BS SOFTWARE 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 (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>
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<tbody>
<tr>
<td>CSC/CPE 101</td>
<td>Fundamentals of Computer Science</td>
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<tr>
<td>CSC/CPE 102</td>
<td>Accelerated Introduction to Computer Science</td>
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<tr>
<td>CSC/CPE 202</td>
<td>Data Structures</td>
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<tr>
<td>CSC/CPE 123</td>
<td>Introduction to Computing</td>
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<tr>
<td>CSC/CPE 203</td>
<td>Project-Based Object-Oriented Programming and Design</td>
<td>4</td>
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<tr>
<td>CSC 225</td>
<td>Introduction to Computer Organization</td>
<td>4</td>
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<tr>
<td>CSC 300</td>
<td>Professional Responsibilities</td>
<td>4</td>
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<tr>
<td>CSC 305</td>
<td>Individual Software Design and Development</td>
<td>4</td>
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<tr>
<td>CSC 308</td>
<td>Software Engineering I</td>
<td>4</td>
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<tr>
<td>CSC 309</td>
<td>Software Engineering II</td>
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<td>CSC 348</td>
<td>Discrete Structures</td>
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<td>CSC 349</td>
<td>Design and Analysis of Algorithms</td>
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<td>CSC/CPE 357</td>
<td>Systems Programming</td>
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<td>CSC 365</td>
<td>Introduction to Database Systems</td>
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<td>CSC 402</td>
<td>Software Requirements Engineering</td>
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<td>CSC 405</td>
<td>Software Construction</td>
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<td>CSC 406</td>
<td>Senior Project - Software Deployment</td>
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<td>CSC 430</td>
<td>Programming Languages</td>
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<tr>
<td>CSC 484</td>
<td>User-Centered Interface Design and Development</td>
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Select Technical Electives based on guidelines below

SUPPORT COURSES
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<td>IME 314</td>
<td>Engineering Economics</td>
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<tr>
<td>or IME 315</td>
<td>Financial Decision Making for Engineers</td>
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<tr>
<td>MATH 141</td>
<td>Calculus I (B1)</td>
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<td>MATH 142</td>
<td>Calculus II (B1)</td>
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<td>MATH 143</td>
<td>Calculus III (Add'l Area B)</td>
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<td>MATH 241</td>
<td>Calculus IV</td>
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<td>MATH 244</td>
<td>Linear Analysis I</td>
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<td>PSY 201/202</td>
<td>General Psychology (E)</td>
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<td>PSY 350</td>
<td>Teamwork</td>
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<tr>
<td>or COMS 217</td>
<td>Small Group Communication</td>
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<tr>
<td>STAT 312</td>
<td>Statistical Methods for Engineers (B6)</td>
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Life Science Support Electives:
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<td>BIO 111</td>
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<tr>
<td>BIO 161</td>
<td>Introduction to Cell and Molecular Biology (B2 &amp; B4)</td>
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<td>BIO 213</td>
<td>Life Science for Engineers and Bioengineering Fundamentals (B2)</td>
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<tr>
<td>&amp; BMED 213</td>
<td>Life Science for Engineers and Bioengineering Fundamentals (B2)</td>
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<td>BOT 121</td>
<td>General Botany (B2 &amp; B4)</td>
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<tr>
<td>MCR 221</td>
<td>Microbiology (B2 &amp; B4)</td>
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<tr>
<td>MCR 224</td>
<td>General Microbiology I (B2 &amp; B4)</td>
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Mathematics Support Electives:
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<td>MATH 304</td>
<td>Vector Analysis</td>
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<tr>
<td>MATH 335</td>
<td>Graph Theory</td>
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<td>MATH 336</td>
<td>Combinatorial Math</td>
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<td>MATH 451</td>
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Physical Science Support Electives
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<td>General Chemistry for Physical Science and Engineering I</td>
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<tr>
<td>&amp; CHEM 125</td>
<td>General Chemistry for Physical Science and Engineering II</td>
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<td>&amp; CHEM 126</td>
<td>General Chemistry for Physical Science and Engineering III</td>
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<tr>
<td>PHYS 141</td>
<td>General Physics IA</td>
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<tr>
<td>&amp; PHYS 132</td>
<td>General Physics II</td>
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<tr>
<td>&amp; PHYS 133</td>
<td>General Physics III</td>
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GENERAL EDUCATION (GE)
(See GE program requirements below.)
Technical Electives Guidelines

Courses used to satisfy any other Major, Support, or General Education requirement are not allowed to count toward Technical Elective requirement. Credit/No Credit grading is not allowed.

Contact the CSC Department for further information.

