CS 101  **Intro Computing: Engrg & Sci**  credit: 3 hours.
Fundamental principles, concepts, and methods of computing, with emphasis on applications in the physical sciences and engineering. Basic problem solving and programming techniques; fundamental algorithms and data structures; use of computers in solving engineering and scientific problems. Intended for engineering and science majors. Prerequisite: MATH 220 or MATH 221.

Students must register for one lab-discussion and one lecture section. Engineering students must obtain a dean's approval to drop this course after the second week of instruction.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31018</td>
<td>Lecture</td>
<td>AL1</td>
<td>01:00 PM - 01:50 PM</td>
<td>MW</td>
<td>AUD - Foellinger Auditorium</td>
<td>Davis, N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quantitative Reasoning II course</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Restricted to Undergrad - Urbana-Champaign</td>
<td></td>
</tr>
<tr>
<td>31115</td>
<td>Laboratory-Discussion</td>
<td>AYA</td>
<td>09:00 AM - 10:50 AM</td>
<td>M</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quantitative Reasoning II course</td>
<td></td>
</tr>
<tr>
<td>31116</td>
<td>Laboratory-Discussion</td>
<td>AYB</td>
<td>11:00 AM - 12:50 PM</td>
<td>M</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quantitative Reasoning II course</td>
<td></td>
</tr>
<tr>
<td>31117</td>
<td>Laboratory-Discussion</td>
<td>AYC</td>
<td>03:00 PM - 04:50 PM</td>
<td>M</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quantitative Reasoning II course</td>
<td></td>
</tr>
<tr>
<td>31118</td>
<td>Laboratory-Discussion</td>
<td>AYD</td>
<td>09:00 AM - 10:50 AM</td>
<td>T</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quantitative Reasoning II course</td>
<td></td>
</tr>
<tr>
<td>58967</td>
<td>Laboratory-Discussion</td>
<td>AYE</td>
<td>11:00 AM - 12:50 PM</td>
<td>T</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.
<table>
<thead>
<tr>
<th>Session</th>
<th>Time</th>
<th>Day</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31119</td>
<td>01:00 PM - 02:50 PM</td>
<td>T</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>31120</td>
<td>03:00 PM - 04:50 PM</td>
<td>T</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>31121</td>
<td>09:00 AM - 10:50 AM</td>
<td>W</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>31122</td>
<td>11:00 AM - 12:50 PM</td>
<td>W</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>31123</td>
<td>03:00 PM - 04:50 PM</td>
<td>W</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>31124</td>
<td>09:00 AM - 10:50 AM</td>
<td>R</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>31125</td>
<td>11:00 AM - 12:50 PM</td>
<td>R</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>58968</td>
<td>01:00 PM - 02:50 PM</td>
<td>R</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>31126</td>
<td>03:00 PM - 04:50 PM</td>
<td>R</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>62100</td>
<td>09:00 AM - 10:50 AM</td>
<td>F</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
</tbody>
</table>
## Quantitative Reasoning II course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62101</td>
<td>Laboratory</td>
<td>AYP</td>
<td>11:00 AM - 12:50 PM</td>
<td>F</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>62102</td>
<td>Laboratory</td>
<td>AYQ</td>
<td>01:00 PM - 02:50 PM</td>
<td>F</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
<tr>
<td>62103</td>
<td>Laboratory</td>
<td>AYR</td>
<td>03:00 PM - 04:50 PM</td>
<td>F</td>
<td>L416 - Digital Computer Laboratory</td>
<td>Davis, N</td>
</tr>
</tbody>
</table>

**CS 102  Little Bits to Big Ideas**  credit: 4 hours.

Same as INFO 102. See INFO 102.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>63230</td>
<td>Laboratory</td>
<td>AB1</td>
<td>04:00 PM - 04:50 PM</td>
<td>T</td>
<td>G27 - Foreign Languages Building</td>
<td>Cunningham, R</td>
</tr>
<tr>
<td>63231</td>
<td>Laboratory</td>
<td>AB2</td>
<td>04:00 PM - 04:50 PM</td>
<td>W</td>
<td>G27 - Foreign Languages Building</td>
<td>Koiliaris, K</td>
</tr>
<tr>
<td>63232</td>
<td>Laboratory</td>
<td>AB3</td>
<td>04:00 PM - 04:50 PM</td>
<td>R</td>
<td>G27 - Foreign Languages Building</td>
<td>Tsai, P</td>
</tr>
<tr>
<td>66601</td>
<td>Laboratory</td>
<td>AB4</td>
<td>05:00 PM - 05:50 PM</td>
<td>T</td>
<td>G27 - Foreign Languages Building</td>
<td>Xiao, J</td>
</tr>
<tr>
<td>66603</td>
<td>Laboratory</td>
<td>AB5</td>
<td>05:00 PM - 05:50 PM</td>
<td>W</td>
<td>G27 - Foreign Languages Building</td>
<td>Khurana, S</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
Registration will be restricted to officially declared Informatics minors until Nov. 16th at noon.
Registration will be restricted to officially declared Informatics minors until Nov. 16th at noon.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>66605</td>
<td>Laboratory</td>
<td>AB6</td>
<td>05:00 PM - 05:50 PM</td>
<td>R</td>
<td>G27 - Foreign Languages Building</td>
<td>Chen, S</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
Registration will be restricted to officially declared Informatics minors until Nov. 16th at noon.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>63225</td>
<td>Lecture</td>
<td>AL1</td>
<td>09:00 AM - 09:50 AM</td>
<td>MWF</td>
<td>2079 - Natural History Building</td>
<td>Cunningham, R</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
Registration will be restricted to officially declared Informatics minors until Nov. 16th at noon.

**CS 105 Intro Computing: Non-Tech** credit: 3 hours.
Computing as an essential tool of academic and professional activities. Functions and interrelationships of computer system components: hardware, systems and applications software, and networks. Widely used application packages such as spreadsheets and databases. Concepts and practice of programming for the solution of simple problems in different application areas. Intended for non-science and non-engineering majors. Prerequisite: MATH 112.

