

# Computer Engineering

## LOWER-DIVISION TRANSFER PATTERN California State University (CSU) Statewide Pattern

The Lower-Division Transfer Pattern (LDTP) consists of the CSU statewide pattern of coursework outlined below, plus campus-specific coursework, bringing the total pattern to at least 60 but no more than 70 transferable semester units for students to complete at a California Community College (CCC).

The CSU statewide pattern of coursework for CCC students who plan to major in Computer Engineering at any CSU campus offering the major includes:

- Partial completion of lower-division general education requirements, following the CSU General Education Breadth pattern;
- Completion of the CSU graduation requirements in United States History, Constitution and American Ideals; and
- Completion of additional semester units as specified below in (3) to (7).

Please note that the information here is an academic and curricular advising tool: a roadmap that enables transfer students to efficiently and effectively progress towards the CSU baccalaureate degree in a specified discipline. California Community College students should work closely with their advisers when planning their academic program in preparation for transfer to the CSU.

This information does not represent any guarantee with regard to admission nor does it include or replace CSU campus admissions impaction criteria (see <http://www.calstate.edu/AR/impactioninfo.shtml>). These curricular guidelines are subject to change.

CSU Statewide Pattern	Semester Unit Requirement
<p>(1) <b>Complete the following lower-division general education requirements areas:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with CSU GE Breadth AREA A1, Oral Communication.</b> <i>And</i></li> <li>• <b>A course that articulates with CSU GE Breadth AREA A2, Written Communication.</b> <i>And</i></li> <li>• <b>Two courses that articulates with CSU GE Breadth AREA C, Arts, Literature, Philosophy, and Foreign Languages.</b></li> <li>• <b>A course that articulates with, CSU GE Breadth AREA D, Social, Political, and Economic Institutions and Behavior, Historical Background.</b></li> </ul> <p><i>A minimum grade of C is required in courses used to meet CSU GE Breadth AREA A.</i></p>	<b>15 units</b>
<p>(2) <b>Complete the graduation requirements in United States History, Constitution, and American Ideals.</b></p> <p>These are typically completed with one course each in American government and American history, or a sequence of courses that integrate the history and government topics.</p>	<b>6 units</b>
<p>(3) <b>Complete the Single Variable Calculus Sequence.</b></p> <p><i>One of these courses is used to complete the CSU GE Breadth AREA B4 requirement.</i></p>	<b>8 units</b>

<p>(4) Complete <u>all</u> of the following:</p> <ul style="list-style-type: none"> <li>• A course that articulates with Physics -- Calculus Based I [CAN PHYS 8]. <u>And</u></li> <li>• A course that articulates with Physics – Calculus Based II [CAN PHYS 12].</li> </ul> <p><i>One of these requirements must include a lab component that satisfies CSU GE Breadth AREA B3.</i></p> <p><i>One of these requirements is used to satisfy the CSU GE Breadth AREA B1 requirement.</i></p>	<b>7 units</b>
<p>(5) Complete <b>Programming Concepts and Methodology I</b> [CAN CSCI 22].</p>	<b>3 units</b>
<p>(6) Complete <b>Programming Concepts and Methodology II</b> [CAN CSCI 24].</p>	<b>3 units</b>
<p>(7) Complete <u>one</u> of the following:</p> <ul style="list-style-type: none"> <li>• A course that articulates with Circuits [CAN ENGR 6]. <u>Or</u></li> <li>• A course that articulates with Circuits, with lab [CAN ENGR 6].</li> </ul>	<b>3-4 units</b>
<b>Total Semester Units Required for Statewide LDTP Pattern</b>	<b>45-46 units</b>

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Bakersfield Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Channel Islands Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Chico Campus-Specific Pattern**

In addition to the statewide pattern, the following is the CSU Chico campus-specific pattern:

