Department of Computer Science and Electrical Engineering

Computer Science
As a computer scientist, imagine creating the next search engine, the next social web site, or even the next “must have” video game. The Computer Science program at BYU-Idaho offers a solid background in computer science by providing experiences in algorithm development, procedural and object-oriented design and programming, software engineering practices, computer security, web engineering, technical communication, and theoretical foundations of computing. Graduates are prepared for high paying employment as software engineers or to continue their education at graduate school.

Computer Engineering
As a computer engineer, imagine creating the next super computer, the next revolutionary MP3/video player, or even the next control system for the latest Air Force fighter jet. The Computer Engineering program at BYU-Idaho balances scientific and engineering theory with technical laboratory experiences in order to develop practical knowledge and skills that working computer engineers need. The curriculum is balanced to make you adept at designing and developing both computer hardware and computer software. In addition, throughout your computer engineering education, you will gain in-depth knowledge and skills in the design and development of many different types of computer systems: from small MP3 players to large parallel computer systems. Graduates are prepared for high paying employment as computer engineers or to continue their education at graduate school.

Electrical Engineering
As an electrical engineer, imagine creating the next generation of consumer electronic devices, the next generation of robotics, or the next electronic medical device that saves lives. The Electrical Engineering program at BYU-Idaho prepares you to use electricity and electronics in novel ways to help solve some of the world’s greatest scientific challenges. The program balances scientific and engineering theory with technical laboratory experiences in order to develop practical knowledge and skills that working electrical engineers need. Graduates are prepared for high paying employment as electrical engineers or to continue their education at graduate school.

Department of Computer Science and Electrical Engineering

The curricula in the Department of Computer Science and Electrical Engineering are designed to provide a broad background in the theory and practice of computer software, computer hardware, and electrical systems. Students learn how to combine scientific knowledge and engineering methods with practical technical skills to help prepare them for life-long learning and rewarding employment. Three degree programs are offered:
1) B.S. in Computer Science
2) B.S. in Computer Engineering
3) B.S. in Electrical Engineering

Graduates in the Department of Computer Science and Electrical Engineering will:
- Have a thorough grounding in the fundamental principles and practices of their respective degree programs
- Have learned how to learn
- Be prepared for a successful career
- Be ethical and responsible employees who make a difference

The Department of Computer Science and Electrical Engineering continually strives to evaluate, improve, and modernize its curricula to keep pace with today’s technological innovations. Advisors can help students determine the best sequence of courses to meet all graduation requirements within eight semesters. To qualify for graduation, students must achieve at least a C- grade in all major required classes.
## BS in Computer Science (440)

### Take required Foundations courses

#### Core Courses

- **Take these courses during your first 3 semesters:**
  - CS 124 3
  - CS 165 3
  - CS 235 3
  - ECEN 160 3

- **Total Major Credits=79**

#### Supplemental Courses

- **Take 15 credits:**
  - CIT 320 3
  - CS 312 3
  - CS 371 3
  - CS 460 3
  - CS 480 3
  - CS 490B 3
  - ECEN 460 3

- **Take these courses:**
  - CS 213 3
  - CS 237 3
  - CS 238 3
  - CS 246 3
  - CS 206 3
  - CS 308 2
  - CS 345 3
  - CS 364 4
  - CS 416 2
  - CS 432 3
  - CS 470 3
  - ECEN 324 3
  - MATH 325 3
  - MATH 341 3

- **Take 1 course:**
  - CS 398 4
  - CS 499R 1

- **Take 3 credits:**
  - CS 499A 2
  - CS 499B 1

#### Math and Science Courses

- **Take 1 course:**
  - BIO 249 4
  - CHEM 106 4
  - MATH 113 3
  - MATH 411 3
  - PH 220 3