Students must register for one lab-discussion and one lecture section.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31128</td>
<td>Lecture</td>
<td>AL2</td>
<td>04:00 PM - 05:30 PM</td>
<td>M</td>
<td>THEAT - Lincoln Hall</td>
<td>Harris, A</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31134</td>
<td>Laboratory-Discussion</td>
<td>AYC</td>
<td>06:30 PM - 07:50 PM</td>
<td>M</td>
<td>101 - 901 W Oregon</td>
<td>Harris, A</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31131</td>
<td>Laboratory-Discussion</td>
<td>AYD</td>
<td>12:30 PM - 01:50 PM</td>
<td>T</td>
<td>101 - 901 W Oregon</td>
<td>Harris, A</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31132</td>
<td>Laboratory-Discussion</td>
<td>AYE</td>
<td>02:00 PM - 03:20 PM</td>
<td>T</td>
<td>101 - 901 W Oregon</td>
<td>Harris, A</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31136</td>
<td>Laboratory-Discussion</td>
<td>AYG</td>
<td>03:30 PM - 04:50 PM</td>
<td>T</td>
<td>101 - 901 W Oregon</td>
<td>Harris, A</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31137</td>
<td>Laboratory-Discussion</td>
<td>AYH</td>
<td>05:00 PM - 06:20 PM</td>
<td>T</td>
<td>101 - 901 W Oregon</td>
<td>Harris, A</td>
</tr>
</tbody>
</table>
CS 125  **Intro to Computer Science**  credit: 4 hours.
Basic concepts in computing and fundamental techniques for solving computational problems. Intended as a first course for computer science majors and others with a deep interest in computing. Prerequisite: Three years of high school mathematics or MATH 112.
Students must register for one lab-discussion and one lecture section. Engineering students must obtain a dean's approval to drop this course after the second week of instruction.
This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31152</td>
<td>Lecture</td>
<td>AL1</td>
<td>08:00 AM - 08:50 AM</td>
<td>MWF</td>
<td>1002 - Electrical &amp; Computer Eng Bldg</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
Not intended for Computer Engineering or Electrical Engineering major(s). Restricted to Undergrad - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31155</td>
<td>Lecture</td>
<td>AL2</td>
<td>10:00 AM - 10:50 AM</td>
<td>MWF</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
Not intended for Computer Engineering or Electrical Engineering major(s). Restricted to Undergrad - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31157</td>
<td>Laboratory-Discussion</td>
<td>AYA</td>
<td>09:00 AM - 10:50 AM</td>
<td>T</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
<tr>
<td>Course Code</td>
<td>Type</td>
<td>Section</td>
<td>Time</td>
<td>Day</td>
<td>Location</td>
<td>Instructor</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------</td>
<td>---------</td>
<td>--------------------</td>
<td>-----</td>
<td>-----------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>31159</td>
<td>Laboratory-Discussion</td>
<td>AYB</td>
<td>11:00 AM - 12:50 PM</td>
<td>T</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
<tr>
<td>31160</td>
<td>Laboratory-Discussion</td>
<td>AYC</td>
<td>01:00 PM - 02:50 PM</td>
<td>T</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
<tr>
<td>31163</td>
<td>Laboratory-Discussion</td>
<td>AYD</td>
<td>03:00 PM - 04:50 PM</td>
<td>T</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
<tr>
<td>31168</td>
<td>Laboratory-Discussion</td>
<td>AYH</td>
<td>11:00 AM - 12:50 PM</td>
<td>W</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
<tr>
<td>31170</td>
<td>Laboratory-Discussion</td>
<td>AYI</td>
<td>01:00 PM - 02:50 PM</td>
<td>W</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
<tr>
<td>31172</td>
<td>Laboratory-Discussion</td>
<td>AYJ</td>
<td>03:00 PM - 04:50 PM</td>
<td>W</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
<tr>
<td>31174</td>
<td>Laboratory-Discussion</td>
<td>AYK</td>
<td>05:00 PM - 06:50 PM</td>
<td>W</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
<tr>
<td>62256</td>
<td>Laboratory-Discussion</td>
<td>AYM</td>
<td>11:00 AM - 12:50 PM</td>
<td>T</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>
Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62257</td>
<td>Laboratory-Discussion</td>
<td>AYN</td>
<td>01:00 PM - 02:50 PM</td>
<td>T</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62258</td>
<td>Laboratory-Discussion</td>
<td>AYO</td>
<td>03:00 PM - 04:50 PM</td>
<td>T</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62259</td>
<td>Laboratory-Discussion</td>
<td>AYP</td>
<td>05:00 PM - 06:50 PM</td>
<td>T</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62261</td>
<td>Laboratory-Discussion</td>
<td>AYR</td>
<td>11:00 AM - 12:50 PM</td>
<td>W</td>
<td>1103 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62262</td>
<td>Laboratory-Discussion</td>
<td>AYS</td>
<td>01:00 PM - 02:50 PM</td>
<td>W</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62264</td>
<td>Laboratory-Discussion</td>
<td>AYT</td>
<td>03:00 PM - 04:50 PM</td>
<td>W</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>62265</td>
<td>Laboratory-Discussion</td>
<td>AYU</td>
<td>05:00 PM - 06:50 PM</td>
<td>W</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Quantitative Reasoning I course.
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

CS 126  **Software Design Studio**  credit: 3 hours.
Fundamental principles and techniques of software development. Design, documentation, testing, and debugging software, with a significant emphasis on code review. Credit is not given for both CS 242 and CS 126. Prerequisite: CS 125. For majors only.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65120</td>
<td>Lecture-Discussion</td>
<td>SD1</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Evans, G</td>
</tr>
</tbody>
</table>
Restricted to Computer Science or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s). Restricted to Undergrad - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65684</td>
<td>Lecture-Discussion</td>
<td>SD2</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Evans, G</td>
</tr>
</tbody>
</table>

Restricted to Computer Science or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s). Restricted to Undergrad - Urbana-Champaign.

CS 173  **Discrete Structures**  credit: 3 hours.

Discrete mathematical structures frequently encountered in the study of Computer Science. Sets, propositions, Boolean algebra, induction, recursion, relations, functions, and graphs. Credit is not given for both CS 173 and MATH 213. Prerequisite: One of CS 125, ECE 220; one of MATH 220, MATH 221.

Students must register for a lecture and discussion section.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Section Type</th>
<th>Section</th>
<th>Time</th>
<th>Day(s)</th>
<th>Location</th>
<th>Instructors</th>
</tr>
</thead>
<tbody>
<tr>
<td>61915</td>
<td>Discussion/ Recitation</td>
<td>ADH</td>
<td>11:00 AM - 11:50 AM</td>
<td>F</td>
<td>1105 - Siebel Center for Comp Sci</td>
<td>Fleck, M</td>
</tr>
<tr>
<td>61916</td>
<td>Discussion/ Recitation</td>
<td>ADI</td>
<td>12:00 PM - 12:50 PM</td>
<td>F</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Fleck, M</td>
</tr>
<tr>
<td>39311</td>
<td>Lecture</td>
<td>AL1</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1002 - Electrical &amp; Computer Eng Bldg</td>
<td>Fleck, M</td>
</tr>
</tbody>
</table>

Restricted to Undergrad - Urbana-Champaign.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Section Type</th>
<th>Section</th>
<th>Time</th>
<th>Day(s)</th>
<th>Location</th>
<th>Instructors</th>
</tr>
</thead>
<tbody>
<tr>
<td>48266</td>
<td>Discussion/ Recitation</td>
<td>BDA</td>
<td>11:00 AM - 11:50 AM</td>
<td>F</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Fleck, M</td>
</tr>
<tr>
<td>48267</td>
<td>Discussion/ Recitation</td>
<td>BDB</td>
<td>12:00 PM - 12:50 PM</td>
<td>F</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Fleck, M</td>
</tr>
<tr>
<td>50441</td>
<td>Discussion/ Recitation</td>
<td>BDC</td>
<td>01:00 PM - 01:50 PM</td>
<td>F</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Fleck, M</td>
</tr>
<tr>
<td>50442</td>
<td>Discussion/ Recitation</td>
<td>BDD</td>
<td>02:00 PM - 02:50 PM</td>
<td>F</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Fleck, M</td>
</tr>
<tr>
<td>51087</td>
<td>Discussion/ Recitation</td>
<td>BDE</td>
<td>03:00 PM - 03:50 PM</td>
<td>F</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Fleck, M</td>
</tr>
<tr>
<td>51089</td>
<td>Discussion/ Recitation</td>
<td>BDF</td>
<td>04:00 PM - 04:50 PM</td>
<td>F</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Fleck, M</td>
</tr>
<tr>
<td>50094</td>
<td>Lecture</td>
<td>BL2</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Fleck, M</td>
</tr>
</tbody>
</table>

Restricted to Undergrad - Urbana-Champaign.

