# BACHELOR OF SCIENCE IN COMPUTER ENGINEERING - QUANTITATIVE REASONING

## CATEGORY III/IV AND ENG 114

128 Total Units Required  
Minimum Number of Units in Major: 94  

This roadmap is a suggested plan of study and does not replace meeting with an advisor. Please note that students may need to adjust the actual sequence of courses based on course availability. Please consult an advisor in your major program for further guidance.

## Course Title Units  
### First Semester  
**ENG 114** Writing the First Year: Finding Your Voice (A2)  3  
**ENGR 100** Introduction to Engineering (Major Core)  1  
**ENGR 121** Gateway to Computer Engineering (Major Core)  1  
**ENGR 212** Introduction to Unix and Linux for Engineers (Major Core)  2  
**MATH 197** Prelude to Calculus I (Prerequisite for MATH 226)  3  
**GE Area A: Oral Communication (A1)**  3  
**GE Area D**  3  

### Second Semester  
Select One (Major Core):  3-5  
**CHEM 115** General Chemistry I: Essential Concepts of Chemistry  
**CHEM 180** Chemistry for the Energy and the Environment (B1, B3, ES)  
**MATH 198** Prelude to Calculus II (Prerequisite for MATH 226, B4)  3  
**GE Area B: Life Science (B2)**  3  
**GE Area C**  3  
**GE Area E**  3  

### Third Semester  
**CSC 210** Introduction to Computer Programming (Major Core)  3  
**MATH 226** Calculus I (Major Core, B4)  4  
**GE Area C - Take Two**  6  
**GE Area D**  3  

### Fourth Semester  
**CSC 220** Data Structures (Major Core)  3  
**CSC 230** Discrete Mathematical Structures for Computer Science (Major Core)  3  
**ENGR 213** Introduction to C Programming for Engineers (Major Core)  3  
**MATH 227** Calculus II (Major Core)  4  
**PHYS 220 & PHYS 222** General Physics with Calculus I and General Physics with Calculus I Laboratory (Major Core)  4  

### Fifth Semester  
**CSC 413** Software Development (Major Core)  3  
**MATH 228** Calculus III (Major Core)  4  
**PHYS 230 & PHYS 232** General Physics with Calculus II and General Physics with Calculus II Laboratory (Major Core)  4  
**GE Area D**  3  

### Sixth Semester  
**CSC 340** Programming Methodology (Major Core)  3  
**ENGR 205** Electric Circuits (Major Core)  3  
**ENGR 206** Circuits and Instrumentation Laboratory (Major Core)  1  

San Francisco State University Bulletin 2021-2022
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>MATH 245</td>
<td>Elementary Differential Equations and Linear Algebra (Major Core)</td>
<td>3</td>
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<tr>
<td><strong>Seventh Semester</strong></td>
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<tr>
<td>ENGR 300</td>
<td>Engineering Experimentation (Major Core)</td>
<td>3</td>
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<tr>
<td>ENGR 305</td>
<td>Linear Systems Analysis (Major Core)</td>
<td>3</td>
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<tr>
<td>ENGR 353</td>
<td>Microelectronics (Major Core)</td>
<td>3</td>
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<tr>
<td>ENGR 356</td>
<td>Digital Design (Major Core)</td>
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<tr>
<td>ENGR 357</td>
<td>Digital Design Laboratory (Major Core)</td>
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<tr>
<td><strong>Upper-Division Electives (6 units) - Take One</strong></td>
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<td><strong>Units</strong></td>
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<td><strong>Eighth Semester</strong></td>
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<tr>
<td>ENGR 301</td>
<td>Microelectronics Laboratory (Major Core)</td>
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<td>ENGR 378</td>
<td>Digital Systems Design (Major Core)</td>
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<td>ENGR 451</td>
<td>Digital Signal Processing (Major Core)</td>
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<td>ENGR 456</td>
<td>Computer Systems (Major Core)</td>
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<tr>
<td>ENGR 476</td>
<td>Computer Communications Networks (Major Core)</td>
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<tr>
<td>ENGR 696</td>
<td>Engineering Design Project I (Major Core)</td>
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<td><strong>Units</strong></td>
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<td><strong>Ninth Semester</strong></td>
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<td>ENGR 478</td>
<td>Design with Microprocessors (Major Core)</td>
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<td>ENGR 697GW</td>
<td>Engineering Design Project II - GWAR (Major Core)</td>
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<td><strong>Upper-Division Electives (6 units) - Take One</strong></td>
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<td><strong>GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)</strong></td>
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<td>3</td>
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<tr>
<td><strong>GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)</strong></td>
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<tr>
<td><strong>Units</strong></td>
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<tr>
<td><strong>Total Units</strong></td>
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</table>

1. ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

2. Depending on courses completed through Early Start, students in Pathway/Category III or IV may be required to enroll in a support course to complement their Quantitative Reasoning/B4 requirement. There are multiple course options for this pathway. Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center (http://cms.sfsu.edu/content/student-center/). Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website (http://developmentalstudies.sfsu.edu/).

3. QR Category III students with a grade of B or higher in high school pre-calculus in the past year may be able to enroll in MATH 226. Please see a department advisor.

4. GE Area A: Critical Thinking (A3) is satisfied upon completion of ENGR 205 and ENGR 201 or ENGR 213.

5. To avoid taking additional units, it is recommended that you meet SF State Studies (AERM, GP, ES, SJ) and Ethnic Studies requirements within your GE or major.

6. GE Area UD-B: Upper-Division Physical and/or Life Sciences is satisfied upon completion of ENGR 300 and either ENGR 301 or ENGR 302.

7. Major Electives (6 units)
   - CSC 415 Operating System Principles (3 units) (CSC 256 and MATH 324 are hidden prerequisites for this course)
   - CSC 510 Analysis of Algorithms I (3 units) (MATH 324 is a hidden prerequisite for this course)
   - CSC 645 Computer Networks (3 units) (CSC 415 is a hidden prerequisite for this course)
   - CSC 648 Software Engineering (3 units)
   - CSC 667 Internet Application Design and Development (3 units)
   - CSC 668 Advanced Object Oriented Software Design and Development (3 units)
   - ENGR 306 Electromechanical Systems (3 units)
   - ENGR 350 Introduction to Engineering Electromagnetics (3 units) (PHYS 240 is a hidden prerequisite for this course)
   - ENGR 442 Operational Amplifier Systems Design (3 units)
   - ENGR 446 Control Systems Laboratory (1 units) (ENGR 447 is a hidden prerequisite for this course)
   - ENGR 447 Control Systems (3 units)
   - ENGR 449 Communication Systems (3 units)
   - ENGR 453 Digital Integrated Circuit Design (4 units)
   - ENGR 454 Application Specific Integrated Circuit Design (4 units)
   - ENGR 610 Engineering Cost Analysis (3 units)
   - ENGR 844 Embedded Systems (3 units)
   - ENGR 848 Digital VLSI Design (3 units)
   - ENGR 849 Advanced Analog IC Design (3 units)
   - ENGR 851 Advanced Microprocessor Architectures (3 units)
   - ENGR 852 Advanced Digital Design (3 units)
   - ENGR 853 Advanced Topics in Computer Communication and Networks (3 units)
   - ENGR 854 Wireless Data Communication Standards (3 units)
   - ENGR 856 Nanoscale Circuits and Systems (3 units)
   - ENGR 868 Advanced Control Systems (3 units)
   - ENGR 869 Robotics (3 units)

   Students must complete 21 units of upper-division Engineering units before registering for ENGR 696.