- **Take these courses:**
  - CHEM 105 4
  - OR
  - PH 121 3
  - PH 150 1

#### Science Courses

- **Take this course:**
  - CHEM 105 4

### Program Notes:

- **Supplemental Courses:**
  - Take 15 credits:
    - CIT 320 3
    - CS 312 3
    - CS 371 3
    - CS 460 3
    - CS 480 3
    - CS 490B 3
    - ECEN 460 3
  - **Take these courses:**
    - CS 213 3
    - CS 237 3
    - CS 238 3
    - CS 246 3
    - CS 206 3
    - CS 308 2
    - CS 345 3
    - CS 364 4
    - CS 416 2
    - CS 432 3
    - CS 470 3
    - ECEN 324 3
    - MATH 325 3
    - MATH 341 3
  - **Take 1 course:**
    - CS 398 4
    - CS 499R 1
  - **Take 3 credits:**
    - CS 499A 2
    - CS 499B 1

### Total Major Credits=79

**Additional Elective Credits Required for Graduation=1**

This major is available on the following tracks:

- **Fall-Winter---- YES**
- **Winter-Spring---- YES**
- **Spring-Fall---- YES**
BS in Electrical Engineering (445)

Major Requirements

No Double Counting of Major Courses - No Grade Less Than C- in Major Courses

<table>
<thead>
<tr>
<th>Core Courses</th>
<th>Take these courses during your first 2 semesters:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 124</td>
<td>3</td>
</tr>
<tr>
<td>CS 165</td>
<td>3</td>
</tr>
<tr>
<td>ECEN 150</td>
<td>3</td>
</tr>
<tr>
<td>ECEN 160</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

Take these courses:

| CS 235       | 3                                                |
| CS 237       | 3                                                |
| CS 308       | 2                                                |
| ECEN 250     | 4                                                |
| ECEN 260     | 3                                                |
| ECEN 340     | 3                                                |
| ECEN 350     | 3                                                |
| ECEN 380     | 3                                                |
| ECEN 390     | 3                                                |
| ECEN 398R    | 1-7                                              |
| ECEN 499     | 3                                                |
| MATH 215     | 4                                                |
| MATH 316     | 4                                                |
| MATH 325     | 3                                                |
| PH 121       | 3                                                |
| PH 220       | 3                                                |
|              | 48                                               |

Take 1 course:

| ECEN 420     | 3                                                |
| ECEN 430     | 3                                                |
| ECEN 470     | 3                                                |
|              | 3                                                |

Supplemental Courses

Take 3 courses:

| CHEM 105     | 4                                                |
| ECEN 324     | 3                                                |
| ECEN 420     | 3                                                |
| ECEN 430     | 3                                                |
| ECEN 440     | 3                                                |
| ECEN 450     | 3                                                |
| ECEN 460     | 3                                                |
| ECEN 470     | 3                                                |
| ECEN 480     | 3                                                |
| ECEN 490     | 3                                                |
|              | 15                                               |

Program Notes:

Total Major Credits = 78

Additional Elective Credits Required for Graduation = 2

This major is available on the following tracks:

| Fall-Winter | YES       | Winter-Spring | YES | Spring-Fall | YES |

215
## BS in Computer Engineering (450)

### Major Requirements

*No Double Counting of Major Courses - No Grade Less Than C- in Major Courses*

<table>
<thead>
<tr>
<th>Core Courses Takes these courses during your first 2 semesters:</th>
<th>Take 1 course:</th>
<th>Supplemental Core Courses Take 2 courses:</th>
<th>Program Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 124 3</td>
<td>ECEN 440 3</td>
<td>CHEM 105 4</td>
<td></td>
</tr>
<tr>
<td>CS 165 3</td>
<td>ECEN 450 3</td>
<td>ECEN 380 3</td>
<td></td>
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<tr>
<td>ECEN 150 3</td>
<td>ECEN 480 3</td>
<td>ECEN 390 3</td>
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<tr>
<td>ECEN 160 3</td>
<td></td>
<td>ECEN 420 3</td>
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<td></td>
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<td>ECEN 430 3</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>ECEN 440 3</td>
<td></td>
</tr>
</tbody>
</table>