**CS 196  Freshman Honors**  credit: 1 hours.

Offered for honors credit in conjunction with other 100-level computer science courses taken concurrently. A special examination may be required for admission to this course. May be repeated. Prerequisite: Concurrent registration in another 100-level computer science course (see Schedule).
CS 199  Undergraduate Open Seminar in Computer Science  credit: 0 TO 5 hours.
Topics vary. Approved for Letter and S/U grading. May be repeated.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68270</td>
<td>Discussion/Recitation</td>
<td>125</td>
<td>ARRANGED</td>
<td>-</td>
<td>-</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Intro Pedagogy Practicum
Instructor Approval Required
Introductory Pedagogy Practicum Prerequisite: High scores in CS 125 and a strong desire to help others with Introduction to Computer Science Investigate approaches to learning and teaching introductory computer science topics through research, discussion and course development. Implement and test new ideas in a classroom format, via online videos, lab section and one-on-one instruction and web-delivered media and apps for introductory computer science students.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68271</td>
<td>Discussion/Recitation</td>
<td>196</td>
<td>ARRANGED</td>
<td>-</td>
<td>-</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Pedagogy Practicum
Instructor Approval Required
Pedagogy Practicum Prerequisite: High scores in CS 125 and a strong desire to help others with Introduction to Computer Science Investigate approaches to learning and teaching introductory computer science topics through research, discussion and course development. Implement and test new ideas in a classroom format, via online videos, lab section and one-on-one instruction and web-delivered media and apps for introductory computer science students.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>63080</td>
<td>Lecture</td>
<td>EMP</td>
<td>05:00 PM - 06:50 PM</td>
<td>M</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Challen, G</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Even More Practice
Meets 29-Jan-18 - 02-May-18.
Even More Practice (EMP) is a one-credit course designed for CS 125 students who think that they might benefit from extra practice and instruction. Students will receive help analyzing algorithms; solving computational problems; and understanding, writing, and debugging computer programs. Examples will be drawn from material covered in CS 125. Graded pass/fail. Requires concurrent enrollment in CS 125. Class first meets on Jan. 29.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65871</td>
<td>Discussion/Recitation</td>
<td>US</td>
<td>ARRANGED</td>
<td>-</td>
<td>-</td>
<td>Kumar, R</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Underground Unicorn Seminar
Instructor Approval Required

Topic: In the tech industry, unicorns are individuals who can both design and develop: a rare combination that is sought after by companies. The goal of this seminar is to teach students the requisite set of complementary skills to become unicorns. The seminar will center around product case studies, guest lectures from industry, and a capstone project where teams will design, develop, and deploy an original web/mobile app. Instructor approval is required for registration.

48739  Lecture-Discussion  WAF  ARRANGED -  -

Credit Hours: 2 hours
Course Prerequisites: Must have taken (and dropped) the first half of CS 225 this semester, and must not have been enrolled in CS 199 “CH” previously. Requirements are FIRM.

CS 210 Ethical & Professional Issues credit: 2 hours.

Ethics for the computing profession. Ethical decision-making; licensing; intellectual property, freedom of information, and privacy. Credit is not given for both CS 210 and ECE 316. Prerequisite: CS 225. Junior standing required.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31205</td>
<td>Lecture-Discussion</td>
<td>AL1</td>
<td>03:00 PM - 03:50 PM</td>
<td>M</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Cunningham, R</td>
</tr>
</tbody>
</table>

Restricted to Computer Science major(s). Restricted to Undergrad - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31206</td>
<td>Discussion/Recitation</td>
<td>AYA</td>
<td>10:00 AM - 10:50 AM</td>
<td>T</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Cunningham, R</td>
</tr>
<tr>
<td>39312</td>
<td>Discussion/Recitation</td>
<td>AYB</td>
<td>11:00 AM - 11:50 AM</td>
<td>T</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Cunningham, R</td>
</tr>
<tr>
<td>39313</td>
<td>Discussion/Recitation</td>
<td>AYC</td>
<td>12:00 PM - 12:50 PM</td>
<td>T</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Cunningham, R</td>
</tr>
<tr>
<td>63350</td>
<td>Discussion/Recitation</td>
<td>AYD</td>
<td>01:00 PM - 01:50 PM</td>
<td>T</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Cunningham, R</td>
</tr>
<tr>
<td>63351</td>
<td>Discussion/Recitation</td>
<td>AYE</td>
<td>02:00 PM - 02:50 PM</td>
<td>T</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Cunningham, R</td>
</tr>
<tr>
<td>63352</td>
<td>Discussion/Recitation</td>
<td>AYF</td>
<td>03:00 PM - 03:50 PM</td>
<td>T</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Cunningham, R</td>
</tr>
</tbody>
</table>

CS 225 Data Structures credit: 4 hours.
Data abstractions: elementary data structures (lists, stacks, queues, and trees) and their implementation using an object-oriented programming language. Solutions to a variety of computational problems such as search on graphs and trees. Elementary analysis of algorithms. Prerequisite: CS 125 or ECE 220; CS 173 or MATH 213.

Students must register for one lecture-discussion and one lecture section.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31208</td>
<td>Lecture</td>
<td>AL1</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
<td>1002 - Electrical &amp; Computer Eng Bldg</td>
<td>Fagen-Ulmschneider, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.
Not intended for Computer Engineering or Electrical Engineering major(s).

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31213</td>
<td>Lecture</td>
<td>AL2</td>
<td>02:00 PM - 02:50 PM</td>
<td>MWF</td>
<td>1002 - Electrical &amp; Computer Eng Bldg</td>
<td>Fagen-Ulmschneider, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.
Not intended for Computer Engineering or Electrical Engineering major(s).