Campus-Specific Pattern	Semester Unit Requirement
<p>(1) <b>If not taken as part of the statewide pattern complete <u>all</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [CSUC MATH 220], <u>Calculus III.</u> <u>And</u></b></li> <li>• <b>A course that articulates with [CSUC EECE 211L], <u>one additional unit for Circuits Lab.</u> <u>And</u></b></li> <li>• <b>A course that articulates with [CSUC PHYS 204C], <u>Physics III.</u> <u>And</u></b></li> <li>• <b>A course that articulates with [CSUC MATH 260], <u>Differential Equations.</u> <u>And</u></b></li> <li>• <b>A course that articulates with [CSUC EECE 144], <u>Logic Design Fundamentals -</u> Definition and properties of switching algebra. Minimization of algebraic function. Use of Karnaugh maps for simplification. Design of combinational logic networks. Design of sequential logic devices including flip-flops, registers, and counters. Analysis and applications of digital devices. Analysis and design of synchronous and asynchronous sequential state machines, state table derivation and reduction. Use of such CAD tools for schematic capture and logic device simulations. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUC EECE 221], <u>Processor Architecture/Assembly Language Programming.</u> <u>And</u></b></li> <li>• <b>A course that articulates with [CSUC EECE 101], <u>Introduction to Electrical and Computer Engineering -</u> A survey of topics from the fields of electrical and computer engineering; applications of critical thinking to the solution of engineering problems and using the computer and sensors to control mechanical devices. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUC EECE 135], <u>Algorithms and Data Structures.</u> <u>And</u></b></li> <li>• <b>A course that articulates with [CSUC CHEM 111], <u>Chemistry.</u></b></li> </ul>	<p><b>0-4 units</b></p> <p><b>0-1 units</b></p> <p><b>0-4 units</b></p> <p><b>0-3 units</b></p> <p><b>0-4 units</b></p> <p><b>0-3 units</b></p> <p><b>0-2 units</b></p> <p><b>0-3 units</b></p> <p><b>0-4 units</b></p>
<p>(2) <b>If necessary, complete additional coursework to bring total to 60 transferable semester units.</b></p>	

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Dominguez Hills Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.

## Computer Engineering LOWER-DIVISION TRANSFER PATTERN CSU East Bay Campus-Specific Pattern

In addition to the statewide pattern, the following is the CSU East Bay campus-specific pattern for the B.S. in Engineering with option in Computer Engineering:

Campus-Specific Pattern	Semester Unit Requirement
<p><b>(1) If not taken as part of the statewide pattern, complete courses from the following to bring total up to 60, and not more than 70 transferable semester units:</b></p> <ul style="list-style-type: none"> <li>• A course that articulates with [CSUEB CHEM 1101], <b>General Chemistry.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB CS 1160], <b>Intro to Computer Science and Programming Methods.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB CS 2360], <b>Programming Methods and Intro to Software Engineering.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB CS 2430], <b>Computer Organization and Assembly Language Programming.</b> <u>And</u></li> <li>• Courses that articulate with [CSUEB MATH 1304, 1305 and 2304], <b>Calculus I, II &amp; III.</b> <u>And</u></li> <li>• Courses that articulate with [CSUEB PHYS 1001, 1002 and 1003], <b>General Physics sequence.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB ECON 2301], <b>Principles of Microeconomics.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB ENGR 1011], <b>Intro to Engineering.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB ENGR 1420], <b>Engineering Graphics.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB ENGR 2060], <b>Materials Science.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB MATH 2101], <b>Elements of Linear Algebra.</b> <u>And</u></li> <li>• A course that articulates with [CSUEB MATH 2150], <b>Discrete Structures.</b></li> </ul>	<p style="text-align: center;"><b>0-4 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-4 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-1 units</b></p> <p style="text-align: center;"><b>0-1 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p>
<p><b>(2) If necessary, complete additional coursework to bring total to 60 transferable semester units.</b></p>	

## Computer Engineering LOWER-DIVISION TRANSFER PATTERN CSU Fresno Campus-Specific Pattern

In addition to the statewide pattern, the following is the CSU Fresno campus-specific pattern for the B.S. in Computer Engineering:

Campus-Specific Pattern	Semester Unit Requirement
<p><b>(1) If not taken as part of the statewide pattern complete <u>all</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• A course that articulates with [CSUF MATH 77], <b>Calculus III - Vectors, three-dimensional calculus, partial derivatives, multiple integrals, Green's Theorem, Stokes' Theorem.</b> <u>And</u></li> <li>• A course that articulates with [CSUF MATH 81], <b>Applied Analysis - An introduction to ordinary linear differential equations; solutions by power series and Laplace transforms; solution of systems of equations and Fourier series.</b> <u>And</u></li> <li>• A course that articulates with [CSUF CHEM 3A], <b>Introductory General Chemistry - A course that covers composition of matter and physical and chemical changes; fundamental laws and principles; atomic and molecular structure; acid-base theory, redox and equilibria; qualitative and quantitative theory and techniques.</b> <u>And</u></li> <li>• If a <b>CSU GE Breadth Area C1</b> requirement was not completed as part of the</li> </ul>	<p style="text-align: center;"><b>0-4 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-4 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p>

<p><b>statewide pattern complete a course that articulates with CSU GE-Breadth AREA C1, Art (Art, Dance, Music, Theater). <u>And</u></b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [CSUF BIOL 10], Life Science</b> - A course that covers how living things work and why they work that way; biology from chemical and physical foundations to ecological and evolutionary processes. This course may be used to satisfy CSU GE Breadth AREA B2, Life Science. <u>And</u></li> <li>• <b>A course that articulates with [CSUF ECE 1], Introduction to Electrical and Computer Engineering</b> - A course that covers electrical and computer engineering professions, career opportunities and preparation, exposure to computer productivity tools, laboratory safety, and hands-on projects. <u>And</u></li> <li>• <b>A course that articulates with [CSUF ECE 2], Introduction to Electrical and Computer Engineering Tools-</b> Intro to engineering application use of Matlab software in analysis and synthesis, basic commands, data arrays, plotting and data presentation, data transfer, computation with loops, iterative solutions, integration with C programming, and technical problem solving. <u>And</u></li> <li>• <b>A course that articulates with [CSUF ECE 85], Design Digital Logic</b> - A course that covers discrete mathematics, logic, and Boolean algebra; number systems and binary arithmetic, logic gates, combinatorial logic, minimization techniques; analysis and design of combinatorial circuits; flip-flops, multivibrators, registers, and counters. <u>And</u></li> <li>• <b>A course that articulates with [CSUF ECE 85L], Digital Design Lab</b> - A lab course in usage, design, and implementation techniques for combinatorial and sequential circuits with experiments utilizing logic gates, Karnaugh maps, multiplexers, decoders, programmable logic devices, latches, flipflops, counters and shift registers. <u>And</u></li> <li>• <b>A course that articulates with [CSUF PHYS 4BL], Laboratory in Electricity, Magnetism, and Heat</b> - Experiments in electricity, magnetism, heat, and thermodynamics. <u>And</u></li> <li>• <b>A course that articulates with [CSUF PHYS 4C], Light and Modern Physics</b> - Maxwell's Equations, geometrical optics; electromagnetic radiation; physical optics; introduction to special relativity; quantum physics; and the physics of atoms, nuclei, and the solid state.</li> </ul>	<p><b>0-3 units</b></p> <p><b>0-1 units</b></p> <p><b>0-2 units</b></p> <p><b>0-3 units</b></p> <p><b>0-1 unit</b></p> <p><b>0-1 unit</b></p> <p><b>0-3 units</b></p>
<p>(2) <b>If not taken as part of the statewide pattern complete <u>one</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [CSUF ECON 40], Principles of Microeconomics.</b></li> <li>• <b>A course that articulates with [CSUF ECON 50], Principles of Macroeconomics.</b></li> </ul>	<p><b>0-3 units</b></p>
<p>(3) <b>If not taken as part of the statewide pattern complete <u>one</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [CSUF PHIL 1], Introduction to Philosophy.</b></li> <li>• <b>A course that articulates with [CSUF PHIL 10], Self, Religion, and Society-</b> Conceptions of human nature; nature and varieties of religion; personal and social implications and values of religion.</li> </ul>	<p><b>0-3 units</b></p>
<p><b>(4) If necessary, complete additional coursework to bring total to 60 transferable semester units.</b></p>	