**Take 3 courses:**

| | ECEN 380 3 | ECEN 450 3 | |
| | ECEN 390 3 | ECEN 470 3 | |
| | | ECEN 480 3 | |
| | | ECEN 490 3 | |
| | ECEN 490 3 | | |
| | | ECEN 490 3 | |

**Take 1 course:**

| | ECEN 440 3 | ECEN 450 3 | |
| | ECEN 480 3 | ECEN 390 3 | |
| | | ECEN 420 3 | |
| | | ECEN 430 3 | |
| | | ECEN 440 3 | |

**Take 3 courses:**

| | ECEN 380 3 | ECEN 450 3 | |
| | ECEN 390 3 | ECEN 470 3 | |
| | | ECEN 480 3 | |
| | | ECEN 490 3 | |
| | ECEN 490 3 | | |
| | | ECEN 490 3 | |

**Total Major Credits=77**

Additional Elective Credits Required for Graduation=3

This major is available on the following tracks:

Fall-Winter---- YES  
Winter-Spring---- YES  
Spring-Fall---- YES

## Minor in Computer Science (147)

### Minor Requirements

*No double counting of minor courses*

<table>
<thead>
<tr>
<th>Core Courses Take these courses:</th>
<th>Optional Courses Take 12 credits:</th>
<th>Program Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 124 3</td>
<td>ECEN 160 3</td>
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</tr>
<tr>
<td>CS 165 3</td>
<td>ECEN 324 3</td>
<td></td>
</tr>
<tr>
<td>CS 235 3</td>
<td>CS 213 3</td>
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<tr>
<td>CS 246 3</td>
<td>CS 237 3</td>
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<td>CS 238 3</td>
<td></td>
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<td></td>
<td>CS 306 3</td>
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<td></td>
<td>CS 312 3</td>
<td></td>
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<td>CS 313 3</td>
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<td></td>
<td>CS 345 3</td>
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<td>CS 364 4</td>
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<td></td>
<td>CS 371 3</td>
<td></td>
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<td></td>
<td>CS 416 2</td>
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<td>CS 432 3</td>
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<td>CS 460 3</td>
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<td>CS 470 3</td>
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<td>CS 480 3</td>
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<tr>
<td></td>
<td>CS 490R 3</td>
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</tr>
</tbody>
</table>

**Total Minor Credits=24**

This minor is available on the following tracks:

Fall-Winter---- YES  
Winter-Spring---- YES  
Spring-Fall---- YES
Software Engineering Concentration (D 106)

Concentration Requirements

No Double Counting of Concentration Courses

<table>
<thead>
<tr>
<th>Introductory Module</th>
<th>Supplemental Courses</th>
<th>Total Concentration Credits=36</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 124 3</td>
<td>CS 165 3</td>
<td>CS 235 3</td>
</tr>
</tbody>
</table>

Software Engineering Module

<table>
<thead>
<tr>
<th>Take these courses:</th>
<th>ECEN 324 3</th>
<th>ECEN 340 3</th>
<th>ECEN 350 3</th>
<th>ECEN 380 3</th>
<th>ECEN 390 3</th>
<th>ECEN 398R 1-7</th>
<th>ECEN 420 3</th>
<th>ECEN 430 3</th>
<th>ECEN 440 3</th>
<th>ECEN 450 3</th>
<th>ECEN 460 3</th>
<th>ECEN 470 3</th>
<th>ECEN 480 3</th>
<th>ECEN 490 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 306 3</td>
<td>CS 312 3</td>
<td>CS 313 3</td>
<td>CS 345 3</td>
<td>CS 398 1-4</td>
<td>CS 460 3</td>
<td>CS 470 3</td>
<td>CS 480 3</td>
<td>CS 490R 3</td>
<td>CS 490R 1-4</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Supplemental Courses: Take 7 credits of upper division courses not included in concentration core or selected emphasis areas:

<table>
<thead>
<tr>
<th>Continued from previous column</th>
<th>ECEN 324 3</th>
<th>ECEN 340 3</th>
<th>ECEN 350 3</th>
<th>ECEN 380 3</th>
<th>ECEN 390 3</th>
<th>ECEN 398R 1-7</th>
<th>ECEN 420 3</th>
<th>ECEN 430 3</th>
<th>ECEN 440 3</th>
<th>ECEN 450 3</th>
<th>ECEN 460 3</th>
<th>ECEN 470 3</th>
<th>ECEN 480 3</th>
<th>ECEN 490 3</th>
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</thead>
<tbody>
<tr>
<td>IDS 398R 1-7</td>
<td>IDS 499 2</td>
<td>15</td>
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</tbody>
</table>

Total Concentration Credits=36

This Concentration is available on the following tracks:

Fall-Winter---- YES Winter-Spring---- YES Spring-Fall---- YES

Computer Science Internet Concentration (D 107)

Concentration Requirements

No Double Counting of Concentration Courses

<table>
<thead>
<tr>
<th>Introductory Module</th>
<th>Supplemental Courses</th>
<th>Total Concentration Credits=36</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 124 3</td>
<td>CS 165 3</td>
<td>CS 235 3</td>
</tr>
</tbody>
</table>

Internet Module

<table>
<thead>
<tr>
<th>Take these courses:</th>
<th>ECEN 324 3</th>
<th>ECEN 340 3</th>
<th>ECEN 350 3</th>
<th>ECEN 380 3</th>
<th>ECEN 390 3</th>
<th>ECEN 398R 1-7</th>
<th>ECEN 420 3</th>
<th>ECEN 430 3</th>
<th>ECEN 440 3</th>
<th>ECEN 450 3</th>
<th>ECEN 460 3</th>
<th>ECEN 470 3</th>
<th>ECEN 480 3</th>
<th>ECEN 490 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 306 3</td>
<td>CS 312 3</td>
<td>CS 313 3</td>
<td>CS 345 3</td>
<td>CS 398 1-4</td>
<td>CS 460 3</td>
<td>CS 470 3</td>
<td>CS 480 3</td>
<td>CS 490R 3</td>
<td>CS 490R 1-4</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Supplemental Courses: Take 9 credits of upper division courses not included in concentration core or selected emphasis areas:

<table>
<thead>
<tr>
<th>Continued from previous column</th>
<th>ECEN 324 3</th>
<th>ECEN 340 3</th>
<th>ECEN 350 3</th>
<th>ECEN 380 3</th>
<th>ECEN 390 3</th>
<th>ECEN 398R 1-7</th>
<th>ECEN 420 3</th>
<th>ECEN 430 3</th>
<th>ECEN 440 3</th>
<th>ECEN 450 3</th>
<th>ECEN 460 3</th>
<th>ECEN 470 3</th>
<th>ECEN 480 3</th>
<th>ECEN 490 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDS 398R 1-7</td>
<td>IDS 499 2</td>
<td>15</td>
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</tbody>
</table>

Total Concentration Credits=36

This Concentration is available on the following tracks:

Fall-Winter---- YES Winter-Spring---- YES Spring-Fall---- YES
Computer Science Hardware Concentration (D 108)

