BS COMPUTER SCIENCE

Program Learning Outcomes
1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
3. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
4. An ability to function effectively on teams to accomplish a common goal.
5. An understanding of professional, ethical, legal, security, and social issues and responsibilities.
6. An ability to communicate effectively with a range of audiences.
7. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
8. Recognition of the need for, and an ability to engage in continuing professional development.
9. An ability to use current techniques, skills, and tools necessary for computing practice.
10. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension and the tradeoffs involved in design choices.
11. An ability to apply design and development principles in the construction of software systems of varying complexity.

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>CSC 107</td>
<td>Fundamentals of Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>CSC 123</td>
<td>Introduction to Computing</td>
<td>4</td>
</tr>
<tr>
<td>CSC 108</td>
<td>Accelerated Introduction to Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>CSC 202</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CSC 203</td>
<td>Project-Based Object-Oriented Programming and Design</td>
<td>4</td>
</tr>
<tr>
<td>CSC 225</td>
<td>Introduction to Computer Organization</td>
<td>4</td>
</tr>
<tr>
<td>CSC 300</td>
<td>Professional Responsibilities</td>
<td>4</td>
</tr>
<tr>
<td>Select from the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSC 307</td>
<td>Introduction to Software Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

Select from the following courses:
- CSC 308 and CSC 309
- CPE 315
- CSC 348
- CSC 349
- CSC/CPE 357
- CSC 430
- CSC/CPE 431
- CSC 445
- CSC/CPE 453
- CSC 491 and CSC 492

Concentration or Technical Electives: 24

Select concentration, or select from the lists in technical electives guidelines below.

SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 149</td>
<td>Technical Writing for Engineers (A3)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I (B1)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142</td>
<td>Calculus II (B1)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 206</td>
<td>Linear Algebra I</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 244</td>
<td>Linear Analysis I</td>
<td></td>
</tr>
<tr>
<td>STAT 312</td>
<td>Statistical Methods for Engineers (B6)</td>
<td>4</td>
</tr>
<tr>
<td>STAT 313</td>
<td>Applied Experimental Design and Regression Models</td>
<td></td>
</tr>
<tr>
<td>STAT 323</td>
<td>Design and Analysis of Experiments I</td>
<td></td>
</tr>
<tr>
<td>STAT 324</td>
<td>Applied Regression Analysis</td>
<td></td>
</tr>
<tr>
<td>STAT 330</td>
<td>Statistical Computing with SAS</td>
<td></td>
</tr>
<tr>
<td>STAT 331</td>
<td>Statistical Computing with R</td>
<td></td>
</tr>
<tr>
<td>STAT 416</td>
<td>Statistical Analysis of Time Series</td>
<td></td>
</tr>
<tr>
<td>STAT 418</td>
<td>Categorical Data Analysis</td>
<td></td>
</tr>
<tr>
<td>STAT 419</td>
<td>Applied Multivariate Statistics</td>
<td></td>
</tr>
</tbody>
</table>

Life Science Support Elective
Select from the following: 4-5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 111</td>
<td>General Biology (B2)</td>
<td>1</td>
</tr>
<tr>
<td>BIO 161</td>
<td>Introduction to Cell and Molecular Biology (B2)</td>
<td>1</td>
</tr>
<tr>
<td>BIO 213</td>
<td>Life Science for Engineers</td>
<td></td>
</tr>
<tr>
<td>&amp; BMED 213</td>
<td>and Bioengineering Fundamentals (B2)</td>
<td>1</td>
</tr>
<tr>
<td>BOT 121</td>
<td>General Botany (B2)</td>
<td>1</td>
</tr>
<tr>
<td>MCRO 221</td>
<td>Microbiology (B2)</td>
<td>1</td>
</tr>
<tr>
<td>MCRO 224</td>
<td>General Microbiology I</td>
<td></td>
</tr>
</tbody>
</table>

Mathematics/Statistics Support Elective
Select from the following: 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
</tr>
<tr>
<td>MATH 248</td>
<td>Methods of Proof in Mathematics</td>
<td></td>
</tr>
<tr>
<td>MATH 306</td>
<td>Linear Algebra II</td>
<td></td>
</tr>
<tr>
<td>MATH 335</td>
<td>Graph Theory</td>
<td></td>
</tr>
<tr>
<td>MATH 336</td>
<td>Combinatorial Math</td>
<td></td>
</tr>
<tr>
<td>MATH 437</td>
<td>Game Theory</td>
<td></td>
</tr>
<tr>
<td>MATH 470</td>
<td>Selected Advanced Topics</td>
<td></td>
</tr>
<tr>
<td>STAT 313</td>
<td>Applied Experimental Design and Regression Models</td>
<td></td>
</tr>
<tr>
<td>STAT 323</td>
<td>Design and Analysis of Experiments I</td>
<td></td>
</tr>
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<td>STAT 324</td>
<td>Applied Regression Analysis</td>
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<tr>
<td>STAT 330</td>
<td>Statistical Computing with SAS</td>
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<td>Statistical Analysis of Time Series</td>
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<td></td>
</tr>
<tr>
<td>STAT 419</td>
<td>Applied Multivariate Statistics</td>
<td></td>
</tr>
</tbody>
</table>
Physical Science Support Elective
Select one sequence from the following: 12
- CHEM 124 & CHEM 125 & CHEM 126
  General Chemistry for Physical Science and Engineering I and II and III (B3, B4) 1
- PHYS 141 & PHYS 132 & PHYS 133
  General Physics I and II and III (B3, B4) 1