## Computer Engineering LOWER-DIVISION TRANSFER PATTERN CSU Fullerton Campus-Specific Pattern

In addition to the statewide pattern, the following is the CSU Fullerton campus-specific pattern:

Campus-Specific Pattern	Semester Unit Requirement
<p>(1) <b>If not taken as part of the statewide pattern complete <u>all</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [CSUF MATH 250A], 3rd Semester Calculus. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUF MATH 250B], Linear Algebra &amp; Differential Equations. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUF MATH 270A], Discrete Math. <u>And</u></b></li> </ul>	<p><b>0-4 units</b></p> <p><b>0-3 units</b></p> <p><b>0-3 units</b></p>

<ul style="list-style-type: none"> <li>• A course that articulates with [CSUF PHYS 227 &amp; 227L], <b>Physics (Calculus-based)</b>. <u>And</u></li> <li>• A course that articulates with [CSUF BIOL 101, 102, 171, or 172], a course in <b>Biology that satisfies the general education requirement</b>. <u>And</u></li> <li>• A course that articulates with [CSUF CPSC 253U], <b>Workshop in Unix - A workshop in the use of the UNIX operating system</b>. <u>And</u></li> <li>• A course that articulates with [CSUF EGEE 203L], <b>One additional unit for Circuits without Lab</b>.</li> </ul>	<b>0-4 units</b> <b>0-3 units</b>  <b>0-1 units</b>  <b>0-1 units</b>
(2) If not taken as part of the statewide pattern, complete at least <u>one</u> of the following: <ul style="list-style-type: none"> <li>• A course that articulates with [CSUF HIST 110A], <b>History of World Civilization, 1st Semester</b>. <u>Or</u></li> <li>• A course that articulates with [CSUF HIST 110B], <b>History of World Civilization, 2nd Semester</b>.</li> </ul>	<b>0-3 units</b>
(3) If necessary, complete additional coursework to bring total to 60 transferable semester units.	

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
Humboldt State University Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Long Beach Campus-Specific Pattern**

In addition to the statewide pattern, the following is the CSU Long Beach campus-specific pattern for the B.S. in Computer Engineering:

Campus-Specific Pattern	Semester Unit Requirement
(1) If not taken as part of the statewide pattern, complete <u>all</u> of the following: <ul style="list-style-type: none"> <li>• A course that articulates with <b>Introduction to Differential Equations</b>. <u>And</u></li> <li>• A course that articulates with [CSULB CECS 228], <b>Discrete Structures with Computer Science applications</b>. <u>And</u></li> <li>• A course that articulates with <b>Critical Thinking</b>. <i>This requirement should be used to complete CSU GE Breadth AREA A3. A minimum grade of C is necessary to meet this requirement.</i></li> </ul>	<b>0-3 units</b> <b>0-3 units</b>  <b>0-3 units</b>
(2) The following additional units are allowed for: <ul style="list-style-type: none"> <li>• <u>One</u> additional unit for <b>Physics (Calculus-based) – Electricity and Magnetism</b>. <u>And</u></li> <li>• <u>One</u> additional unit for <b>Circuits with Lab</b>.</li> </ul>	
(3) If necessary, complete additional coursework to bring total to 60 transferable semester units	
<u>Recommended Course:</u> <ul style="list-style-type: none"> <li>• A course that articulates with [CSULB CECS 282], <b>C++ for Java Programmers</b>.</li> </ul>	