### Concentration Requirements

**No Double Counting of Concentration Courses**

<table>
<thead>
<tr>
<th>Introductory Module</th>
<th>Supplemental Courses</th>
<th>Program Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Take these courses:</strong></td>
<td></td>
<td>continued from previous column</td>
</tr>
<tr>
<td>CS 124 3</td>
<td>CS 308 2</td>
<td>ECEN 340 3</td>
</tr>
<tr>
<td>CS 165 3</td>
<td>CS 312 3</td>
<td>ECEN 350 3</td>
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<tr>
<td>CS 235 3</td>
<td>CS 313 3</td>
<td>ECEN 380 3</td>
</tr>
<tr>
<td>CS 246 3</td>
<td>CS 364 4</td>
<td>ECEN 390 3</td>
</tr>
<tr>
<td>IDS 398R 1-3</td>
<td>CS 371 3</td>
<td>ECEN 398R 1-7</td>
</tr>
<tr>
<td>IDS 499 2</td>
<td>CS 398 1-4</td>
<td>ECEN 420 3</td>
</tr>
<tr>
<td><strong>Computer Science Hardware Module</strong></td>
<td></td>
<td>ECEN 430 3</td>
</tr>
<tr>
<td><strong>Take these courses:</strong></td>
<td></td>
<td>ECEN 440 3</td>
</tr>
<tr>
<td>CS 345 3</td>
<td>CS 416 2</td>
<td>ECEN 450 3</td>
</tr>
<tr>
<td>ECEN 160 3</td>
<td>CS 432 3</td>
<td>ECEN 470 3</td>
</tr>
<tr>
<td>ECEN 324 3</td>
<td>CS 460 3</td>
<td>ECEN 480 3</td>
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<tr>
<td>ECEN 460 3</td>
<td>CS 470 3</td>
<td>ECEN 490 3</td>
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<tr>
<td><strong>Total Concentration Credits=36</strong></td>
<td>CS 480 3</td>
<td></td>
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<td>CS 490R 3</td>
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<tr>
<td></td>
<td>CS 498R 1-4</td>
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</tbody>
</table>

This Concentration is available on the following tracks:

- Fall-Winter----  YES
- Winter-Spring---- YES
- Spring-Fall----  YES

Computer Science Theory Concentration (D 109)

### Concentration Requirements

**No Double Counting of Concentration Courses**

<table>
<thead>
<tr>
<th>Introductory Module</th>
<th>Supplemental Courses</th>
<th>Program Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Take these courses:</strong></td>
<td></td>
<td>continued from previous column</td>
</tr>
<tr>
<td>CS 124 3</td>
<td>CS 308 2</td>
<td>ECEN 324 3</td>
</tr>
<tr>
<td>CS 165 3</td>
<td>CS 312 3</td>
<td>ECEN 340 3</td>
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<td>CS 235 3</td>
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<tr>
<td>CS 246 3</td>
<td>CS 364 4</td>
<td>ECEN 380 3</td>
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<td>IDS 398R 1-3</td>
<td>CS 371 3</td>
<td>ECEN 390 3</td>
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<td>IDS 499 2</td>
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<td>ECEN 398R 1-7</td>
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<td><strong>Theory Module</strong></td>
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<td><strong>Take these courses:</strong></td>
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<tr>
<td>CS 237 3</td>
<td>CS 416 2</td>
<td>ECEN 440 3</td>
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<td>CS 238 3</td>
<td>CS 432 3</td>
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<td>CS 306 3</td>
<td>CS 460 3</td>
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<tr>
<td>CS 480 3</td>
<td>CS 470 3</td>
<td>ECEN 470 3</td>
</tr>
<tr>
<td><strong>Total Concentration Credits=36</strong></td>
<td>CS 490R 3</td>
<td>ECEN 480 3</td>
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<tr>
<td></td>
<td>CS 498R 1-4</td>
<td>ECEN 490 3</td>
</tr>
</tbody>
</table>

This Concentration is available on the following tracks:

- Fall-Winter----  YES
- Winter-Spring---- YES
- Spring-Fall----  YES
Computer Science and Electrical Engineering Pre-approved Clusters