Additional Science Support Elective 6
Select from the following: 4-5
- BIO 111
  General Biology (B2)
- BIO 161
  Introduction to Cell and Molecular Biology (B2)
- BOT 121
  General Botany (B2)
- CHEM 124
  General Chemistry for Physical Science and Engineering I (B3)
- MCRO 221
  Microbiology (B2)
- MCRO 224
  General Microbiology I (B2)
- PHYS 141
  General Physics IA (B3)

Upper-division Elective
Select any upper-division course(s) 4

GENERAL EDUCATION (GE)
(See list of GE program requirements below.) 40

FREE ELECTIVES 0

Total units 180-181

1 Required in Support; also satisfies GE.
2 An additional 4 units of CPE/CSC technical electives may substitute for CPE/CSC 123, although new students are strongly encouraged to take CPE/CSC 123.
3 CSC 309 counts as Technical Elective. Students in the Interactive Entertainment Concentration are advised to take CSC 307 instead of CSC 308 and CSC 309.
4 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.
5 An additional 4 units of CPE/CSC technical electives is needed if CSC 123 is not taken.
6 No double counting is allowed between Additional Science Support Elective and Life Science Support Elective or Physical Science Support Elective.

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.

Select Technical Electives from the following: 1
- CSC 301
  Personal Software Process
- CSC 305
  Individual Software Design and Development
- CSC 309
  Software Engineering II
- CSC 321
  Introduction to Computer Security

- CSC 323
  Cryptography Engineering
- CSC 325
  Introduction to Privacy: Policy and Technology
- CSC 344
  Music Programming
- CSC 365
  Introduction to Database Systems
- CSC 366
  Database Modeling, Design and Implementation
- CSC 369
  Introduction to Distributed Computing
- CSC 371
  Game Design
- CSC 378
  Interactive Entertainment Engineering
- CSC 400
  Special Problems
- CSC 402
  Software Requirements Engineering
- CSC 405
  Software Construction
- CSC 406
  Software Deployment
- CSC 409
  Current Topics in Software Engineering
- CSC 410
  Software Evaluation
- CSC 422
  Network and Web Security
- CSC 424
  Software Security
- CSC 429
  Current Topics in Computer Security
- CSC 435
  Introduction to Object Oriented Design Using Graphical User Interfaces
- CSC 436
  Mobile Application Development
- CSC 437
  Web Development
- CSC 448
  Bioinformatics Algorithms
- CSC/CPE 454
  Implementation of Operating Systems
- CSC/CPE 458
  Current Topics in Computer Systems
- CSC 466
  Knowledge Discovery from Data
- CSC 468
  Database Management Systems Implementation
- CSC/CPE 471
  Introduction to Computer Graphics
- CSC 473
  Advanced Rendering Techniques
- CSC 474
  Computer Animation
- CSC/CPE 476
  Real-Time 3D Computer Graphics Software
- CSC 477
  Scientific and Information Visualization
- CSC 478
  Current Topics in Computer Graphics
- CSC 480
  Artificial Intelligence
- CSC 481
  Knowledge Based Systems
- CSC 483
  Current Topics in Human-Computer Interaction
- CSC 484
  User-Centered Interface Design and Development
- CSC 486
  Human-Computer Interaction Theory and Design
- CSC 489
  Current Topics in Artificial Intelligence
- CSC 490
  Selected Advanced Topics
- CSC 496
  Selected Advanced Laboratory
CSC 508  Software Engineering I
CSC 509  Software Engineering II
CSC/CPE 515  Computer Architecture
CSC 521  Computer Security
CSC 530  Languages and Translators
CSC 540  Theory of Computation II
CSC 550  Operating Systems
CSC 560  Database Systems
CSC/CPE 564  Computer Networks: Research Topics
CSC 566  Topics in Advanced Data Mining
CSC/CPE 569  Distributed Computing
CSC 570  Current Topics in Computer Science
CSC 572  Computer Graphics
CSC 580  Artificial Intelligence
CSC 581  Computer Support for Knowledge Management
CSC 582  Introduction to Natural Language Processing
CPE 400  Special Problems for Undergraduates
CPE 416  Autonomous Mobile Robotics
CPE 419  Applied Parallel Computing
CPE 428  Computer Vision
CPE 464  Introduction to Computer Networks
CPE 465  Advanced Computer Networks
CPE 482  Advanced Topics in Systems for Computer Engineering
CPE 485  Autonomous Robot Navigation
CPE 488  Microelectronics and Electronics Packaging
DATA 301  Introduction to Data Science

The following restrictions must be satisfied.