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Los Angeles Campus-Specific Pattern**

In addition to the statewide pattern, the following is the CSU Los Angeles campus-specific pattern:

Campus-Specific Pattern	Semester Unit Requirement
<p>(1) If not taken as part of the statewide pattern complete <u>all</u> of the following:</p> <ul style="list-style-type: none"> <li>• A course that articulates with [CAN MATH 24], Differential Equations. <u>And</u></li> <li>• A course that articulates with [CAN PHYS 14], Physics (Calculus-based). <u>And</u></li> <li>• A course that articulates with Chemistry with Lab. <u>And</u></li> <li>• A course that articulates with [CAN ENGR 8], Statics. <u>And</u></li> <li>• A course that articulates with a second semester of expository writing that emphasizes exposition, research, and critical thinking, typically called “Writing and Critical Thinking” (as opposed to “Literature and Composition”). <u>And</u></li> <li>• A course that articulates with CSU GE Breadth AREA C2, Humanities. <u>And</u></li> <li>• A course that articulates with CSU GE Breadth AREA E, Lifelong Understanding.</li> </ul>	<p>0-3 units 0-4 units 0-4 units 0-3 units 0-3 units</p> <p>0-3 units 0-3 units</p>
<p>(2) If necessary, complete additional coursework to bring total to 60 transferable semester units.</p>	

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
California Maritime Academy Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Monterey Bay Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Northridge Campus-Specific Pattern**

In addition to the statewide pattern, the following is the CSU Northridge campus-specific pattern:

Campus-Specific Pattern	Semester Unit Requirement
<p>(1) If not taken as part of the statewide pattern complete <u>all</u> of the following:</p> <ul style="list-style-type: none"> <li>• A course that articulates with [CSUN MATH 250], Calculus III. <u>And</u></li> <li>• A course that articulates with [CSUN MATH 280], Applied Differential Equations. <u>And</u></li> <li>• A course that articulates with [CSUN MATH 262], Introduction to Linear Algebra. <u>And</u></li> <li>• A course that articulates with [CSUN CHEM 101 &amp; 101L], General Chemistry I, with lab.</li> </ul> <p><i>A minimum grade of C is required in courses used to meet these requirements.</i></p>	<p>0-4 units 0-4 units</p> <p>0-3 units</p> <p>0-5 units</p>

**(2) If necessary, complete additional coursework to bring total to 60 transferable semester units.**

## Computer Engineering LOWER-DIVISION TRANSFER PATTERN Cal Poly Pomona Campus-Specific Pattern

In addition to the statewide pattern, the following is the Cal Poly Pomona campus-specific pattern for the B.S. in Computer Engineering:

Campus-Specific Pattern	Semester Unit Requirement
<p><b>(1) If not taken as part of the statewide pattern complete <u>all</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>Courses that articulate with [CPP MAT 114, 115, 116, 214, and 215], Calculus 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> semesters. <u>And</u></b></li> <li>• <b>A course that articulates with CSU GE Breadth Area A3, Critical Thinking. <u>And</u></b></li> <li>• <b>A course that articulates with CSU GE Breadth Area D, Social Sciences. <u>And</u></b></li> <li>• <b>A course that articulates with CSU GE Breadth Area E, Lifelong Learning and Self-Development. <u>And</u></b></li> <li>• <b>A course that articulates with [CPP MAT 224], Elementary Linear Algebra and Differential Equations. <u>And</u></b></li> <li>• <b>A course that articulates with [CPP CHM 121], General Chemistry - A course that covers atomic theory of structure and bonding, chemical equations, gas laws, oxidation-reduction, electrochemistry, states of matter, equilibrium, acids and bases, thermodynamics and reaction kinetics and their applications to chemistry, physics, and engineering science. <u>And</u></b></li> <li>• <b>A course that articulates with [CPP CHM 121L], General Chemistry Laboratory - A lab course that conducts experiments in basic quantitative analysis techniques, gas measurement, acid-base, pH, and redox titrations, electrochemistry, kinetics, thermodynamics, and ionic equilibria and qualitative analysis procedures. <u>And</u></b></li> <li>• <b>A course that articulates with [CPP BIO 110], Life Science - Basic concepts in the study of living systems, including human beings. Uses the study of biology to illustrate approaches of science in understanding the universe. The role of science in modern society and the impact of human civilization on other organisms considered. Designed to satisfy the general education requirements for life science. <u>And</u></b></li> <li>• <b>A course that articulates with [CPP BIO 111L], Life Science Laboratory - An optional laboratory to accompany BIO 110. A basic understanding of living organisms achieved through experiments and demonstrations.</b></li> </ul>	<p style="text-align: center;"><b>0-12 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-1 units</b></p>
<p><b>(2) If necessary, complete additional coursework to bring total to 60 transferable semester units.</b></p>	

