BS MANUFACTURING ENGINEERING

Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering (includes proficiency in materials)
2. An ability to design and conduct experiments, as well as to analyze and interpret data (includes manufacturing laboratory or facility experience, the ability to measure manufacturing process variables and develop technical inferences about the process)
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (includes proficiency in manufacturing processes, the ability to design manufacturing processes that result in products that meet specific material and other requirements; proficiency in process, assembly and product engineering, the ability to design products and the equipment, tooling, and environment necessary for their manufacture; and proficiency in manufacturing systems design, the ability to analyze, synthesize, and control manufacturing operations using statistical methods)
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (includes manufacturing competitiveness, of the ability to create competitive advantage through manufacturing planning, strategy, quality, and control)
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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 (http://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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IME 101</td>
<td>Introduction to Industrial and Manufacturing Engineering</td>
<td>1</td>
</tr>
<tr>
<td>IME 140</td>
<td>Graphics Communication and Modeling</td>
<td>2</td>
</tr>
<tr>
<td>IME 141</td>
<td>Manufacturing Processes: Net Shape</td>
<td>1</td>
</tr>
<tr>
<td>IME 142</td>
<td>Manufacturing Processes: Materials Joining</td>
<td>2</td>
</tr>
<tr>
<td>IME 144</td>
<td>Introduction to Design and Manufacturing</td>
<td>4</td>
</tr>
<tr>
<td>IME 156</td>
<td>Basic Electronics Manufacturing</td>
<td>2</td>
</tr>
<tr>
<td>IME 223</td>
<td>Process Improvement Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>IME 314</td>
<td>Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>IME 327</td>
<td>Test Design and Analysis in Manufacturing Engineering</td>
<td>4</td>
</tr>
<tr>
<td>IME 330</td>
<td>Fundamentals of Manufacturing Engineering</td>
<td>4</td>
</tr>
<tr>
<td>IME 335</td>
<td>Computer-Aided Manufacturing I</td>
<td>4</td>
</tr>
<tr>
<td>IME 342</td>
<td>Manufacturing Systems Integration</td>
<td>4</td>
</tr>
<tr>
<td>IME 356</td>
<td>Manufacturing Automation</td>
<td>4</td>
</tr>
<tr>
<td>IME 417</td>
<td>Supply Chain and Logistics Management</td>
<td>4</td>
</tr>
<tr>
<td>IME 418</td>
<td>Product-Process Design</td>
<td>4</td>
</tr>
<tr>
<td>IME 430</td>
<td>Quality Engineering</td>
<td>4</td>
</tr>
<tr>
<td>IME 450</td>
<td>Manufacturing Process and Tool Engineering</td>
<td>4</td>
</tr>
<tr>
<td>IME 481</td>
<td>Senior Design Project I</td>
<td>2</td>
</tr>
<tr>
<td>IME 482</td>
<td>Senior Design Project II</td>
<td>3</td>
</tr>
</tbody>
</table>

Technical Electives

Select from the following:

- AG/ISLA/EDES/ENGR/SCM/UNIV 350: The Global Environment
- BMED 212: Introduction to Biomedical Engineering Design
- BMED 410: Biomechanics
- BUS 310: Introduction to Entrepreneurship
- BUS 311: Managing Technology in the International Legal Environment
- BUS 346: Principles of Marketing
- CE 207: Mechanics of Materials II
- 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/HNRS 322: Leadership and Project Management
- IME 336: Computer-Aided Manufacturing II
- IME 351: Advanced Material Removal Process Design
- IME 401: Sales Engineering
- IME 408: Systems Engineering
- IME 410: Production Planning and Control Systems
- IME 416: Automation of Industrial Systems
IME 420       Simulation
IME 421       Manufacturing Organizations
IME 428       Engineering Metrology
IME 429       Ergonomics Laboratory
IME 432       Additive Manufacturing
IME 435       Reliability for Design and Testing
IME 441       Engineering Supervision I
IME 442       Engineering Supervision II
IME 443       Facilities Planning and Design
IME 451       Radio Frequency Identification
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/AERO 510       Systems Engineering I
IME/AERO 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
ITP 326       Product Design and Development
ITP 329       Industrial Materials
ITP 330       Packaging Fundamentals
ITP 341       Packaging Polymers and Processing
ITP 371       Supply Chain Management in Manufacturing and Services
ITP 406       Industrial Sales
ITP 428       Commercialization of New Technologies
MATE 410       Nanoscale Engineering
MATE 430       Micro/Nano Fabrication
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 305       Introduction to Mechatronics
ME 341       Fluid Mechanics I
ME 415       Energy Conversion

