# Computer Science with Business Applications

**Fall Quarter** | **Units** | **Winter Quarter** | **Units** | **Spring Quarter** | **Units**
--- | --- | --- | --- | --- | ---
CS 010A | 4 | CS 010B | 4 | CS 010C | 4
*C++ Programming I* | *Intro to Data Structures & Algorithms*
ENGL 001A | 4 | ENGL 001B | 4 | MATH 009C | 4
*Beginning Composition* | *
ENGR 001M | 1 | MATH 009B | 4 | *Breadth _______
Professional Dev. & Mentoring | *Humanities/Natural Sciences*
MATH 009A | 4 | CS/MATH 011 | 4 | *Breadth _______
*First Year Calculus* | *Intro to Discrete Structures*

**FIRST YEAR**

**BUS 020** | 4 | MATH 010A | 4 | ECON 003 | 5
*Financial Accounting & Reporting* | *
CS 061 | 4 | CS 111 | 4 | MATH 031 or EE 020 | 5
*Machine Org. & Assembly Lang. Prog.* | *
CS 100 | 4 | STAT 155 | 4 | *Breadth _______
Software Construction | *
ECON 002 | 5 | *Breadth _______
*Intro to Macroeconomics* | *

**THIRD YEAR**

**BUS 103** | 4 | BUS/STAT 104 | 4 | CS 153 | 4
*Marketing & Distribution Mgmt* | *
CS 141 | 4 | BUS 106/ECON 134 | 4 | ENGR 180W** | 4
*Intern. Data Structures & Algorithms* | *
Breadth ______ | 4 | CS Technical Elective* | 4 | SOC 150 | 4
*Humanities/Natural Sciences* | *
Breadth ______ | 4 | ENGR 101M | 1 | CS Technical Elective** | 4
*Humanities/Natural Sciences* | *

**FOURTH YEAR**

**BUS Technical Elective** | 4 | BUS Technical Elective | 4 | CS Technical Elective** | 4

**CS Elective** | 4 | CS Technical Elective* | 4 | BUS Technical Elective* | 4
*CS 164, CS 166, CS 172 or CS 180*
CS Elective | 4 | CS 165 | 4 | BUS Technical Elective* | 4
*CS 164, CS 166, CS 172 or CS 180*

**Total Units:** 177  
**Maximum Units:** 222

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**ENGLISH COMPOSITION**

A C or better is required in three quarters of English Composition courses to satisfy the graduation requirement. ENGR 180W fulfills third quarter English Composition.

**BREADTH REQUIREMENTS**

For an approved list of Breadth courses: http://student.engr.ucr.edu/policies/requirements/breadth.html.

**Humanities: (3 courses)**
- A. World History: _________
- B. Fine Arts/Lit./Phil./Rlst: _________
- C. Human Persp. on Sci: _________

**Natural Sciences: (4 courses)**
- A. Biological Science: _________
- B. Physical Science: 1_______ 2_______ 3_______

**Ethnicity: (1 course)**
- 1. _________

**Upper Division: (1 course)**
- 1. _________

**TECHNICAL ELECTIVES *****

Please note that Technical Electives may be offered throughout the Academic Year. Consult with your Academic Advisor about potential offerings. See approved technical electives on back.

**Computer Science Technical Electives:**
- 1. _________ 3. _________
- 2. _________ 4. _________

**Business Administration Technical Electives:**
- 1. _________ (IS) 3. _________
- 2. _________ (IS) 4. _________

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Course Plan is subject to change.
## Computer Science w/Business Applications Technical Electives

