirements below)		27
FREE ELECTIVES		
Free Electives		0
Total Units		125-127

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

² If a course is taken to meet this requirement, it cannot be double-counted to satisfy another Major or Support requirement.

³ Maximum of 8 units of MATE 4400 may count towards Technical Electives or Professional Development Electives.

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 units in Support) ¹	0
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
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 Support) 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