Program Learning Outcomes

In order to prepare our alumni for their career accomplishments expressed by the Program Educational Objectives, the students in the program will be proficient in the following skills upon graduation:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and mathematics.
   a. The student will be able to apply basic math and science principles and associated analysis techniques.
   b. The student will be able to evaluate components, systems, and processes and be able to develop appropriate models of engineering systems.
   c. The student will be able to analyze their models, interpret their results, and formulate appropriate action.

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.
   a. The student will be able to recognize a need, identify constraints, and develop appropriate design specifications.
   b. Using the above specifications, the student will be able to synthesize conceptual solutions for a component, system, or process.
   c. The student will be able to use analysis techniques to refine and select the design of a component, system, or process.
   d. The student will be able to build a functional prototype and assess if it meets design specifications.

3. An ability to communicate effectively with a range of audiences.
   a. The student will be able to write an effective memorandum, letter, abstract, and project report for a wide range of audiences.
   b. The student will be able to give a coherent and effective oral presentation for a wide range of audiences.
   c. The student will be able to critique writing samples and oral presentations and identify both strong points and weak points in grammar, clarity, and organization.

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.
   a. The student will be able to interpret engineering professional codes of ethics and to identify situations with ethical concerns.
   b. The student will be able to identify and mitigate health and safety concerns associated with their design.
   c. The student will be able to assess the environmental, societal, and economic impact of their engineering solutions.

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.
   a. The student will be able to manage a team project by establishing goals, planning tasks, and meeting objectives.
   b. The student will be able to collaborate effectively on a team and contribute to an inclusive teamwork environment.
   c. The student will be able to identify when problems occur due to poor interactions among team members and identify ways to improve team dynamics.

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
   a. The student will be able to select and operate appropriate instrumentation used in engineering measurement.
   b. The student will be able to design and conduct an experiment and compare the results to those predicted by an analytical model.
   c. The student will be able to interpret and draw conclusions from the results.

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
   a. The student will be able to recognize the limitations of their knowledge and to acquire new knowledge using appropriate learning strategies.
   b. The student will be able to find and use appropriate technical resources.
   c. The student will be able to identify their need for additional learning.

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

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

Major Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 128</td>
<td>Introduction to Mechanical Engineering I</td>
<td>1</td>
</tr>
<tr>
<td>ME 129</td>
<td>Introduction to Mechanical Engineering II</td>
<td>1</td>
</tr>
<tr>
<td>ME 130</td>
<td>Introduction to Mechanical Engineering III</td>
<td>1</td>
</tr>
<tr>
<td>ME 163</td>
<td>Freshmen Orientation to Mechanical Engineering I</td>
<td>1</td>
</tr>
<tr>
<td>ME 211</td>
<td>Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>ME 212</td>
<td>Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 234</td>
<td>Philosophy of Design</td>
<td>3</td>
</tr>
<tr>
<td>ME 236</td>
<td>Measurement and Engineering Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ME 251</td>
<td>Introduction to Detailed Design with Solid Modeling</td>
<td>2</td>
</tr>
<tr>
<td>ME 302</td>
<td>Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ME 303</td>
<td>Thermodynamics II</td>
<td>3</td>
</tr>
<tr>
<td>ME 318</td>
<td>Mechanical Vibrations</td>
<td>4</td>
</tr>
</tbody>
</table>
BS Mechanical Engineering

ME 322 Introduction to System Dynamics 4
ME 328 Design for Strength and Stiffness 4
ME 329 Mechanical Systems Design 4
ME 341 Fluid Mechanics I 3
ME 347 Fluid Mechanics II 4
ME 350 Heat Transfer 4
ME 420 Thermal System Design 4