### Computer Science Technical Electives:
You must complete at least 16 units of upper division Computer Science Technical Electives which must be distinct from major requirements. These 16 units may be chosen from upper division requirements or technical electives for the Computer Science Major. At least four courses must be in the Department of Computer Science and Engineering.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 105</td>
<td>Data Analysis Methods</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS 110</td>
<td>Web Development</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 120A</td>
<td>Logic Design</td>
<td>5</td>
<td></td>
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<tr>
<td>CS 120B</td>
<td>Introduction to Embedded Systems</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 122A</td>
<td>Inter. Embedded&amp;Real-Time Syst.</td>
<td>5</td>
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<tr>
<td>CS 122B</td>
<td>Adv. Embedded &amp; Real-Time Syst.</td>
<td>5</td>
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<tr>
<td>CS 130</td>
<td>Computer Graphics</td>
<td>4</td>
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<tr>
<td>CS 133</td>
<td>Computational Geometry</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 135</td>
<td>Virtual Reality</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 142</td>
<td>Algorithm Engineering</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 144</td>
<td>Algorithm for Bioinformatics</td>
<td>4</td>
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<td>CS 145</td>
<td>Combinatorial Optimization Algor.</td>
<td>4</td>
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<tr>
<td>CS 150</td>
<td>Theory of Automata &amp; Formal Lang.</td>
<td>4</td>
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<tr>
<td>CS 152</td>
<td>Compiler Design</td>
<td>4</td>
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<tr>
<td>CS 160</td>
<td>Concurrent Prog. &amp; Parallel Syst.</td>
<td>4</td>
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<tr>
<td>CS 161</td>
<td>Design&amp;Architecture of Comp. Syst.</td>
<td>4</td>
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<tr>
<td>CS 162</td>
<td>Computer Architecture</td>
<td>4</td>
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<tr>
<td>CS 164*</td>
<td>Computer Networks</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 166*</td>
<td>Database management Systems</td>
<td>4</td>
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<tr>
<td>CS 167</td>
<td>Intro to BIG-DATA Management</td>
<td>4</td>
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<tr>
<td>CS 168</td>
<td>Introduction to VLSI Design</td>
<td>4</td>
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<tr>
<td>CS 169</td>
<td>Mobile Wireless Networks</td>
<td>4</td>
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<tr>
<td>CS 170</td>
<td>Introduction to Artificial Intelligence</td>
<td>4</td>
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<tr>
<td>CS 171</td>
<td>Intro to Machine Learning &amp; Data Mining</td>
<td>4</td>
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<tr>
<td>CS 172*</td>
<td>Introduction to Information Retrieval</td>
<td>4</td>
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<tr>
<td>CS 173</td>
<td>Introduction to NLP</td>
<td>4</td>
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<tr>
<td>CS 175</td>
<td>Entrepreneurship in Computing</td>
<td>4</td>
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<tr>
<td>CS 177</td>
<td>Modeling &amp; Simulation</td>
<td>4</td>
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<tr>
<td>CS 179 (E-Z)</td>
<td>Project in Computer Science</td>
<td>4</td>
<td>(4 units maximum)</td>
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<tr>
<td>CS 180*</td>
<td>Introduction to Software Engineering</td>
<td>4</td>
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<tr>
<td>CS 181</td>
<td>Principles of Programming Languages</td>
<td>4</td>
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<tr>
<td>CS 182</td>
<td>Software Testing and Verification</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 183</td>
<td>UNIX System Administration</td>
<td>4</td>
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<tr>
<td>CS 193</td>
<td>Design Project</td>
<td>4</td>
<td>(4 units maximum)</td>
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</table>

*These courses will satisfy the CS Elective or a CS Technical Elective degree requirements. These courses will not double count for both degree requirements.

### Business Administration Technical Electives:
You must complete at least 16 units of upper division Business Administration Technical Electives, including at least 8 units of courses listed in the Information Systems concentration within the Business Administration major. These units must be distinct from major requirements and may be chosen from any of the available Business Administration courses.

**Choose at least TWO from Information Systems courses:**
- BUS 110 Intro to Data Mining and Visual Analytics (4)
- BUS 125 Simulation for Business (4)
- BUS 128 Project Planning and Control (4)
- BUS 163 Technology Entrepreneurship (4)
- BUS 171 System Analysis & Design (4)
- BUS 172 Information Economics (4)
- BUS 173 Introduction to Databases for Mgmt (4)
- BUS 174 Electronic Commerce (4)
- BUS 175 Business Data Communications (4)
- BUS 179 Bus App of GIS

**Choose remaining TWO from:**
- ANY AVAILABLE UPPER DIVISION BUSINESS ADMINISTRATION (BUS) COURSES, EXCEPT BUS 101

Please note the following credit exceptions:
- No credit is given for BUS 101
- Only one of BUS 171 or CS 180 can be taken for credit
- Only one of BUS 173 or CS 166 can be taken for credit
- Only one of BUS 175 or CS 164 can be taken for credit
- Only one of BUS 125 or CS 177 can be taken for credit

1 Technical Electives may require that you complete additional courses as prerequisites that are not accounted for in the undergraduate program. Please go to www.catalog.ucr.edu for course descriptions and prerequisite information.