Select Technical Electives from the following: 1,2

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
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<td>CSC 301</td>
<td>Personal Software Process</td>
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<tr>
<td>CSC 313</td>
<td>Teaching Computing</td>
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<tr>
<td>CSC/CPE 321</td>
<td>Introduction to Computer Security</td>
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<tr>
<td>CSC 323</td>
<td>Cryptography Engineering</td>
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<tr>
<td>CSC 325</td>
<td>Introduction to Privacy: Policy and Technology</td>
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<tr>
<td>CSC 344</td>
<td>Music Programming</td>
</tr>
<tr>
<td>CSC 366</td>
<td>Database Modeling, Design and Implementation</td>
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<td>CSC 369</td>
<td>Introduction to Distributed Computing</td>
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<tr>
<td>CSC 371</td>
<td>Game Design</td>
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<tr>
<td>CSC 377</td>
<td>Introduction to Mixed Reality</td>
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<tr>
<td>CSC 378</td>
<td>Interactive Entertainment Engineering</td>
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<td>CSC 400</td>
<td>Special Problems 2</td>
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<tr>
<td>CSC 409</td>
<td>Current Topics in Software Engineering</td>
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<td>CSC 410</td>
<td>Software Evaluation</td>
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<td>CSC 422</td>
<td>Network and Web Security</td>
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<td>CSC 424</td>
<td>Software Security</td>
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<tr>
<td>CSC 429</td>
<td>Current Topics in Computer Security</td>
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<tr>
<td>CSC/CPE 431</td>
<td>Compiler Construction</td>
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<td>CSC 435</td>
<td>Introduction to Object Oriented Design Using Graphical User Interfaces</td>
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<tr>
<td>CSC 436</td>
<td>Mobile Application Development</td>
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<td>CSC 437</td>
<td>Dynamic Web Development</td>
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<td>CSC 445</td>
<td>Theory of Computation I</td>
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<td>CSC 448</td>
<td>Bioinformatics Algorithms</td>
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<td>CSC/CPE 453</td>
<td>Introduction to Operating Systems</td>
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<td>CSC/CPE 454</td>
<td>Implementation of Operating Systems</td>
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<td>CSC/CPE 458</td>
<td>Current Topics in Computer Systems</td>
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<td>CSC 466</td>
<td>Knowledge Discovery from Data</td>
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<td>CSC 468</td>
<td>Database Management Systems Implementation</td>
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<td>CSC/CPE 469</td>
<td>Distributed Systems</td>
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<td>CSC/CPE 471</td>
<td>Introduction to Computer Graphics</td>
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<td>CSC 473</td>
<td>Advanced Rendering Techniques</td>
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<td>CSC 474</td>
<td>Computer Animation</td>
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<td>CSC/CPE 476</td>
<td>Real-Time 3D Computer Graphics Software</td>
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<td>CSC 477</td>
<td>Scientific and Information Visualization</td>
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<td>CSC 478</td>
<td>Current Topics in Computer Graphics</td>
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<tr>
<td>CSC 480</td>
<td>Artificial Intelligence</td>
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<td>CSC 481</td>
<td>Knowledge Based Systems</td>
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<td>CSC 482</td>
<td>Speech and Language Processing</td>
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<tr>
<td>CSC 483</td>
<td>Current Topics in Human-Computer Interaction</td>
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<tr>
<td>CSC 486</td>
<td>Human-Computer Interaction Theory and Design</td>
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<td>CSC 487</td>
<td>Deep Learning</td>
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<tr>
<td>CSC 489</td>
<td>Current Topics in Artificial Intelligence</td>
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<tr>
<td>CSC 490</td>
<td>Selected Advanced Topics 2</td>
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<td>CSC 496</td>
<td>Selected Advanced Laboratory 2</td>
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<td>CSC 497</td>
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<tr>
<td>CSC 508</td>
<td>Software Engineering I</td>
</tr>
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<td>CSC 509</td>
<td>Software Engineering II</td>
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<td>CSC 521</td>
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<td>CSC 530</td>
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<td>CSC 540</td>
<td>Theory of Computation II</td>
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<td>CSC 550</td>
<td>Operating Systems</td>
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<tr>
<td>CSC 560</td>
<td>Database Systems</td>
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<tr>
<td>CSC/CPE 564</td>
<td>Computer Networks: Research Topics</td>
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<td>CSC 566</td>
<td>Topics in Advanced Data Mining</td>
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<td>CSC/CPE 569</td>
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<td>CSC 570</td>
<td>Current Topics in Computer Science</td>
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<td>CSC 572</td>
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<td>CSC 581</td>
<td>Computer Support for Knowledge Management</td>
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<tr>
<td>CSC 582</td>
<td>Computational Linguistics</td>
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<tr>
<td>CPE 315</td>
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<td>CPE 400</td>
<td>Special Problems for Undergraduates 2</td>
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<tr>
<td>CPE 416</td>
<td>Autonomous Mobile Robotics</td>
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<tr>
<td>CPE 419</td>
<td>Applied Parallel Computing</td>
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<td>CPE/EE 428</td>
<td>Computer Vision</td>
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<tr>
<td>CPE 464</td>
<td>Introduction to Computer Networks</td>
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<td>Advanced Computer Networks</td>
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<td>CPE 482</td>
<td>Advanced Topics in Systems for Computer Engineering</td>
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<tr>
<td>CPE 485</td>
<td>Autonomous Robot Navigation</td>
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</table>
The following restrictions must be satisfied:
4 of these units must be satisfied by a course that has as a prerequisite either:
1) An upper-division course required by the major (excluding CSC 357 and CSC 348) or
2) Another technical elective