Concentration 25-27

SUPPORT COURSES
BIO 213 & BMED 213 Life Science for Engineers and Bioengineering Fundamentals (B2) 2 4
CE 204 Mechanics of Materials I 3 3
CE 207 Mechanics of Materials II 3 2
CHEM 124 General Chemistry for Physical Science and Engineering I (B1 & B3) 2 4
CHEM 125 General Chemistry for Physical Science and Engineering II 4
CSC 231 Programming for Engineering Students 2-3
or CSC 234 C and Unix
EE 201 Electric Circuit Theory 3
EE 251 Electric Circuits Laboratory 1
EE 321 Electronics 3
EE 361 Electronics Laboratory 1
ENGL 149 Technical Writing for Engineers (A3) 2 4
IME 142 Manufacturing Processes: Materials Joining 2
IME 145 & IME 146 Subtractive Manufacturing Processes for Mechanical Designs I and Subtractive Manufacturing Processes for Mechanical Designs II 2
or IME 143 Manufacturing Processes: Material Removal
MATE 210 Materials Engineering 4
& MATE 215 and Materials Laboratory I
MATH 141 Calculus I (B4) 2 4
MATH 142 Calculus II (B4) 2 4
MATH 143 Calculus III (Area B Electives) 2 4
MATH 241 Calculus IV 4
MATH 244 Linear Analysis I 4
MATH 344 Linear Analysis II (Upper-Division B) 2 4
PHYS 141 General Physics IA (Area B Electives) 2 4
PHYS 132 General Physics II 4
PHYS 133 General Physics III 4

Manufacturing Processes Elective
Select from the following: 1-4
IME 141 Manufacturing Processes: Net Shape
ITP 341 Packaging Polymers and Processing
ME 161 Introduction to Composite Materials Manufacturing

GENERAL EDUCATION
(See GE program requirements below.) 40

FREE ELECTIVES
Free Electives 0
Total units 196-202

1 ME 228, ME 263 and ME 264 are required in lieu of ME 128, ME 129, ME 130, and ME 163 for transfer students.
2 Required in Major or Support; also satisfies General Education (GE) requirement.
3 May take CE 208 in place of CE 204 and CE 207.
4 IME 143 is required in lieu of IME 145 and IME 146 for change of major and transfer students.

Concentrations (select one)

- General (http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/mechanicalengineering/bsmechanicalengineering/generalconcentration/)
- Energy Resources (http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/mechanicalengineering/bsmechanicalengineering/energysourcesconcentration/)
- Heating, Ventilating, Air-Conditioning and Refrigerating (HVAC&R) (http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/mechanicalengineering/bsmechanicalengineering/hvacconcentration/)
- Mechatronics (http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/mechanicalengineering/bsmechanicalengineering/mechatronicsconcentration/)
- Manufacturing (http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/mechanicalengineering/bsmechanicalengineering/manufacturingconcentration/)

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 (http://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
<table>
<thead>
<tr>
<th>Area</th>
<th>Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area B</strong></td>
<td>Electives (8 units in Support)</td>
</tr>
<tr>
<td><strong>Area C</strong></td>
<td><strong>Arts and Humanities</strong></td>
</tr>
<tr>
<td>C1</td>
<td>Arts: Arts, Cinema, Dance, Music, Theater</td>
</tr>
<tr>
<td>C2</td>
<td>Humanities: Literature, Philosophy, Languages other than English</td>
</tr>
<tr>
<td>C3</td>
<td>Lower-Division C Elective - Select a course from either C1 or C2.</td>
</tr>
<tr>
<td>D1</td>
<td>American Institutions (Title 5, Section 40404 Requirement)</td>
</tr>
<tr>
<td>D2</td>
<td>Lower-Division D</td>
</tr>
<tr>
<td>D3</td>
<td>Area D Elective - Select either a lower-division or upper-division course.</td>
</tr>
<tr>
<td><strong>Area E</strong></td>
<td><strong>Lifelong Learning and Self-Development</strong></td>
</tr>
<tr>
<td>E1</td>
<td>Lower-Division E</td>
</tr>
<tr>
<td><strong>Total units</strong></td>
<td></td>
</tr>
</tbody>
</table>

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