Computer Science 6600

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 124 Introduction to Software Development</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>Prerequisites: High School Algebra</td>
<td></td>
</tr>
<tr>
<td>CS 165 Object-oriented Software Development</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>Prerequisites: CS 124</td>
<td></td>
</tr>
<tr>
<td>Software design and development using the object-oriented paradigm; algorithm formulation and object-oriented programming</td>
<td></td>
</tr>
<tr>
<td>CS 213 Web Engineering 1</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>Prerequisites: CS 165</td>
<td></td>
</tr>
<tr>
<td>Internet and Web basics. Web fundamentals - web terminology, web browsers and web servers. This course teaches the concepts behind the fundamental tools used for building client-side web applications. It emphasizes client-side programming standards and programming tools used to create dynamic web applications.</td>
<td></td>
</tr>
<tr>
<td>CS 235 Data Structures</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>Prerequisites: CS 165</td>
<td></td>
</tr>
<tr>
<td>Builds on the foundation of CS 124 and CS 165 to introduce the fundamental concepts of data structures and the algorithms that proceed from them.</td>
<td></td>
</tr>
<tr>
<td>CS 237 Discrete Mathematics 1</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>Prerequisites: CS 165: FDMAT112</td>
<td></td>
</tr>
<tr>
<td>Introduces the mathematical topics needed to provide a solid theoretical foundation for computer science and computer engineering.</td>
<td></td>
</tr>
<tr>
<td>CS 238 Discrete Mathematics 2</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>Prerequisites: CS 237</td>
<td></td>
</tr>
<tr>
<td>Continues the mathematical topics needed to provide a solid theoretical foundation for computer science.</td>
<td></td>
</tr>
<tr>
<td>CS 246 Software Design and Development</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>Prerequisites: CS 235</td>
<td></td>
</tr>
<tr>
<td>Advanced object-oriented design and software development.</td>
<td></td>
</tr>
<tr>
<td>CS 290 Special Topics</td>
<td>(1-3:8:0)</td>
</tr>
<tr>
<td>Prerequisites: Instructor consent</td>
<td></td>
</tr>
<tr>
<td>Faculty/student consultation will determine an area of study/research that will give an advanced student greater appreciation and experience in this field. Terms of enrollment, credit, etc., will be determined by the instructor.</td>
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</tr>
</tbody>
</table>

Computer or Electrical Engineering 6601

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 124 Introduction to Software Development</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>CS 165 Object-oriented Software Development</td>
<td>(3:3:0)</td>
</tr>
<tr>
<td>Prerequisites: CS 235, College Algebra and MATH 111</td>
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</tr>
<tr>
<td>Effectively use freely available source tools and C programming APIs, including Blender, OpenGL, and SDL, with an introduction to sound, physics, and networking libraries.</td>
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<tr>
<td>CS 345 Operating Systems</td>
<td>(3:3:0)</td>
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<tr>
<td>Prerequisites: ECEN 324</td>
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<tr>
<td>Analysis of methods used by operating systems to perform typical system services, including: process control, memory management, scheduling, I/O, file management, and concurrency.</td>
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<tr>
<td>CS 371 Human-Computer Interaction</td>
<td>(3:3:0)</td>
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<tr>
<td>Prerequisites: CS 308, CS 246 or instructor consent</td>
<td></td>
</tr>
<tr>
<td>Software engineering overview; software requirements engineering including elicitation and specification; software design.</td>
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</tr>
</tbody>
</table>

Advanced object-oriented design and software development. (Fall, Winter)

Prerequisites: High School Algebra. The goal of this class is that each student will be able to solve problems in C++ and have a solid foundation in software development methodology. (Fall, Winter, Spring)

Prerequisites: CS 124 |

(As needed)
CS 398 Internship
Prerequisites: CS 246 and consent of Department Internship Coordinator
Planned and supervised practical experience in vocational or educational settings; interns acquire practical skills while applying classroom theory and principles.
(Fall, Winter, Spring)

CS 416 Software Engineering 2
Prerequisites: CS 246; CS 308
Software quality engineering including testing and verification and validation; software metrics; software cost estimation.
(Fall, Winter)

CS 432 Software Engineering 3
Prerequisites: CS 246; CS 308
Software process and project management.
(Winter, Spring)

CS 460 Computer Communication and Networks
Prerequisites: CS 246 or non-CS major: CS 235 and instructor consent
Introduction to computer networking and network programming with an Internet focus, including: applications, protocols, transport services, IP, routing, LANs, wireless and security.
(Fall, Spring)

CS 470 Computer Security
Prerequisites: CS 246; CS 308
CS 470; Computer Security, is essentially a research class. The purpose of this class is to help each student develop the skills necessary to become a security expert in whatever domain of computer security that is important to their job when they enter the work force.
(Fall, Winter)