Select from the following:

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<td>Introduction to Privacy: Policy and Technology</td>
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<tr>
<td>CSC 366</td>
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<td>Computer Networks: Research Topics</td>
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<td>Introduction to Communication Systems</td>
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<td>EE/CPE 336</td>
<td>Microprocessor System Design</td>
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<td>EE 424</td>
<td>Introduction to Remote Sensing</td>
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<td>Operations Research I</td>
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<td>IME 356</td>
<td>Manufacturing Automation</td>
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<td>Mechatronics</td>
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<td>PHIL 412</td>
<td>Epistemology</td>
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<td>PHIL 422</td>
<td>Philosophy of Mind</td>
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<td>Research Methods in Psychology</td>
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<td>PSY 333</td>
<td>Quantitative Research Methods for the Behavioral Sciences</td>
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<td>STAT 313</td>
<td>Applied Experimental Design and Regression Models</td>
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<td>STAT 323</td>
<td>Design and Analysis of Experiments I</td>
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<td>STAT 324</td>
<td>Applied Regression Analysis</td>
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BS Software Engineering

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<tr>
<td>STAT 330</td>
<td>Statistical Computing with SAS</td>
</tr>
<tr>
<td>STAT 331</td>
<td>Statistical Computing with R</td>
</tr>
<tr>
<td>STAT 334</td>
<td>Applied Linear Models</td>
</tr>
<tr>
<td>STAT 416</td>
<td>Statistical Analysis of Time Series</td>
</tr>
<tr>
<td>STAT 418</td>
<td>Categorical Data Analysis</td>
</tr>
<tr>
<td>STAT 419</td>
<td>Applied Multivariate Statistics</td>
</tr>
<tr>
<td>STAT 434</td>
<td>Statistical Learning: Methods and Applications</td>
</tr>
</tbody>
</table>

Total units 16

1 A total of 16 technical elective units selected from upper-division and graduate CSC and CPE courses open to those in the major and not otherwise required by the major.

An additional 4 units of CPE/CSC technical electives may substitute for CSC 123 in major requirements.

2 Up to a combined 4 units may be taken from CSC 400, CPE 400, CSC 490, or CSC 496.

**General Education (GE) Requirements**

- 72 units required, 36 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.

<table>
<thead>
<tr>
<th>Area A: Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Expository Writing</td>
</tr>
<tr>
<td>A2 Oral Communication</td>
</tr>
<tr>
<td>A3 Reasoning, Argumentation and Writing (4 units in Support) 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area B: Math, Science, and Quantitative Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1 Mathematics/Statistics (8 units in Support)</td>
</tr>
<tr>
<td>B2 Life Science (4 units in Support) 1</td>
</tr>
<tr>
<td>B3 Physical Science (4 units in Support) 1</td>
</tr>
<tr>
<td>B4 One lab taken with either a B2 or B3 course</td>
</tr>
<tr>
<td>B6 Upper-division Area B (4 units in Support) 1</td>
</tr>
</tbody>
</table>

| Additional Area B units (8 units in Support) 1 | 0 |

<table>
<thead>
<tr>
<th>Area C: Arts and Humanities</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 Literature</td>
</tr>
<tr>
<td>C2 Philosophy</td>
</tr>
<tr>
<td>C3 Fine/Performing Arts</td>
</tr>
<tr>
<td>C4 Upper-division elective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area D: Society and the Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1 The American Experience (Title 5, Section 40404 requirement) (40404)</td>
</tr>
<tr>
<td>D2 Political Economy</td>
</tr>
<tr>
<td>D3 Comparative Social Institutions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area E: Lifelong Learning and Self-Development</th>
</tr>
</thead>
</table>

1 Required in Major/Support; also satisfies GE.