## Computer Engineering LOWER-DIVISION TRANSFER PATTERN CSU Sacramento Campus-Specific Pattern

In addition to the statewide pattern, the following is the CSU Sacramento campus-specific pattern:

Campus-Specific Pattern	Semester Unit Requirement
<p><b>(1) If not taken as part of the statewide pattern complete <u>all</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [CSUS CSC 28], Discrete Structures. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUS CSC 35], Microcomputer Assembly. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUS MATH 45], Differential Equations. <u>And</u></b></li> <li>• <b>A course that articulates with CSU GE Breadth AREA B2, Life Science. <u>And</u></b></li> <li>• <b>A course that articulates with CSU GE Breadth AREA C, Arts, Literature, Philosophy, and Foreign Language.</b></li> </ul>	<p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p>

**(2) If necessary, complete additional coursework to bring total to 60 transferable semester units.**

## Computer Engineering LOWER-DIVISION TRANSFER PATTERN CSU San Bernardino Campus-Specific Pattern

In addition to the statewide pattern, the following is the CSU San Bernardino campus-specific pattern:

Campus-Specific Pattern	Semester Unit Requirement
<b>(1) If not taken as part of the statewide pattern complete <u>all</u> of the following:</b> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [CSUSB MATH 251 &amp; MATH 252], Multivariable Calculus. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUSB MATH 272], Discrete Mathematics. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUSB CHEM 215], General Chemistry. <u>And</u></b></li> <li>• <b>A course that articulates with [CSUSB PHYS 223], Physics III. <u>And</u></b></li> <li>• <b>A course that meets CSU GE Breadth AREA C - Arts, Literature, Philosophy, and Foreign Language.</b></li> </ul>	<p style="text-align: center;"><b>0-5 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-5 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p>
<b>(2) If necessary, complete additional coursework to bring total to 60 transferable semester units.</b>	

## Computer Engineering LOWER-DIVISION TRANSFER PATTERN San Diego State University Campus-Specific Pattern

In addition to the statewide pattern, the following is the San Diego State University campus-specific pattern.

Campus-Specific Pattern	Semester Unit Requirement
<b>(1) If not taken as part of the statewide pattern, complete <u>all</u> of the following:</b> <ul style="list-style-type: none"> <li>• <b>A course that articulates with CSU GE Breadth AREA A3, Critical Thinking. <u>And</u></b></li> <li>• <b>Coursework that articulates with CSU GE Breadth AREA C2, Humanities (Literature, Philosophy, Foreign Language). <u>And</u></b></li> <li>• <b>A course that articulates with CSU GE Breadth AREA B2, Life Science. <u>And</u></b></li> <li>• <b>A course that articulates with [SDSU ENGR 280], Methods of Analysis - A course that covers selected topics from ordinary differential equations, the Laplace transform, Fourier series, and linear algebra, with engineering applications. <u>And</u></b></li> <li>• <b>A course that articulates with [SDSU MATH 245], Discrete Mathematics. <u>And</u></b></li> <li>• <b>A course that articulates with [SDSU MATH 254], Introduction to Linear Algebra. <u>And</u></b></li> <li>• <b>A course that articulates with [SDSU PHYS 196L], Principles of Physics Laboratory - Experiments in DC circuits, AC circuits, electrical resonance, oscilloscope measurement techniques, and electric and magnetic fields. <u>And</u></b></li> <li>• <b>A course that articulates with [SDSU COMPE 270], Digital Systems - A course that covers modeling, analysis and design of digital systems, primarily at the Logic Design level. Combinational and sequential networks covered. <u>And</u></b></li> <li>• <b>A course that articulates with [SDSU COMPE 271], Computer Organization - A course that covers organization and operation of computer hardware and software; operating system shell and services; program design and development; input-output programming; multi-module and mixed language programming; assembler and C language.</b></li> </ul>	<p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-1 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p> <p style="text-align: center;"><b>0-3 units</b></p>
<b>(2) Students must complete 60 (but not more than 70) transferable semester units. Coursework not taken at the community college must be completed at SDSU.</b>	