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31218</td>
<td>Laboratory-Discussion</td>
<td>AYB</td>
<td>07:00 PM - 08:50 PM</td>
<td>W</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31222</td>
<td>Laboratory-Discussion</td>
<td>AYC</td>
<td>09:00 AM - 10:50 AM</td>
<td>R</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31225</td>
<td>Laboratory-Discussion</td>
<td>AYD</td>
<td>11:00 AM - 12:50 PM</td>
<td>R</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31227</td>
<td>Laboratory-Discussion</td>
<td>AYE</td>
<td>01:00 PM - 02:50 PM</td>
<td>R</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31229</td>
<td>Laboratory-Discussion</td>
<td>AYF</td>
<td>03:00 PM - 04:50 PM</td>
<td>R</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shaffer, E</td>
</tr>
<tr>
<td>Number</td>
<td>Type</td>
<td>Section</td>
<td>Day</td>
<td>Time</td>
<td>Room</td>
<td>Instructor</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------</td>
<td>---------</td>
<td>-----</td>
<td>-----------------------</td>
<td>-----------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>31231</td>
<td>Laboratory-Discussion</td>
<td>AYG</td>
<td>R</td>
<td>05:00 PM - 06:50 PM</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
<tr>
<td>31234</td>
<td>Laboratory-Discussion</td>
<td>AYH</td>
<td>R</td>
<td>07:00 PM - 08:50 PM</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
<tr>
<td>31236</td>
<td>Laboratory-Discussion</td>
<td>AYI</td>
<td>F</td>
<td>09:00 AM - 10:50 AM</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
<tr>
<td>31239</td>
<td>Laboratory-Discussion</td>
<td>AYJ</td>
<td>F</td>
<td>11:00 AM - 12:50 PM</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
<tr>
<td>56809</td>
<td>Laboratory-Discussion</td>
<td>AYK</td>
<td>F</td>
<td>01:00 PM - 02:50 PM</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
<tr>
<td>56810</td>
<td>Laboratory-Discussion</td>
<td>AYL</td>
<td>F</td>
<td>03:00 PM - 04:50 PM</td>
<td>0224 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
<tr>
<td>56811</td>
<td>Laboratory-Discussion</td>
<td>AYM</td>
<td>W</td>
<td>05:00 PM - 06:50 PM</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
<tr>
<td>60535</td>
<td>Laboratory-Discussion</td>
<td>AYN</td>
<td>R</td>
<td>01:00 PM - 02:50 PM</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.

LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Meeting Time</th>
<th>Room</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31216</td>
<td>Laboratory-Discussion</td>
<td>AYO 03:00 PM</td>
<td>R 1302 - Siebel Center for Comp Sci</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.  
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Meeting Time</th>
<th>Room</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>60536</td>
<td>Laboratory-Discussion</td>
<td>AYP 05:00 PM</td>
<td>R 1302 - Siebel Center for Comp Sci</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.  
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Meeting Time</th>
<th>Room</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>60537</td>
<td>Laboratory-Discussion</td>
<td>AYQ 09:00 AM</td>
<td>F 0218 - Siebel Center for Comp Sci</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Meeting Time</th>
<th>Room</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>61000</td>
<td>Laboratory-Discussion</td>
<td>AYR 07:00 PM</td>
<td>W 1304 - Siebel Center for Comp Sci</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.  
LAPTOP LAB SECTION -- Student are required to bring their own computer to this lab section.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Meeting Time</th>
<th>Room</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>61001</td>
<td>Laboratory-Discussion</td>
<td>AYS 01:00 PM</td>
<td>F 0218 - Siebel Center for Comp Sci</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Meeting Time</th>
<th>Room</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>66120</td>
<td>Laboratory-Discussion</td>
<td>AYT 05:00 PM</td>
<td>W 0218 - Siebel Center for Comp Sci</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Meeting Time</th>
<th>Room</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68283</td>
<td>Laboratory</td>
<td>ZJU 03:00 PM</td>
<td>F ARR - Zhejiang University</td>
</tr>
<tr>
<td></td>
<td>Laboratory-Discussion</td>
<td>ZJU 10:00 AM</td>
<td>F ARR - Zhejiang University</td>
</tr>
<tr>
<td></td>
<td>Lecture</td>
<td>ZJU 08:00 AM</td>
<td>MWF ARR - Zhejiang University</td>
</tr>
</tbody>
</table>

Quantitative Reasoning II course.  
Departmental Approval Required  
Restricted to ZJU Institute
CS 233  **Computer Architecture**  credit: 4 hours.

Fundamentals of computer architecture: digital logic design, working up from the logic gate level to understand the function of a simple computer; machine-level programming to understand implementation of high-level languages; performance models of modern computer architectures to enable performance optimization of software; hardware primitives for parallelism and security. Prerequisite: CS 125 and CS 173; credit or concurrent enrollment in CS 225.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>61689</td>
<td>Lecture</td>
<td>AL1</td>
<td>12:00 PM - 12:50 PM</td>
<td>MWF</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61827</td>
<td>Lecture</td>
<td>AL2</td>
<td>01:00 PM - 01:50 PM</td>
<td>MWF</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61690</td>
<td>Discussion/Recitation</td>
<td>AYB</td>
<td>01:00 PM - 01:50 PM</td>
<td>M</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td>AYB</td>
<td>02:00 PM - 02:50 PM</td>
<td>M</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td>61691</td>
<td>Discussion/Recitation</td>
<td>AYC</td>
<td>02:00 PM - 02:50 PM</td>
<td>M</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td>AYC</td>
<td>03:00 PM - 03:50 PM</td>
<td>M</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td>61692</td>
<td>Discussion/Recitation</td>
<td>AYD</td>
<td>03:00 PM - 03:50 PM</td>
<td>M</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td>AYD</td>
<td>04:00 PM - 04:50 PM</td>
<td>M</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td>61821</td>
<td>Discussion/Recitation</td>
<td>AYE</td>
<td>04:00 PM - 04:50 PM</td>
<td>M</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td>AYE</td>
<td>05:00 PM - 05:50 PM</td>
<td>M</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td>61693</td>
<td>Discussion/Recitation</td>
<td>AYF</td>
<td>11:00 AM - 11:50 AM</td>
<td>T</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------</td>
<td>------------------</td>
<td>---</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>AYF</td>
<td>12:00 PM - 12:50 PM</td>
<td>T</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>AYG</td>
<td>01:00 PM - 01:50 PM</td>
<td>T</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>61694 Discussion/Recitation</td>
<td>AYG</td>
<td>12:00 PM - 12:50 PM</td>
<td>T</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>AYG</td>
<td>01:00 PM - 01:50 PM</td>
<td>T</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>61695 Discussion/Recitation</td>
<td>AYG</td>
<td>01:00 PM - 01:50 PM</td>
<td>T</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>AYG</td>
<td>02:00 PM - 02:50 PM</td>
<td>T</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>61696 Discussion/Recitation</td>
<td>AYG</td>
<td>02:00 PM - 02:50 PM</td>
<td>T</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>AYG</td>
<td>03:00 PM - 03:50 PM</td>
<td>T</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>61822 Discussion/Recitation</td>
<td>AYG</td>
<td>03:00 PM - 03:50 PM</td>
<td>T</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>AYG</td>
<td>04:00 PM - 04:50 PM</td>
<td>T</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>61823 Packaged Section</td>
<td>AYG</td>
<td>04:00 PM - 04:50 PM</td>
<td>T</td>
<td>1111 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
<tr>
<td>Packaged Section</td>
<td>AYG</td>
<td>05:00 PM - 05:50 PM</td>
<td>T</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Herman, G Zilles, C</td>
<td></td>
</tr>
</tbody>
</table>

**CS 241 System Programming**  credit: 4 hours.

Basics of system programming, including POSIX processes, process control, inter-process communication, synchronization, signals, simple memory management, file I/O and directories, shell programming, socket network programming, RPC programming in distributed systems, basic security mechanisms, and standard tools for systems programming such as debugging tools. Credit is not given for both CS 241 and ECE 391. Prerequisite: CS 225; credit or concurrent registration in CS 233.