CS 480 Computational Theory
Prerequisites: CS 306
Finite automata, regular expressions, grammars, languages, Turing machines, computability, complexity, P and NP problems.
(Winter, Spring)

CS 490R Special Topics
Current topics in Computer Science.
(As needed)

CS 499R Internship
Prerequisites: CS 398
Planned and supervised practical experience in vocational or educational settings; interns acquire practical skills while applying classroom theory and principles.
(Fall, Winter, Spring)

CS 499 Senior Project
Prerequisites: CS 364
Directed individual or group research and study of a topic in computer science not covered by the curriculum. The topic shall be such that the student shall 1) demonstrate he/she has learned how to learn and 2) apply material covered by the curriculum to understand a new topic.
(Fall, Winter, Spring)

CS 499A Senior Project, Part A
Prerequisites: CS 364
Directed individual or group research and study of a topic in Computer Science not covered by the curriculum. Part A of the senior project includes proposal preparation, research, requirements specification, and other activities as specified in the proposal.
(Fall, Winter, Spring)

CS 499B Senior Project, Part B
Prerequisites: CS 499A
Completion of the senior project started in CS 499A as specified in the proposal and requirements specification.
(Fall, Winter, Spring)

CS 499S Senior Project Supplemental
Co-requisites: CS 499
An extension of CS 499, Senior Project; allows the Senior Project student to engage in a more significant project by registering for an extra one or two credits
(Fall, Winter, Spring)

ECEN 150 Electric Circuit Analysis 1
Prerequisites: Proficiency in algebra, exposure to trigonometry
Introduction to electrical and computer engineering: Analysis and design of DC and AC circuits. Resistors, capacitors, inductors, transformers, and batteries. Ohm's Law, power and network theorems. Steady state and frequency domain analysis. A student project and presentation is required. Laboratory exercises are included.
(Fall, Winter, Spring)

ECEN 160 Fundamentals of Digital Systems
Prerequisites: CS 124
Theory, design, and implementation of combinational and sequential logic; students must design and build a project that uses sequential logic and a programmable logic device. A student presentation is required. Laboratory exercises are included.
(Fall, Winter, Spring)

ECEN 250 Electric Circuit Analysis 2
Prerequisites: ECEN 150
Co-requisite: MATH 316
Analysis and design of DC and AC circuits. Transient analysis using differential equations. Laboratory exercises are included.
(Winter, Spring)

ECEN 260 Microprocessor-Based System Design
Prerequisites: CS 165; ECEN 160 or ECEN 224
Applications, architecture, programming and interfacing of microprocessors and microcontrollers. Laboratory exercises are included. Formerly ECEN 360.
(Fall, Winter)

ECEN 324 Computer Architecture
Prerequisites: CS 235; ECEN 160 or ECEN 224
Computer system and processor architecture including: instruction sets, control unit, and data path design, memory hierarchy, pipelining, I/O, and program performance optimization. Laboratory exercises are included.
(Fall, Winter)

ECEN 340 Digital Systems Design
Prerequisites: ECEN 160 or ECEN 224
Hierarchical design of digital systems. Synchronous state machine design, including the use of ROMs, one-hot count sequences, and other variations. Asynchronous state machine design. Circuit synthesis and simulation using the Verilog hardware description language. Circuit implementation field programmable gate arrays (FPGAs). A technical report and presentation is required. Laboratory exercises are included.
(Fall, Winter)

ECEN 350 Electronic Devices and Circuits
Prerequisites: ECEN 250
Introduction to semiconductor devices. Principles of rectifiers, zener diodes, and other pn junction devices. Diode applications such as voltage rectifiers, voltage multipliers, voltage regulators, clippers, and clamps. Principles, biasing, modeling, and small signal applications of bipolar junction transistors and field effect transistors. Students must design, build, and demonstrate electronic equipment that meets given specifications. A student presentation is required. Laboratory exercises are included.
(Fall, Winter)

