BS MATERIALS ENGINEERING

Program Learning Outcomes

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/generalrequirementsbachelorsdegree/#generaleducationtext) section of this catalog, including:

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

Note: No Major or Support courses may be selected as credit/no credit.

MAJOR COURSES

MATE 110	Introduction to Materials Engineering Design I	1
MATE 120	Introduction to Materials Engineering Design II	1
MATE 210	Materials Engineering	3
MATE 215	Materials Laboratory I	1
MATE 225	Materials Laboratory II	1
MATE 232	Materials, Ethics, and Society	4
MATE 235	Materials Laboratory III	1
MATE 245	Materials Engineering Analysis	1
MATE 280	Introduction to Materials Thermodynamics	4
MATE 300	Materials Selection for the Life Cycle (GWR)	4
MATE 310	Noncrystalline Material Systems	4
MATE 325	Transport Phenomena I	1
MATE 340	Electronic Materials Systems	4
MATE 350	Structural Materials Systems	4
MATE 360	Metallurgical Materials Systems	4
MATE 370	Kinetics of Materials and Process Design	4
MATE 480	Composite Materials Systems	4
MATE 482 & MATE 483 & MATE 484	Senior Project I and Senior Project II and Senior Project III [1]	5
Technical Electives		
Select from the following: [2,3,4]		12
BMED 420	Principles of Biomaterials Design	
BMED 434/ MATE 430	Micro/Nano Fabrication	
BMED/MATE 435	Microfabrication Laboratory	
BMED/MATE 530	Biomaterials	
CHEM 444	Polymers & Coatings I	
CHEM/MATE 446	Surface Chemistry of Materials	
CHEM 447	Polymers and Coatings Laboratory I	
CPE 488/ IME 458/MATE 458	Microelectronics and Electronics Packaging	
EE/PHYS 422	Polymer Electronics Laboratory	
ENVE 490	Environmental Nanotechnology	
IME 331	Intermediate Metal Casting	
MATE 400	Special Problems for Advanced Undergraduates	
MATE 401	Materials Characterization Techniques	
MATE 402	Materials Characterization Theory	
MATE 403	Computational Materials Analysis	
MATE 410	Nanoscale Engineering	
MATE 420	Biopolymers and Bionanocomposites	
MATE 422	Ceramics and Glasses	
MATE 425	Corrosion Engineering	
MATE 440	Welding Metallurgy and Joining of Advanced Materials	
MATE 445	Joining of Advanced Materials Laboratory	
MATE 450	Fracture and Failure Analysis	
MATE 456	Materials for Electrochemical Energy Storage	
MATE 460	Materials Selection in Mechanical Design	
MATE 465	Ferrous Metallurgy	
MATE 470	Selected Advanced Topics	
MATE 471	Selected Advanced Laboratory	
MATE 485	Materials and the Environment	
MATE 490	Solidification and Densification	
MATE 500	Individual Study	