CHEM 125       General Chemistry for Physical Science and Engineering II
CSC 232       Computer Programming for Scientists and Engineers
EE 201       Electric Circuit Theory
EE 251       Electric Circuits Laboratory
EE 321       Electronics
ENGL 149       Technical Writing for Engineers (A3)  
MATE 210       Materials Engineering
MATE 215       Materials Laboratory I
MATH 141       Calculus I (B1)  
MATH 142       Calculus II (B1)  
MATH 143       Calculus III (Add'l Area B)  
MATH 241       Calculus IV
MATH 244       Linear Analysis I
ME 211       Engineering Statics
ME 212       Engineering Dynamics
ME 302       Thermodynamics I
PHYS 132       General Physics II
PHYS 133       General Physics III
PHYS 141       General Physics IA (Add'l Area B)  
STAT 321       Probability and Statistics for Engineers and Scientists (B6)  

GENERAL EDUCATION (GE)

FREE ELECTIVES
Free Electives

Total units 192

1 Required in Support; also satisfies GE
2 The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).
3 At least 10 units must be upper level (300-level or above) engineering or computer science courses.
4 A maximum of 4 units of technical electives may be upper level (300-level or above) courses from outside of the College of Engineering or lower level (100 or 200 level) engineering or computer science courses.
5 Students may take other 300 level or above courses not in the list subject to the approval by advisor and IME department chair. Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
6 ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives.

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext).
- Minimum of 8 units required at the 300 level.

Area A Communication
<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1  Expository Writing</td>
<td>4</td>
</tr>
<tr>
<td>A2  Oral Communication</td>
<td>4</td>
</tr>
<tr>
<td>A3  Reasoning, Argumentation and Writing (4 units in Support)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Area B</strong> Science and Mathematics</td>
<td></td>
</tr>
<tr>
<td>B1  Mathematics/Statistics (8 units in Support)</td>
<td>0</td>
</tr>
<tr>
<td>B2  Life Science (4 units in Support)</td>
<td>0</td>
</tr>
<tr>
<td>B3  Physical Science (4 units in Support)</td>
<td>0</td>
</tr>
<tr>
<td>B4  One lab taken with either a B2 or B3 course</td>
<td></td>
</tr>
<tr>
<td>B6  Upper-division Area B (4 units in Support)</td>
<td>0</td>
</tr>
<tr>
<td>Additional Area B units (8 units in Support)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Area C</strong> Arts and Humanities</td>
<td></td>
</tr>
<tr>
<td>C1  Literature</td>
<td>4</td>
</tr>
<tr>
<td>C2  Philosophy</td>
<td>4</td>
</tr>
<tr>
<td>C3  Fine/Performing Arts</td>
<td>4</td>
</tr>
<tr>
<td>C4  Upper-division elective</td>
<td>4</td>
</tr>
<tr>
<td><strong>Area D/E</strong> Society and the Individual</td>
<td></td>
</tr>
<tr>
<td>D1  The American Experience (Title 5, Section 40404 requirement)</td>
<td>4</td>
</tr>
<tr>
<td>D2  Political Economy</td>
<td>4</td>
</tr>
<tr>
<td>D3  Comparative Social Institutions</td>
<td>4</td>
</tr>
<tr>
<td>D4  Self Development (CSU Area E)</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total units</strong></td>
<td>40</td>
</tr>
</tbody>
</table>

1 Required in Support; also satisfies GE