4 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:

CSC 325  Introduction to Privacy: Policy and Technology
CSC 366  Database Modeling, Design and Implementation
CSC 402  Software Requirements Engineering
CSC 405  Software Construction
CSC 406  Software Deployment
CSC 409  Current Topics in Software Engineering
CSC 410  Software Evaluation
CSC 422  Network and Web Security
CSC 424  Software Security
CSC 429  Current Topics in Computer Security
CSC 435  Introduction to Object Oriented Design Using Graphical User Interfaces
CSC 437  Web Development
CSC/CPE 454  Implementation of Operating Systems
CSC 466  Knowledge Discovery from Data
CSC 468  Database Management Systems Implementation
CSC 473  Advanced Rendering Techniques
CSC 474  Computer Animation
CSC/CPE 476  Real-Time 3D Computer Graphics Software
CSC 477  Scientific and Information Visualization
CSC 478  Current Topics in Computer Graphics
CSC 481  Knowledge Based Systems
CSC 483  Current Topics in Human-Computer Interaction
CSC 484  User-Centered Interface Design and Development
CSC 486  Human-Computer Interaction Theory and Design
CSC 489  Current Topics in Artificial Intelligence
CSC 508  Software Engineering I
CSC 509  Software Engineering II
CSC/CPE 515  Computer Architecture
CSC 521  Computer Security
CSC 530  Languages and Translators
CSC 540  Theory of Computation II
CSC 550  Operating Systems
CSC 560  Database Systems
CSC/CPE 564  Computer Networks: Research Topics
CSC 566  Topics in Advanced Data Mining
CSC 572  Computer Graphics
CSC 580  Artificial Intelligence
CSC 581  Computer Support for Knowledge Management
CSC 582  Introduction to Natural Language Processing
CPE 416  Autonomous Mobile Robotics
CPE 465  Advanced Computer Networks

Up to 4 units may be taken from CSC 400, CPE 400, or CSC 490.

Up to 4 units may be taken from approved external electives.

Select from the following:

AERO 450  Introduction to Aerospace Systems Engineering
ART 384  Digital 3D Modeling and Design
BUS 310  Introduction to Entrepreneurship
CHEM 216  Organic Chemistry I
CHEM 217  Organic Chemistry II
CHEM 218  Organic Chemistry III
CHEM 312  Survey of Organic Chemistry
ECON 339  Econometrics
EE 201  Electric Circuit Theory
EE 251  and Electric Circuits Laboratory
EE 314  Introduction to Communication Systems
EE/CPE 336  Microprocessor System Design
EE 424  Introduction to Remote Sensing
ENVE 542  Sustainable Environmental Engineering
IME 301  Operations Research I
IME 314  Engineering Economics
IME 356  Manufacturing Automation
MATH 241  Calculus IV
MATH 242  Differential Equations I
MATH 248  Methods of Proof in Mathematics
MATH 304  Vector Analysis
MATH 341  Theory of Numbers
MATH 350  Mathematical Software
MATH 412  Introduction to Analysis I
ME 211  Engineering Statics
ME 212  Engineering Dynamics
ME 405  Mechatronics
PHIL 412  Epistemology
PHIL 422  Philosophy of Mind
PSY 329  Research Methods in Psychology
PSY 333  Quantitative Research Methods for the Behavioral Sciences
PSY 351  Group Dynamics
PSY 457  Memory and Cognition
STAT 313  Applied Experimental Design and Regression Models
STAT 323  Design and Analysis of Experiments I
STAT 324  Applied Regression Analysis
STAT 330  Statistical Computing with SAS
STAT 331  Statistical Computing with R
STAT 416  Statistical Analysis of Time Series
STAT 418  Categorical Data Analysis
STAT 419  Applied Multivariate Statistics

Total units 24

• See the complete GE course listing (http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext).
• Minimum of 8 units required at the 300 level.

Concentration
Interactive Entertainment (http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/computersciencesoftwareengineering/bcomputerscience/interactiveentertainmentconcentration)

General Education (GE) Requirements
• 72 units required, 32 of which are specified in Major and/or Support.