## 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 (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

| CPE 100 | Computer Engineering Orientation | 1 |
| :--- | :--- | :--- |
| CPE/CSC 101 | Fundamentals of Computer Science | 4 |
| CPE/CSC 123 | Introduction to Computing ${ }^{1}$ | 4 |


| CPE/EE 133 | Digital Design | 4 |
| :---: | :---: | :---: |
| CPE/CSC 202 | Data Structures | 4 |
| CPE/CSC 203 | Project-Based Object-Oriented Programming and Design | 4 |
| CPE/EE 233 | Computer Design and Assembly Language Programming | 4 |
| CPE 315 or CPE 333 | Computer Architecture <br> Computer Hardware Architecture an | 4 |
| CPE/EE 329 <br> or CPE 316 | Microcontroller-Based Systems <br> Design <br> Microcontrollers and Embedded Appli | 4 |
| CPE/CSC 357 | Systems Programming | 4 |
| CPE 350 | Capstone ${ }^{2}$ | 4 |
| CPE 450 | Capstone II ${ }^{2}$ | 3 |
| CPE/CSC 453 | Introduction to Operating Systems | 4 |
| Select from the following: ${ }^{3}$ |  | 4-5 |
| CPE 461 <br> \& CPE 462 | Senior Project I and Senior Project II |  |
| or |  |  |
| $\begin{aligned} & \text { CSC } 497 \\ & \& \text { CSC } 498 \end{aligned}$ | Research Senior Project I and Research Senior Project II |  |
| CPE 464 | Introduction to Computer Networks | 4 |
| CSC 248 | Discrete Structures | 4 |
| CPE 327 <br> \& CPE 367 <br> or EE 228 | Digital Signals and Systems and Digital Signals and Systems Laboratory <br> Continuous-Time Signals and System | 4 |
| $\begin{aligned} & \text { CPE } 321 \\ & \text { or CPE } 422 \\ & \text { or CPE } 426 \end{aligned}$ | Introduction to Computer Security <br> Network Security <br> Introduction to Hardware Security | 4 |
| EE 115 <br> \& EE 145 | Electrical and Electronic Circuits I and Electrical and Electronic Circuits I Laboratory | 4 |
| EE 215 <br> \& EE 245 | Electrical and Electronic Circuits II and Electrical and Electronic Circuits II Laboratory | 4 |
| EE 315 | Electrical and Electronic Circuits III | 4 |
| Technical Electives ${ }^{\text {3,4,5 }}$ |  |  |
| Select from the | wing: | 19 |
| Any 300-500 level CPE Course (up to 4 units of CPE 400) |  |  |
| Any 300-500 level CSC or EE Course |  |  |
| Up to 8 units of any 200-500 level course offered by the College of Engineering or College of Science and Mathematics |  |  |
| SUPPORT COURSES |  |  |
| CHEM 124 | General Chemistry for Physical Science and Engineering I (B1 \& B3) ${ }^{6}$ | 4 |
| Select from the | wing: (C2) ${ }^{6}$ | 4 |
| PHIL 230 | Philosophical Classics: Knowledge and Reality |  |
| PHIL 231 | Philosophical Classics: Ethics and Political Philosophy |  |
| Any GE Area C2 Course |  |  |
| Select from the following: (Upper-Division C) ${ }^{6}$ |  | 4 |
| 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 |  |
| ES 350 | Gender, Race, Culture, Science \& Technology | 4 |
| or ES 351 | Gender, Race, Class, Nation in Global Engineering, Technology \& International Development |  |
| 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 |
| PHYS 141 | General Physics I (Area B Electives) ${ }^{6}$ | 4 |
| PHYS 142 | General Physics II | 4 |
| PHYS 143 | General Physics III | 4 |
| STAT 350 | Probability and Random Processes for Engineers (Upper-Division B) ${ }^{6}$ | 4 |

## GENERAL EDUCATION (GE)

| (See GE program requirements below.) | 40 |
| :--- | :--- |
| FREE ELECTIVES |  |


| Free Electives | 0 |
| :--- | ---: |
| Total units | $191-192$ |

1 An additional 4 units of Technical Electives may be substituted, although new students are strongly encouraged to take CSC 123/CPE 123.
2 ENGR 459, ENGR 460, ENGR 461, and CPE 400 (7) or ENGR 463, ENGR 464, ENGR 465, and CPE 400 (7) may substitute for CPE 350 and CPE 450 (7).
3
Consultation with an advisor is recommended prior to selecting Approved or Technical Electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
Courses taken to meet the Technical Electives requirement cannot be double-counted to satisfy another Major or Support requirement.
5 The following courses may not be used to satisfy this requirement: COOP units; BUS 499; CSC 304, CSC 320, CSC 364, CSC 400, CSC 500; EE 321, EE 322, EE 361, EE 400, EE 460, EE 500, EE 563. A student with credit in CPE 327/CPE 367 cannot take EE 328/EE 368 for credit.
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 |
| Area B | Scientific Inquiry and Quantitative Reasoning |  |
| B1 | Physical Science (4 units in Support) | 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 units in Support) ${ }^{1}$ | 0 |
| Lower-Division C Elective - Select a course from either C1 or C2. |  | 4 |
| Upper-Division C (4 units in Support) ${ }^{1}$ |  | 0 |
| Area D | Social Sciences |  |
| D1 | American Institutions (Title 5, Section 40404 Requirement) | 4 |
| Area D Elective - Select either a lower-division D2 or upperdivision D course. |  | 4 |
| Area E | Lifelong Learning and SelfDevelopment |  |
| 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.