MATE 550	Micro Systems	
or BMED 432	Micro/Nano System Design	
PHYS 425	Solid State Physics	
PHYS 427	Advanced Topics in Solid State Physics	
Approved Electives/Technical Breadth Electives		
Select from the following: [2,3,4]		8
BIO 231	Human Anatomy and Physiology I	
BMED 212	Introduction to Biomedical Engineering Design	
BMED 310	Biomedical Engineering Measurement and Analysis	
BMED 401	Biomedical Entrepreneurship	
BMED 434/ MATE 430	Micro/Nano Fabrication	
BMED/MATE 435	Microfabrication Laboratory	
BMED/MATE 530	Biomaterials	
BMED 550	Current and Evolving Topics in Biomedical Engineering	
BUS 207	Legal Responsibilities of Business	
BUS 212	Financial Accounting for Nonbusiness Majors	
CE 207	Mechanics of Materials II	
CHEM 444	Polymers & Coatings I	
CHEM/MATE 446	Surface Chemistry of Materials	
CHEM 447	Polymers and Coatings Laboratory I	
CHEM 466	Learning Assistant Seminar	
CPE 488/ IME 458/MATE 458	Microelectronics and Electronics Packaging	
CSC 231	Programming for Engineering Students	
EE/PHYS 422	Polymer Electronics Laboratory	
ECON 221	Microeconomics	
ENGR 322/ SCM 302	The Learn By Doing Lab Teaching Practicum	
ENGR 470	Selected Advanced Topics	
ENGR 471	Selected Advanced Laboratory	
ENVE 490	Environmental Nanotechnology	
IME 223	Process Improvement Fundamentals	
IME 331	Intermediate Metal Casting	
IME 421	Engineering Management	
MATE 400	Special Problems for Advanced Undergraduates	
MATE 401	Materials Characterization Techniques	
MATE 402	Materials Characterization Theory	
MATE 403	Computational Materials Analysis	
MATE 410	Nanoscale Engineering	
MATE 420	Biopolymers and Bionanocomposites	
MATE 422	Ceramics and Glasses	
MATE 425	Corrosion Engineering	
MATE 440	Welding Metallurgy and Joining of Advanced Materials	
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MATE 470	Selected Advanced Topics	
MATE 471	Selected Advanced Laboratory	
MATE 485	Materials and the Environment	
MATE 490	Solidification and Densification	
MATE 500	Individual Study	
MATE 550	Micro Systems	
or BMED 432	Micro/Nano System Design	
MATE 570	Selected Advanced Topics	
MATE 571	Selected Advanced Laboratory	
ME 212	Engineering Dynamics	
ME 341	Fluid Mechanics I	
PHYS 211	Modern Physics I	
PHYS 425	Solid State Physics	
PHYS 427	Advanced Topics in Solid State Physics	
PSC/UNIV 392	Appropriate Technology for the World's People: Design	
PSC/UNIV 492	Appropriate Technology for the World's People: Design	
Approved Electives/Junior Year Elective:		
Select from the following:		4-5
CHEM 312	Organic Chemistry: Fundamentals and Applications	
ENGR 334	Needfinding in New Product Design	
IME 303	Project Organization and Management	
ITP 341	Packaging Polymers and Processing	
MATE 390	Textile and Fiber Engineering	
NR 434	Wood Properties, Products and Sustainable Uses	
SUPPORT COURSES		
CE 204	Mechanics of Materials I	3
CHEM 124	General Chemistry for Physical Science and Engineering I (B1 & B3) [5]	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
EE 201	Electric Circuit Theory	3
EE 251	Electric Circuits Laboratory	1
IME 144	Introduction to Design and Manufacturing	4
MATH 141	Calculus I (B4) [5]	4
MATH 142	Calculus II (B4) [5]	4
MATH 143	Calculus III (Area B Electives) [5]	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 211	Engineering Statics	3

PHYS 141	General Physics I (Area B Electives) [5]	4
PHYS 142	General Physics II	4
PHYS 143	General Physics III	4
Select from the following (Upper-Division B): [5]		7-8
STAT 312 & IME 315	Statistical Methods for Engineers and Financial Decision Making for Engineers	
or		
STAT 321 & IME 315	Probability and Statistics for Engineers and Scientists and Financial Decision Making for Engineers	
or		
STAT 321 & IME 326	Probability and Statistics for Engineers and Scientists and Engineering Test Design and Analysis	
GENERAL EDUCATION		
(See GE program requirements below.)		48
FREE ELECTIVES		
Free Electives		0
Total units		**184-186**

1. ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for MATE 482, MATE 483 and MATE 484 (5) with the one excess unit counting towards Technical Electives.
2. If a course is taken to meet this requirement, it cannot be double-counted to satisfy another Major or Support requirement.
3. Consultation with an advisor is recommended prior to selecting Technical or Approved Electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
4. 8 units maximum of MATE 400 and/or MATE 500 may count towards Technical Electives or Approved Electives/Technical Breadth Electives.
5. Required in Major or Support; also satisfies General Education (GE) requirement.

General Education (GE) Requirements

- 72 units required, 24 of which are specified in Major and/or Support.
- If any of the remaining 48 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/generalrequirementsbachelorsdegree/#generaleducationtext).
- A grade of C- or better is required in one course in each of the following GE Areas: A1 (Oral Communication), A2 (Written Communication), A3 (Critical Thinking), and B4 (Mathematics/Quantitative Reasoning).

Area A	**English Language Communication and Critical Thinking**	
A1	Oral Communication	4
A2	Written Communication	4
A3	Critical Thinking	4
Area B	**Scientific Inquiry and Quantitative Reasoning**	
B1	Physical Science (4 units in Support) [1]	0
B2	Life Science	4
B3	One lab taken with either a B1 or B2 course	
B4	Mathematics/Quantitative Reasoning (8 units in Support) [1]	0
Upper-Division B (4 units in Support) [1]		0
Area B Electives (8 units in Support) [1]		0
Area C	**Arts and Humanities**	
Lower-division courses in Area C must come from three different subject prefixes.		
C1	Arts: Arts, Cinema, Dance, Music, Theater	4
C2	Humanities: Literature, Philosophy, Languages other than English	4
Lower-Division C Elective - Select a course from either C1 or C2.		4
Upper-Division C		4
Area D	**Social Sciences**	
D1	American Institutions (Title 5, Section 40404 Requirement)	4
Area D Elective - Select either a lower-division D2 or upper-division D course.		4
Area E	**Lifelong Learning and Self-Development**	
Lower-Division E		4
Area F	**Ethnic Studies**	
F	Ethnic Studies	4
Total units		**48**

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