BS COMPUTER ENGINEERING

Program Learning Outcomes
In addition to the general abilities expected of College of Engineering graduates, computer engineering students are expected to graduate with:

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.

In addition to the general abilities expected of College of Engineering graduates, computer engineering students are expected to graduate with:

• Knowledge of probability and statistics, including applications appropriate to CPE program objectives.
• Knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to CPE program objectives.
• Knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

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
• 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPE 100</td>
<td>Computer Engineering Orientation</td>
<td>1</td>
</tr>
<tr>
<td>CPE/CSC 101</td>
<td>Fundamentals of Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>CPE/CSC 123</td>
<td>Introduction to Computing</td>
<td>4</td>
</tr>
<tr>
<td>CPE/CSC 202</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CPE/CSC 203</td>
<td>Project-Based Object-Oriented Programming and Design</td>
<td>4</td>
</tr>
<tr>
<td>CPE/EE 233</td>
<td>Computer Design and Assembly Language Programming</td>
<td>4</td>
</tr>
<tr>
<td>CPE 315</td>
<td>Computer Architecture</td>
<td>4</td>
</tr>
<tr>
<td>or CPE 333</td>
<td>Computer Hardware Architecture and Design</td>
<td>4</td>
</tr>
<tr>
<td>CPE/EE 329</td>
<td>Microcontroller-Based Systems Design</td>
<td>4</td>
</tr>
<tr>
<td>or CPE 316</td>
<td>Microcontrollers and Embedded Applications</td>
<td>4</td>
</tr>
<tr>
<td>or EE 336</td>
<td>Microprocessor System Design</td>
<td>4</td>
</tr>
<tr>
<td>CPE/CSC 357</td>
<td>Systems Programming</td>
<td>4</td>
</tr>
<tr>
<td>CPE 350</td>
<td>Capstone I 2</td>
<td>4</td>
</tr>
<tr>
<td>CPE 450</td>
<td>Capstone II 2</td>
<td>3</td>
</tr>
<tr>
<td>CPE/CSC 453</td>
<td>Introduction to Operating Systems</td>
<td>4</td>
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</tbody>
</table>

Select from the following: 3

CPE 461 & CPE 462 Senior Project I and Senior Project II

or

CSC 497 & CSC 498 Research Senior Project I and Research Senior Project II

CPE 464 Introduction to Computer Networks

CSC 248 Discrete Structures

EE 211 Electric Circuit Analysis I

& EE 241 and Electric Circuit Analysis Laboratory II

Select from the following: 4-5

EE 112 Electric Circuit Analysis I

& IME 156 and Basic Electronics Manufacturing

EE 112 Electric Circuit Analysis I

& IME 458 and Microelectronics and Electronics Packaging

EE 113 Electric Circuit Analysis I

& EE 143 and Electronics Manufacturing and Circuit Analysis Laboratory

EE 212 Electric Circuit Analysis III

& EE 242 and Electric Circuit Analysis Laboratory III

Select from the following: 3

EE 228 Continuous-Time Signals and Systems

CPE 327 & CPE 367 Digital Signals and Systems and Digital Signals and Systems Laboratory

EE 306 Semiconductor Device Electronics

& EE 346 and Semiconductor Device Electronics Laboratory

EE 307 Digital Electronics and Integrated Circuits

& EE 347 and Digital Electronics and Integrated Circuits Laboratory

Technical Electives 4,5,6

Select from the following: 4

Any 300-500 level CPE Course

Any 300-500 level CSC or EE Course
CPE 400  Special Problems for Undergraduates  
(up to 4 units)

Up to four units from the following:

- BMED 432  Micro/Nano System Design
- BMED 434/EE 423/MATE 430  Micro/Nano Fabrication
- CHEM/MATE 435  Microfabrication Laboratory
- CHEM 312  Survey of Organic Chemistry
- CSC 300  Professional Responsibilities
- CPE 488/IME 458/MATE 458  Microelectronics and Electronics
- DATA 301  Introduction to Data Science
- IME 301  Operations Research I
- IME 303  Project Organization and Management
- IME 314  Engineering Economics
- IME 315  Financial Decision Making for Engineers
- IME 319  Human Factors Engineering
- IME 401  Sales Engineering
- IME 457  Advanced Electronic Manufacturing
- MATH 304  Vector Analysis
- MATH 408  Complex Analysis I
- MATH 409  Complex Analysis II
- MATH 451  Numerical Analysis I
- ME 405  Mechatronics
- PHYS 322  Vibrations and Waves
- PHYS 323  Optics
- PHYS 408  Electromagnetic Fields and Waves I
- PHYS 412  Solid State Physics
- PHYS 452  Solid State Physics Laboratory

**SUPPORT COURSES**

- CHEM 124  General Chemistry for Physical Science and Engineering I (B1 & B3) 7
- CHEM 224  General Chemistry for Physical Science and Engineering II

Select from the following: (C2) 7

- PHIL 230  Philosophical Classics: Knowledge and Reality (C2) 7
- PHIL 231  Philosophical Classics: Ethics and Political Philosophy

Select from the following: (Upper-Division C) 7

- PHIL 323  Ethics, Science and Technology
- PHIL 327  Robot Ethics
- PHIL 328  Technologies and Ethics of Warfare
- PHIL 339  Biomedical Ethics
- PHIL 340  Environmental Ethics

**Approved CSC, EE, Math, or Science Elective**

Select from the following: 3

- CHEM 125  General Chemistry for Physical Science and Engineering II
- CPE/EE 328  Discrete Time Signals and Systems
- CSC 349  Design and Analysis of Algorithms

**BS Computer Engineering**

**Design and Analysis of Algorithms**

**Discrete Time Signals and Systems**

**Science and Engineering II**

**General Chemistry for Physical Biomedical Ethics**

**Technologies and Ethics of Warfare**

**Robot Ethics**

**Ethics, Science and Technology**

**Philosophical Classics: Ethics and Political Philosophy**

**Area A**

**English Language Communication and Critical Thinking**

A1  Oral Communication  4
<table>
<thead>
<tr>
<th>Category</th>
<th>Course Description</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>A2</td>
<td>Written Communication</td>
<td>4</td>
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<tr>
<td>A3</td>
<td>Critical Thinking</td>
<td>4</td>
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<tr>
<td><strong>Area B</strong></td>
<td><strong>Scientific Inquiry and Quantitative Reasoning</strong></td>
<td>4</td>
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<tr>
<td>B1</td>
<td>Physical Science (4 units in Support)</td>
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<tr>
<td>B2</td>
<td>Life Science</td>
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<td>B3</td>
<td>One lab taken with either a B1 or B2 course</td>
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<tr>
<td>B4</td>
<td>Mathematics/Quantitative Reasoning (8 units in Support)</td>
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<tr>
<td><strong>Upper-Division B (4 units in Support)</strong></td>
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<tr>
<td><strong>Area B Electives (8 units in Support)</strong></td>
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<tr>
<td><strong>Area C</strong></td>
<td><strong>Arts and Humanities</strong></td>
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<tr>
<td>C1</td>
<td>Arts: Arts, Cinema, Dance, Music, Theater</td>
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<tr>
<td>C2</td>
<td>Humanities: Literature, Philosophy, Languages other than English (4 units in Support)</td>
<td>0</td>
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<td><strong>Lower-Division C Elective - Select a course from either C1 or C2.</strong></td>
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<td><strong>Upper-Division C (4 units in Support)</strong></td>
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<tr>
<td><strong>Area D</strong></td>
<td><strong>Social Sciences</strong></td>
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<tr>
<td>D1</td>
<td>American Institutions (Title 5, Section 40404 Requirement)</td>
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<tr>
<td><strong>Area D Elective - Select either a lower-division D2 or upper-division D course.</strong></td>
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<tr>
<td><strong>Area E</strong></td>
<td><strong>Lifelong Learning and Self-Development</strong></td>
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<td>Lower-Division E</td>
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<tr>
<td><strong>Area F</strong></td>
<td><strong>Ethnic Studies</strong></td>
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<td>Lower-Division F</td>
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<td><strong>Total units</strong></td>
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1 Required in Major or Support; also satisfies General Education (GE) requirement.