BS MANUFACTURING 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.

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
- 2.0 GPA
- Graduation Writing Requirements (GWR)
- U.S. Cultural Pluralism (USCP)

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

MAJOR COURSES

IME 101	Introduction to Industrial and Manufacturing Engineering	1
IME 141	Manufacturing Processes: Net Shape	1
IME 142	Manufacturing Processes: Materials Joining	2
IME 144	Introduction to Design and Manufacturing	4
IME 156	Basic Electronics Manufacturing	2
IME 223	Process Improvement Fundamentals	4
IME 244	Intermediate Design and Manufacturing	2
IME 314	Engineering Economics	3
or IME 315	Financial Decision Making for Engineers	
IME 327	Test Design and Analysis in Manufacturing Engineering	4
IME 330	Fundamentals of Manufacturing Engineering	4
IME 335	Computer-Aided Manufacturing I	4
IME 342	Manufacturing Systems Integration	4
IME 356	Manufacturing Automation	4
IME 417	Supply Chain and Logistics Management	4
IME 418	Product-Process Design	4
IME 430	Quality Engineering	4
IME 450	Manufacturing Process and Tool Engineering	4
IME 481 & IME 482 & IME 483	Senior Design Project I and Senior Design Project II and Senior Design Project III [1, 2]	6
Technical Electives		
Select from Category A (8-13 units) & Category B (0-5 units) below: [3,4]		13
Category A		
BMED 410	Biomechanics	
EE 361	Electronics Laboratory	
EE 434	Automotive Engineering for a Sustainable Future	
IME 301	Operations Research I	
IME 303	Project Organization and Management	
IME 305	Operations Research II	
IME 312	Data Management and System Design	
IME 319	Human Factors Engineering	
IME 331	Intermediate Metal Casting	
IME 336	Computer-Aided Manufacturing II	
IME 400	Special Problems for Advanced Undergraduates	
IME 408	Systems Engineering	
IME 409	Economic Decision Systems	
IME 410	Production Planning and Control Systems	
IME 415	Service Enterprises Engineering and Management	
IME 416	Automation of Industrial Systems	
IME 420	Simulation	
IME 424	Industrial Engineering in Healthcare	
IME 428	Engineering Metrology	
IME 429	Ergonomics Laboratory	
IME 432	Additive Manufacturing	
IME 435	Reliability for Design and Testing	
IME 443	Facilities Planning and Design	
IME 451	Radio Frequency Identification and Sensing System Design	
IME 456	The Industrial Internet of Things	
IME 457	Advanced Electronic Manufacturing	
IME/MATE 458/ CPE 488	Microelectronics and Electronics Packaging	
IME 470	Selected Advanced Topics	

IME 471	Selected Advanced Laboratory
IME 510	Systems Engineering I
IME 511	Systems Engineering II
IME 520	Advanced Information Systems for Operations
IME 527	Design of Experiments
IME 541	Advanced Operations Research
IME 542	Applied Reliability Engineering
IME 543	Applied Human Factors
IME 544	Advanced Topics in Engineering Economy
IME 545	Advanced Topics in Simulation
MATE 401	Materials Characterization Techniques
MATE 410	Nanoscale Engineering
MATE 430	Micro/Nano Fabrication
MATE 435	Microfabrication Laboratory
MATE 440	Welding Metallurgy and Joining of Advanced Materials
MATE 445	Joining of Advanced Materials Laboratory
MATH 344	Linear Analysis II
MATH 350	Mathematical Software
ME 303	Thermodynamics II
ME 305	Introduction to Mechatronics
ME 318	Mechanical Vibrations
ME 326	Intermediate Dynamics
ME 328	Design for Strength and Stiffness
ME 329	Mechanical Systems Design
ME 341	Fluid Mechanics I
ME 343	Heat Transfer
ME 405	Mechatronics
ME 415	Energy Conversion
Category B	
BMED 212	Introduction to Biomedical Engineering Design
BUS/ENGR 310	Introduction to Entrepreneurship
BUS 311	Managing Technology in the International Legal Environment
BUS 346	Principles of Marketing
BUS 382	Leadership and Organizations
CE 207	Mechanics of Materials II [5]
ENGR 350	The Global Environment
IME 212	Introduction to Enterprise Analytics
IME 401	Sales Engineering
IME 421	Engineering Management
IME 441	Engineering Supervision I
IME 460	Introduction to Value Chain Analysis
ITP 326	Product Design and Development
ITP 330	Packaging Fundamentals
ITP 341	Packaging Polymers and Processing
ITP 371	Supply Chain Management in Manufacturing and Services
ITP 406	Professional Technical Selling
ITP 428	Commercialization of New Technologies
ME 234	Philosophy of Design

SUPPORT COURSES		
BIO 213 & BMED 213	Life Science for Engineers and Bioengineering Fundamentals (B2) [6]	4
CE 204	Mechanics of Materials I [5]	3
CHEM 124	General Chemistry for Physical Science and Engineering I (B1 & B3) [6]	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CSC 232	Computer Programming for Scientists and Engineers	3
EE 201	Electric Circuit Theory	3
EE 251	Electric Circuits Laboratory	1
EE 321	Electronics	3
ENGL 147	Writing Arguments about STEM (A3) [6]	4
MATE 210	Materials Engineering	3
MATE 215	Materials Laboratory I	1
MATH 141	Calculus I (B4) [6]	4
MATH 142	Calculus II (B4) [6]	4
MATH 143	Calculus III (Area B Electives) [6]	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 211	Engineering Statics	3
ME 212	Engineering Dynamics	3
ME 302	Thermodynamics I	3
PHYS 141	General Physics I (Area B Electives) [6]	4
PHYS 142	General Physics II	4
PHYS 143	General Physics III	4
STAT 321	Probability and Statistics for Engineers and Scientists (Upper-Division B) [6]	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		40
FREE ELECTIVES		
Free Electives		0
Total units		**192**

1 ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for IME 481, IME 482 and IME 483 (6).

2 ENGR 463, ENGR 464 and ENGR 465 (6) may substitute for IME 481, IME 482 and IME 483 (6).

3 If a course is taken to meet the Technical Electives requirement, it cannot be double-counted to satisfy another Major or Support requirement.

4 Consultation with an advisor is recommended prior to selecting Technical Electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals. Upper-division courses not on this list may substitute as Technical Electives, if approved by an advisor and the Industrial and Manufacturing Engineering department chair.

[5] CE 208 (5) may substitute for both CE 204 (3) and CE 207 (2).

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

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- If any of the remaining 40 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 units in Support) [1]	0
Area B	**Scientific Inquiry and Quantitative Reasoning**	
B1	Physical Science (4 units in Support) [1]	0
B2	Life Science (4 units in Support) [1]	0
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		**40**

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