Students must register for one lecture and one discussion section.
<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>53753</td>
<td>Discussion/Recitation</td>
<td>ADA</td>
<td>09:00 AM - 10:20 AM</td>
<td>R</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>48069</td>
<td>Discussion/Recitation</td>
<td>ADB</td>
<td>10:30 AM - 11:50 AM</td>
<td>R</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>48070</td>
<td>Discussion/Recitation</td>
<td>ADC</td>
<td>12:00 PM - 01:20 PM</td>
<td>R</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>48071</td>
<td>Discussion/Recitation</td>
<td>ADD</td>
<td>01:30 PM - 02:50 PM</td>
<td>R</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>48072</td>
<td>Discussion/Recitation</td>
<td>ADE</td>
<td>03:00 PM - 04:20 PM</td>
<td>R</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>48073</td>
<td>Discussion/Recitation</td>
<td>ADF</td>
<td>04:30 PM - 05:50 PM</td>
<td>R</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>48075</td>
<td>Discussion/Recitation</td>
<td>ADG</td>
<td>06:00 PM - 07:20 PM</td>
<td>R</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>50109</td>
<td>Discussion/Recitation</td>
<td>ADH</td>
<td>07:30 PM - 08:50 PM</td>
<td>R</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>56807</td>
<td>Discussion/Recitation</td>
<td>ADJ</td>
<td>12:00 PM - 01:20 PM</td>
<td>R</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>63637</td>
<td>Discussion/Recitation</td>
<td>ADK</td>
<td>01:30 PM - 02:50 PM</td>
<td>R</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
<tr>
<td>63638</td>
<td>Discussion/Recitation</td>
<td>ADL</td>
<td>03:00 PM - 04:20 PM</td>
<td>R</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
</tbody>
</table>
CS 242  **Programming Studio**  credit: 3 hours.

Intensive programming lab intended to strengthen skills in programming. Prerequisite: CS 241.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>43558</td>
<td>Laboratory</td>
<td>AB1</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Woodley, M</td>
</tr>
</tbody>
</table>

Restricted to Undergrad - Urbana-Champaign.
Restricted to students with Senior class standing.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>43557</td>
<td>Lecture</td>
<td>AL1</td>
<td>12:30 PM - 01:20 PM</td>
<td>F</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Woodley, M</td>
</tr>
</tbody>
</table>

Restricted to Undergrad - Urbana-Champaign.
Restricted to Computer Science or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s). Restricted to students with Junior or Senior class standing.

CS 296  **Honors Course**  credit: 1 hours.

Group projects for honors credit in computer science. Sections of this course are offered in conjunction with other 200-level computer science courses taken concurrently. A special examination may be required for admission to this course. May be repeated. Prerequisite: Concurrent registration in another 200-level computer science course (see Schedule).

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31262</td>
<td>Lecture-Discussion</td>
<td>25</td>
<td>05:00 PM - 05:50 PM</td>
<td>R</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Fagen-Ulmschneider, W Shaffer, E</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>61175</td>
<td>Lecture-Discussion</td>
<td>33</td>
<td>04:00 PM - 04:50 PM</td>
<td>W</td>
<td>-</td>
<td>Herman, G</td>
</tr>
</tbody>
</table>

Honors section 33 is for students registered in CS 233 Computer Architecture

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>56375</td>
<td>Lecture-Discussion</td>
<td>41</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Angrave, L</td>
</tr>
</tbody>
</table>

CS 357  **Numerical Methods I**  credit: 3 hours.
Fundamentals of numerical methods for students in science and engineering; floating-point computation, systems of linear equations, approximation of functions and integrals, the single nonlinear equation, and the numerical solution of ordinary differential equations; various applications in science and engineering; programming exercises and use of high quality mathematical library routines. Same as MATH 357. Credit is not given for CS 357 if credit for CS 450 has been earned. (Counts for advanced hours in LAS). Prerequisite: A 100-level computer science course; MATH 225 or MATH 415; MATH 241.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>61476</td>
<td>Lecture-Discussion</td>
<td>M</td>
<td>03:30 PM - 04:45 PM</td>
<td>TR</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Sohn, M</td>
</tr>
<tr>
<td></td>
<td>Restricted to Undergrad - Urbana-Champaign.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50106</td>
<td>Lecture-Discussion</td>
<td>N</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Sohn, M</td>
</tr>
<tr>
<td></td>
<td>Restricted to Undergrad - Urbana-Champaign.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CS 361  Probability & Statistics for Computer Science  credit: 3 hours.
Introduction to probability theory and statistics with applications to computer science. Topics include: visualizing datasets, summarizing data, basic descriptive statistics, conditional probability, independence, Bayes theorem, random variables, joint and conditional distributions, expectation, variance and covariance, central limit theorem. Markov inequality, Chebyshev inequality, law of large numbers, Markov chains, simulation, the PageRank algorithm, populations and sampling, sample mean, standard error, maximum likelihood estimation, Bayes estimation, hypothesis testing, confidence intervals, linear regression, principal component analysis, classification, and decision trees. Same as STAT 361. Credit is not given for both CS 361 and ECE 313. Prerequisite: MATH 220 or 221; credit or concurrent registration in MATH 225. For majors only.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65083</td>
<td>Discussion/Recitation</td>
<td>ADA</td>
<td>10:00 AM - 10:50 AM</td>
<td>R</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Barber, R</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65084</td>
<td>Discussion/Recitation</td>
<td>ADB</td>
<td>11:00 AM - 11:50 AM</td>
<td>R</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Barber, R</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65085</td>
<td>Discussion/Recitation</td>
<td>ADC</td>
<td>12:00 PM - 12:50 PM</td>
<td>R</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Barber, R</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65082</td>
<td>Lecture</td>
<td>AL1</td>
<td>08:30 AM - 09:45 AM</td>
<td>MW</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Barber, R</td>
</tr>
</tbody>
</table>

Restricted to Undergrad - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68207</td>
<td>Online</td>
<td>CSP</td>
<td>ARRANGED -</td>
<td></td>
<td>B - Illini Center</td>
<td>Barber, R</td>
</tr>
</tbody>
</table>

Restricted to O/C Engineering City Scholars students.