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
San Francisco State University Campus-Specific Pattern**

In addition to the statewide pattern, the following is the San Francisco State University campus-specific pattern:

Campus-Specific Pattern	Semester Unit Requirement
<p>(1) <b>If not taken as part of the statewide pattern, complete <u>all</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [SFSU MATH 245], Elementary Differential Equations and Linear Algebra</b> – A course in first and second order linear differential equations, Laplace transform methods, Fourier series, matrix algebra. <u>And</u></li> <li>• <b>A course that articulates with [SFSU MATH 228], Calculus III.</b> <u>And</u></li> <li>• <b>A course that articulates with [SFSU PHYS 240 and 242], General Physics with Calculus III with laboratory.</b> <u>And</u></li> <li>• <b>A course that articulates with [SFSU CHEM 115], General Chemistry I: Essential Concepts of Chemistry.</b> <u>And</u></li> <li>• <b>A course that articulates with [SFSU ENGR 120], Introduction to Computer Engineering.</b> <u>And</u></li> <li>• <b>A course that articulates with [SFSU ENGR 206], Circuits and Instrumentation Lab.</b> <u>And</u></li> <li>• <b>A course that articulates with [SFSU CSC 212], Introduction to Software Development in Unix.</b></li> </ul>	<p><b>0-3 units</b></p> <p><b>0-4 units</b></p> <p><b>0-4 units</b></p> <p><b>0-5 units</b></p> <p><b>0-3 units</b></p> <p><b>0-1 units</b></p> <p><b>0-2 units</b></p>
<p>(2) <b>When possible, satisfy CSU GE Breadth or IGETC Areas by completing:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [SFSU ENG 114], College Composition, 1st semester</b> – Training in expository- argumentative composition, emphasizing work on clear and effective sentences and the organization and development of paragraph and essay. <u>And</u></li> <li>• <b>A course that articulates with [SFSU ENG 214], College Composition and Literature, 2nd semester</b> – Expository- argumentative composition and critical reading skills through the study of literature; special attention to logic, style, and rhetoric. <i>A minimum grade of C is necessary in courses used to meet this requirement.</i></li> </ul>	
<p>(3) <b>If necessary, complete additional coursework to bring total to 60 transferable semester units.</b></p>	

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
San José State University Campus-Specific Pattern**

In addition to the statewide pattern, the following is the San José State University campus-specific pattern for the B.S. in Computer Engineering:

Campus-Specific Pattern	Semester Unit Requirement
<p>(1) <b>If not taken as part of the statewide pattern, complete courses from the following to bring total up to 60, and not more than 70 transferable semester units:</b></p> <ul style="list-style-type: none"> <li>• <b>A course approved for CSU GE Breadth Area E, Lifelong Understanding and Self-Development.</b> <u>And</u></li> <li>• <b>A course approved for CSU GE-Breadth Area C2, Humanities (Literature, Philosophy, and Foreign Language.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU PHYS 050], General Physics/Mechanics.</b> <i>A minimum grade of C- or higher is required in courses used to meet this requirement.</i> <u>And</u></li> <li>• <b>A course that articulates with [SJSU PHYS 052], General Physics/Heat and Light.</b></li> </ul>	<p><b>0-3 units</b></p> <p><b>0-3 units</b></p> <p><b>0-4 units</b></p> <p><b>0-4 units</b></p>