ECEN 380 Signals and Systems
Prerequisites: ECEN 250; MATH 316
The main goal of this class is to develop the classical signals and systems analysis theory for both continuous and discrete-time cases. The course includes: signals and systems and their properties, linear time-invariant systems; stability analysis, sampling of continuous-time signals, z-transform, discrete Fourier transform, time and frequency domain representations of discrete-time signals and systems, and introductory concepts in communications.
(Winter, Spring)

ECEN 390 Electricity and Magnetism
Prerequisites: ECEN 250; MATH 316
This course is an introduction to electromagnetic waves and fields. Students will learn the properties of electric and magnetic field theories and their applications. These applications include transmission lines, capacitors, inductors, electrical motors and generators, photonic, and antennas. Laboratory experiments are included.
(Fall, Spring)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Description</th>
<th>(Semesters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECEN 398R Internship</td>
<td></td>
<td>ECEN 250 and instructor consent</td>
<td>Full-time employment as an electrical engineering or a computer engineering intern for one semester or more. (Fall, Winter, Spring)</td>
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<tr>
<td>ECEN 420 RF Circuits</td>
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<td>ECEN 350</td>
<td>This course is an introduction to RF circuits. Students will learn the basics of key RF components including high frequency transistors, filters, mixers, oscillators, and phase locked loops. Students will also be introduced to laboratory test equipment, network analysis, and the fundamentals of transmission lines. Finally the students will understand basic high frequency test equipment. Laboratory experiments are included. (Rotating semesters)</td>
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<tr>
<td>ECEN 430 Power Electronics</td>
<td></td>
<td>ECEN 350; ECEN 380</td>
<td>Introduction to power semiconductor devices, magnetic circuits, transformers, half-wave and full-wave diode and phase rectifiers, switching converters, and motor drivers. (Rotating semesters)</td>
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<tr>
<td>ECEN 440 Data and Computer Communications</td>
<td></td>
<td>ECEN 250</td>
<td>Fundamentals of data and computer communications focusing on the physical and data link layers of the OSI architecture. Laboratory exercises are included. (Rotating semesters)</td>
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<tr>
<td>ECEN 450 Digital VLSI System Design</td>
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<td>ECEN 340</td>
<td>Advanced digital design concepts including design methodologies, tools, and functional verification of HDL models. VLSI concepts are also covered, including the translation of HDL to gates, to transistors, and then to functional silicon. CMOS transistor concepts with special attention to the digital CMOS silicon manufacturing process are also stressed as well as formal validation of silicon components. (Rotating semesters)</td>
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<tr>
<td>ECEN 460 Real-Time and Embedded Systems</td>
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<td>ECEN 260</td>
<td>Hardware/software interface, real-time kernel internals, implementation of high-level language constructs issues in real-time application software development. (Rotating semesters)</td>
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<tr>
<td>ECEN 470 Feedback Control of Dynamic Systems</td>
<td></td>
<td>MATH 316</td>
<td>Dynamic modeling, dynamic response, analysis and design of feedback control. (Rotating semesters)</td>
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<tr>
<td>ECEN 480 Digital Signal Processing</td>
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<td>ECEN 380</td>
<td>Time and frequency domain analysis of discrete time systems subjected to periodic or non-periodic input signals. Digital signal processing, fast Fourier transforms, digital filter design, spectrum analysis and applications. Laboratory exercises are included. (Rotating semesters)</td>
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</tr>
<tr>
<td>ECEN 490 Special Topics</td>
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<td>Instructor consent</td>
<td>In this class you will be introduced to the elements and analysis of Power Systems, including a survey of the methods and tools used to study the generation and movement of electric power throughout a power grid. The class will both introduce the concepts that govern the generation and flow of power and the computer-based tools that are used in industry to understand them. We will also cover the devices normally associated with renewable energy in the electric grid, for example, wind and solar power sources. (Rotating semesters)</td>
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<tr>
<td>ECEN 499 Senior Project</td>
<td></td>
<td>ECEN 398 and instructor consent</td>
<td>Culminating design experience based on skills learned in advanced technical courses. Students work in teams to plan, design, test and demonstrate a major project. (Fall, Winter, Spring)</td>
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</tbody>
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