CS 374  Introduction to Algorithms & Models of Computation  credit: 4 hours.
Analysis of algorithms, major paradigms of algorithm design including recursive algorithms, divide-and-conquer algorithms, dynamic programming, greedy algorithms, and graph algorithms. Formal models of computation including finite automata and Turing machines. Limitations of computation arising from fundamental notions of algorithm and from complexity-theoretic constraints. Reductions, undecidability and NP-completeness. Same as ECE 374. Prerequisite: CS 225; MATH 225 or MATH 415.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65088</td>
<td>Lecture</td>
<td>AL1</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR</td>
<td>1002 - Electrical &amp; Computer Eng Bldg</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

Restricted to students with Junior or Senior class standing. Restricted to Undergrad - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65089</td>
<td>Discussion/Recitation</td>
<td>AYA</td>
<td>09:00 AM - 09:50 AM</td>
<td>WF</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65090</td>
<td>Discussion/Recitation</td>
<td>AYB</td>
<td>10:00 AM - 10:50 AM</td>
<td>WF</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65091</td>
<td>Discussion/Recitation</td>
<td>AYC</td>
<td>11:00 AM - 11:50 AM</td>
<td>WF</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65092</td>
<td>Discussion/Recitation</td>
<td>AYD</td>
<td>12:00 PM - 12:50 PM</td>
<td>WF</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65093</td>
<td>Discussion/Recitation</td>
<td>AYE</td>
<td>01:00 PM - 01:50 PM</td>
<td>WF</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65094</td>
<td>Discussion/Recitation</td>
<td>AYF</td>
<td>02:00 PM - 02:50 PM</td>
<td>WF</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65095</td>
<td>Discussion/Recitation</td>
<td>AYG</td>
<td>03:00 PM - 03:50 PM</td>
<td>WF</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65096</td>
<td>Discussion/Recitation</td>
<td>AYH</td>
<td>04:00 PM - 04:50 PM</td>
<td>WF</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65097</td>
<td>Discussion/Recitation</td>
<td>AYJ</td>
<td>01:00 PM - 01:50 PM</td>
<td>WF</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Erickson, J</td>
</tr>
</tbody>
</table>
### CS 397  **Individual Study**  credit: 1 TO 3 hours.
May be repeated. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10464</td>
<td>Independent Study</td>
<td>ARRANGED -</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Students must see the CS Department to receive the appropriate CRN for the instructor.

**CS 398  Special Topics  credit: 1 to 4 hours.**

Subject offerings of new and developing areas of knowledge in computer science intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68114</td>
<td>Lecture</td>
<td>ACC</td>
<td>05:00 PM - 06:20 PM</td>
<td>MW</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Brunner, R</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

**Applied Cloud Computing**

Restricted to Undergrad - Urbana-Champaign.

Introduction to service-level Cloud Computing technologies, frameworks, and application paradigms. Topics include Hadoop MapReduce, Spark (and its frameworks), distributed databases, streaming applications, Infrastructure as a Service (IaaS), Cloud Functions, and containerization. These concepts will be introduced in a hands-on lab setting, and students will use both local clusters and remote cloud platforms. Previous Python experience recommended. Prerequisites: CS225 or equivalent is recommended. Students should bring a laptop computer to class.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68294</td>
<td>Lecture-Discussion</td>
<td>IDU</td>
<td>09:30 AM - 12:20 PM</td>
<td>M</td>
<td>126 - Grad Sch of Lib &amp; Info Science</td>
<td>Stodden, V</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

**CS 410  Text Information Systems  credit: 3 OR 4 hours.**

Theory, design, and implementation of text-based information systems. Text analysis, retrieval models (e.g., Boolean, vector space, probabilistic), text categorization, text filtering, clustering, retrieval system design and implementation, and applications to web information management. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>46258</td>
<td>Lecture</td>
<td>B3</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Zhai, C</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>46259</td>
<td>Lecture</td>
<td>B4</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Zhai, C</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>61371</td>
<td>Discussion/Recitation</td>
<td>C3</td>
<td>11:00 AM - 12:15 PM</td>
<td>T</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Zhai, C</td>
</tr>
</tbody>
</table>

| Lecture | C3 | ARRANGED - |  |  |  |  | Zhai, C |
CS 411  **Database Systems**  credit: 3 OR 4 hours.
Examination of the logical organization of databases: the entity-relationship model; the hierarchical, network, and relational data models and their languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity; concurrency control, and distributed database systems. 3 undergraduate hours. 3 or 4 graduate hours.
Prerequisite: CS 225.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>67992</td>
<td>Online</td>
<td>DSO</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Chang, K</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to MCS: Computer Sci Online - UIUC or NDEG: Computer Science Onl-UIUC.
This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31352</td>
<td>Lecture-Discussion</td>
<td>N3</td>
<td>08:00 AM - 09:15 AM</td>
<td>MW</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Parameswaran, A</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31355</td>
<td>Lecture-Discussion</td>
<td>N4</td>
<td>08:00 AM - 09:15 AM</td>
<td>MW</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Parameswaran, A</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>40658</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Parameswaran, A</td>
</tr>
</tbody>
</table>

Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

CS 412  **Introduction to Data Mining**  credit: 3 OR 4 hours.
Concepts, techniques, and systems of data warehousing and data mining. Design and implementation of data warehouse and on-line analytical processing (OLAP) systems; data mining concepts, methods, systems, implementations, and applications. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68208</td>
<td>Online</td>
<td>CSP</td>
<td>ARRANGED -</td>
<td></td>
<td>B - Illini Center</td>
<td>Sundaram, H</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to O/C Engineering City Scholars students.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65867</td>
<td>Online</td>
<td>DSO</td>
<td>ARRANGED -</td>
<td></td>
<td>-</td>
<td>Han, J</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.
This course is only for students that are in the Computer Science MCS-DC Program. Additional Coursera ID verification and ProctorU fees may apply.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65881</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED -</td>
<td></td>
<td>-</td>
<td>Sundaram, H</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>63461</td>
<td>Lecture-Discussion</td>
<td>P3</td>
<td>02:30 PM - 03:45 PM</td>
<td>WF</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Sundaram, H</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>63462</td>
<td>Lecture-Discussion</td>
<td>P4</td>
<td>02:30 PM - 03:45 PM</td>
<td>WF</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Sundaram, H</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

**CS 413 Intro to Combinatorics** credit: 3 OR 4 hours.
Same as MATH 413. See MATH 413.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>37945</td>
<td>Lecture-Discussion</td>
<td>C13</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
<td>245 - Altgeld Hall</td>
<td>Yong, A</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>37948</td>
<td>Lecture-Discussion</td>
<td>C14</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
<td>245 - Altgeld Hall</td>
<td>Yong, A</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>60844</td>
<td>Lecture-Discussion</td>
<td>E13</td>
<td>01:00 PM - 01:50 PM</td>
<td>MWF</td>
<td>245 - Altgeld Hall</td>
<td>Yong, A</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
CS 418  **Interactive Computer Graphics**  credit: 3 or 4 hours.