<ul style="list-style-type: none"> <li>• <u>And</u></li> <li>• <b>A course that articulates with [SJSU CHEM 001A], one semester of: General Chemistry.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU MATH 030], Calculus I.</b> <i>A minimum grade of C- or higher is required in courses used to meet this requirement.</i> <u>And</u></li> <li>• <b>A course that articulates with [SJSU MATH 031], Calculus II.</b> <i>A minimum grade of C- or higher is required in courses used to meet this requirement.</i> <u>And</u></li> <li>• <b>A course that articulates with [SJSU MATH 032], Calculus III.</b> <i>A minimum grade of C- or higher is required in courses used to meet this requirement.</i> <u>And</u></li> <li>• <b>A course that articulates with [SJSU MATH 042], Discrete Mathematics.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU ENGR 010], Introduction to Engineering.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU CMPE 050], Object-Oriented Concepts and Methodology.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU CMPE 030], Programming Concepts and Methodology.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU ME 019], Graphics for Engineers.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU EE 097], Introductory Electrical Engineering Laboratory.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU EE 098], Introduction to Circuit Analysis.</b> <u>And</u></li> <li>• <b>A course that articulates with [SJSU ENGL 001B], Composition 2</b> , or an equivalent 2nd Semester English Composition course approved for IGETC AREA 1B. <i>A minimum grade of C or higher is required in courses used to meet this requirement.</i> <u>And</u></li> <li>• <b>Physical Activity</b> (2 units, taken from at least 2 different activities).</li> </ul>	<p>0-5 units</p> <p>0-3 units</p> <p>0-4 units</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-1 unit</p> <p>0-1 unit</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-2 units</p>
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**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
Cal Poly San Luis Obispo Campus-Specific Pattern**

In addition to the statewide pattern, the following is the Cal Poly San Luis Obispo campus-specific pattern:

Campus-Specific Pattern	Semester Unit Requirement
<p>(1) <b>If not taken as part of the statewide pattern complete <u>all</u> of the following:</b></p> <ul style="list-style-type: none"> <li>• <b>A course that articulates with [SLO MATH 143], Calculus III.</b> <u>And</u></li> <li>• <b>A course that articulates with [SLO MATH 241], Calculus IV.</b> <u>And</u></li> <li>• <b>A course that articulates with [SLO MATH 244], Linear Analysis I.</b> <u>And</u></li> <li>• <b>A course that articulates with [SLO PHYS 133], General Physics III.</b> <u>And</u></li> <li>• <b>A course that articulates with [SLO PHYS 211], Modern Physics I.</b> <u>And</u></li> <li>• <b>A course that articulates with [SLO CHEM 124], General Chemistry for the Engineering Disciplines I.</b> <u>And</u></li> <li>• <b>A course that articulates with [SLO ENGR 110], Engineering Science I.</b> <u>And</u></li> <li>• <b>A course that articulates with [SLO MATE 210], Materials Engineering.</b> <u>And</u></li> <li>• <b>A course that articulates with [SLO MATE 215], Materials Laboratory I.</b></li> </ul>	<p>0-3 units</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-3 units</p> <p>0-2 units</p> <p>0-2 units</p> <p>0-1 units</p>
<p>(2) <b>If necessary, complete additional coursework to bring total to 60 transferable semester units.</b></p>	

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU San Marcos Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
Sonoma State University Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.

**Computer Engineering  
LOWER-DIVISION TRANSFER PATTERN  
CSU Stanislaus Campus-Specific Pattern**

This campus does not have a major, concentration, or option in Computer Engineering.