Basic mathematical tools and computational techniques for modeling, rendering, and animating 3-D scenes. Same as CSE 427. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225; MATH 225 or MATH 415; MATH 241.

Students will register for a lecture and a discussion section.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>48270</td>
<td>Discussion/Recitation</td>
<td>AD1</td>
<td>11:00 AM - 11:50 AM</td>
<td>M</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
</tr>
<tr>
<td>48271</td>
<td>Discussion/Recitation</td>
<td>AD2</td>
<td>12:00 PM - 12:50 PM</td>
<td>M</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
</tr>
<tr>
<td>48273</td>
<td>Discussion/Recitation</td>
<td>AD3</td>
<td>01:00 PM - 01:50 PM</td>
<td>M</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
</tr>
<tr>
<td>59592</td>
<td>Discussion/Recitation</td>
<td>AD4</td>
<td>02:00 PM - 02:50 PM</td>
<td>M</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
</tr>
<tr>
<td>59593</td>
<td>Discussion/Recitation</td>
<td>AD5</td>
<td>03:00 PM - 03:50 PM</td>
<td>M</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
</tr>
<tr>
<td>59594</td>
<td>Discussion/Recitation</td>
<td>AD6</td>
<td>04:00 PM - 04:50 PM</td>
<td>M</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
</tr>
<tr>
<td>31359</td>
<td>Lecture</td>
<td>AL1</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31361</td>
<td>Lecture</td>
<td>AL2</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Shaffer, E</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign.
CS 421  **Progrmg Languages & Compilers**  credit: 3 OR 4 hours.
Structure of programming languages and their implementation. Basic language design principles; abstract data types; functional languages; type systems; object-oriented languages. Basics of lexing, parsing, syntax-directed translation, semantic analysis, and code generation. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 233 and CS 373.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31375</td>
<td>Lecture-Discussion</td>
<td>B3</td>
<td>05:00 PM - 06:15 PM</td>
<td>TR</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Beckman, A</td>
</tr>
<tr>
<td></td>
<td>Credit Hours: 3 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31376</td>
<td>Lecture-Discussion</td>
<td>B4</td>
<td>05:00 PM - 06:15 PM</td>
<td>TR</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Beckman, A</td>
</tr>
<tr>
<td></td>
<td>Credit Hours: 4 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63756</td>
<td>Lecture-Discussion</td>
<td>C3</td>
<td>03:30 PM - 04:45 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Beckman, A</td>
</tr>
<tr>
<td></td>
<td>Credit Hours: 3 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63757</td>
<td>Lecture-Discussion</td>
<td>C4</td>
<td>03:30 PM - 04:45 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Beckman, A</td>
</tr>
<tr>
<td></td>
<td>Credit Hours: 4 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68231</td>
<td>Online</td>
<td>CSP</td>
<td>ARRANGED -</td>
<td>-</td>
<td></td>
<td>Beckman, A</td>
</tr>
<tr>
<td></td>
<td>Credit Hours: 3 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Restricted to Graduate - Urbana-Champaign.

Restricted to O/C Engineering City Scholars students.

CS 422  **Programming Language Design**  credit: 3 OR 4 hours.
Exploration of major language design paradigms using imperative and functional programming as unifying themes. Tools include both practical language processor construction and theoretical models. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 421.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>50085</td>
<td>Lecture-Discussion</td>
<td>T3</td>
<td>02:00 PM - 03:15 PM</td>
<td>WF</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Rosu, G</td>
</tr>
<tr>
<td></td>
<td>Credit Hours: 3 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50086</td>
<td>Lecture-Discussion</td>
<td>T4</td>
<td>02:00 PM - 03:15 PM</td>
<td>WF</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Rosu, G</td>
</tr>
<tr>
<td></td>
<td>Credit Hours: 4 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Restricted to Graduate - Urbana-Champaign.
CS 423  **Operating Systems Design**  credit: 3 OR 4 hours.
Organization and structure of modern operating systems and concurrent programming concepts. Deadlock, virtual memory, processor scheduling, and disk systems. Performance, security, and protection. Same as CSE 423. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 241 or ECE 391.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31378</td>
<td>Lecture-Discussion</td>
<td>C3</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Bates, A</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31379</td>
<td>Lecture-Discussion</td>
<td>C4</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Bates, A</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

CS 425  **Distributed Systems**  credit: 3 OR 4 hours.
Protocols, specification techniques, global states and their determination, reliable broadcast, transactions and commitment, security, and real-time systems. Same as ECE 428. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 241 or ECE 391.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31384</td>
<td>Lecture-Discussion</td>
<td>T3</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Vaidya, N</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>56315</td>
<td>Lecture-Discussion</td>
<td>T4</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Vaidya, N</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68087</td>
<td>Lecture-Discussion</td>
<td>V3</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Vaidya, N</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Overflow section for Students in this section will complete this course completely online except for the following which must be completed on-campus: Exams (will be completed in the classroom with the instructor/TA), Homework/exam sessions.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68088</td>
<td>Lecture-Discussion</td>
<td>V4</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Vaidya, N</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Overflow section for Students in this section will complete this course completely online except for the following which must be completed on-campus: Exams (will be completed in the classroom with the instructor/TA), Homework/exam sessions.

CS 428  **Software Engineering II**  credit: 3 OR 4 hours.
Continuation of CS 427. Software development, management, and maintenance. Project and configuration management, collaborative development models, software quality assurance, interoperability domain engineering and software reuse, and software re-engineering. Same as CSE 429. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 427.
<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>40652</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED -</td>
<td></td>
<td>-</td>
<td>Marinov, D</td>
</tr>
</tbody>
</table>

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineering -UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, NDEG:Undergrad Nondeg-CE-UIUC, or MENG: Mech Engineering Onl-UIUC. Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. Center for Innovation in Teaching & Learning (CITL) restrictions and assessments apply, see http://online.illinois.edu. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31389</td>
<td>Lecture-Discussion</td>
<td>Q3</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Marinov, D</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>39377</td>
<td>Lecture-Discussion</td>
<td>Q4</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Marinov, D</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign.

**CS 429  Software Engineering II, ACP**  credit: 3 hours.

Continuation of CS 427. Identical to CS 428 except for the additional writing component. See CS 428. 3 undergraduate hours. 3 graduate hours. Prerequisite: CS 427.

This course satisfies the General Education Criteria for a:
Advanced Composition

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>41483</td>
<td>Lecture-Discussion</td>
<td>Q3</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Marinov, D</td>
</tr>
</tbody>
</table>

Advanced Composition course.

**CS 431  Embedded Systems**  credit: 3 or 4 hours.

A survey of sampled data systems and embedded architecture; key concepts in common embedded system applications; signal processing and control; embedded microprocessor and device interface; time-critical I/O handling; data communications; real-time operating systems and techniques for the development and analysis of embedded real-time software; hands-on laboratory projects. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 241 or ECE 391.

Students must register for one lab and one lecture section.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31398</td>
<td>Laboratory</td>
<td>AB1</td>
<td>03:00 PM - 04:50 PM</td>
<td>W</td>
<td>2325 - Siebel Center for Comp Sci</td>
<td>Sha, L</td>
</tr>
</tbody>
</table>

Lab sections for CS 431 will meet in 2325 Siebel Center.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31401</td>
<td>Laboratory</td>
<td>AB2</td>
<td>05:00 PM - 06:50 PM</td>
<td>W</td>
<td>2325 - Siebel Center for Comp Sci</td>
<td>Sha, L</td>
</tr>
</tbody>
</table>
Lab sections for CS 431 will meet in 2325 Siebel Center.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31399</td>
<td>Laboratory</td>
<td>AB3</td>
<td>05:00 PM - 06:50 PM</td>
<td>R</td>
<td>2325 - Siebel Center for Comp Sci</td>
<td>Sha, L</td>
</tr>
</tbody>
</table>

Lab sections for CS 431 will meet in 2325 Siebel Center.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31393</td>
<td>Lecture</td>
<td>AL3</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Sha, L</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31396</td>
<td>Lecture</td>
<td>AL4</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Sha, L</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign.

**CS 433  Computer System Organization**  credit: 3 OR 4 hours.

Computer system analysis and design. Organizational dependence on computations to be performed; speed and cost of parts and overall machines; instruction set design; pipeline and vector machines; memory hierarchy design. Same as CSE 422. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 233.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31405</td>
<td>Lecture-Discussion</td>
<td>S3</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Fletcher, C</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31407</td>
<td>Lecture-Discussion</td>
<td>S4</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Fletcher, C</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign.

**CS 436  Computer Networking Laboratory**  credit: 3 OR 4 hours.

Same as ECE 435. See ECE 435.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>67921</td>
<td>Laboratory</td>
<td>C1</td>
<td>ARRANGED -</td>
<td></td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Caesar, M</td>
</tr>
<tr>
<td></td>
<td>Lecture</td>
<td>C1</td>
<td>09:30 AM - 10:50 AM</td>
<td>MW</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Caesar, M</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
CS 438  Communication Networks  credit: 3 OR 4 hours.
Layered architectures and the OSI Reference Model; design issues and protocols in the transport, network, and data link layers; architectures and control algorithms of local-area, point-to-point, and satellite networks; standards in networks access protocols; models of network interconnection; overview of networking and communication software. Same as ECE 438. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 241 or ECE 391; one of ECE 313, MATH 461, MATH 463.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>51445</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Kravets, R</td>
</tr>
</tbody>
</table>

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineering -UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, NDEG:Undergrad Nondeg-CE-UIUC, or MENG:Mech Engineering Onl-UIUC. Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31410</td>
<td>Lecture-Discussion</td>
<td>R3</td>
<td>09:30 AM - 10:45 AM</td>
<td>WF</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Kravets, R</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>56310</td>
<td>Lecture-Discussion</td>
<td>R4</td>
<td>09:30 AM - 10:45 AM</td>
<td>WF</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Kravets, R</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign.

CS 440  Artificial Intelligence  credit: 3 OR 4 hours.
Major topics in and directions of research in artificial intelligence: AI languages (LISP and PROLOG), basic problem solving techniques, knowledge representation and computer inference, machine learning, natural language understanding, computer vision, robotics, and societal impacts. Same as ECE 448. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225 or ECE 391.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31423</td>
<td>Lecture-Discussion</td>
<td>Q3</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>1002 - Electrical &amp; Computer Eng Bldg</td>
<td>Hasegawa-Johnson, M</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31424</td>
<td>Lecture-Discussion</td>
<td>Q4</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>1002 - Electrical &amp; Computer Eng Bldg</td>
<td>Hasegawa-Johnson, M</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

Restricted to Graduate - Urbana-Champaign.

CS 446  Machine Learning  credit: 3 OR 4 hours.
Theory and basic techniques in machine learning. Major theoretical paradigms and key concepts developed in machine learning in the context of applications such as natural language and text processing, computer vision, data mining, adaptive computer systems and others. Review of several supervised and unsupervised learning approaches: methods for learning linear representations; on-line learning, Bayesian methods; decision-trees; features and kernels; clustering and dimensionality reduction. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 373 and CS 440.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
</table>
CS 450  **Numerical Analysis**  credit: 3 or 4 hours.

Linear system solvers, optimization techniques, interpolation and approximation of functions, solving systems of nonlinear equations, eigenvalue problems, least squares, and quadrature; numerical handling of ordinary and partial differential equations. Same as CSE 401, ECE 491, and MATH 450. 3 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both CS 450 and CS 457.

Prerequisite: CS 101 or CS 125; CS 357 or MATH 415; MATH 285.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31427</td>
<td>Lecture-Discussion</td>
<td>B3</td>
<td>01:00 PM - 02:15 PM</td>
<td>WF</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Solomonik, E</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31430</td>
<td>Lecture-Discussion</td>
<td>B4</td>
<td>01:00 PM - 02:15 PM</td>
<td>WF</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Solomonik, E</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

CS 460  **Security Laboratory**  credit: 3 or 4 hours.

Operating systems security: access control, least privilege mechanism and malware techniques. Network security: firewalls, sniffing, tunnels, intrusion detection, AAA and worm structure. System security: forensics security architectures, and attack/defend exercises. Complements CS 461 via hands-on project. Same as ECE 419. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 461.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>57998</td>
<td>Laboratory</td>
<td>AD1</td>
<td>01:00 PM - 02:20 PM</td>
<td>T</td>
<td>1129 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
<tr>
<td>CRN</td>
<td>Type</td>
<td>Section</td>
<td>Time</td>
<td>Days</td>
<td>Location</td>
<td>Instructor</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------</td>
<td>---------</td>
<td>--------------------</td>
<td>------</td>
<td>-------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>50112</td>
<td>Laboratory</td>
<td>AD2</td>
<td>03:00 PM - 04:20 PM</td>
<td>T</td>
<td>1129 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
<tr>
<td>50113</td>
<td>Laboratory</td>
<td>AD3</td>
<td>01:00 PM - 02:20 PM</td>
<td>W</td>
<td>1129 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
<tr>
<td>57997</td>
<td>Laboratory</td>
<td>AD4</td>
<td>03:00 PM - 04:20 PM</td>
<td>W</td>
<td>1129 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
<tr>
<td>62653</td>
<td>Laboratory</td>
<td>AD5</td>
<td>01:00 PM - 02:20 PM</td>
<td>R</td>
<td>1129 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
<tr>
<td>62723</td>
<td>Laboratory</td>
<td>AD6</td>
<td>03:00 PM - 04:20 PM</td>
<td>R</td>
<td>1129 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
<tr>
<td>57523</td>
<td>Lecture</td>
<td>AL1</td>
<td>01:00 PM - 02:45 PM</td>
<td>M</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
<tr>
<td>57524</td>
<td>Lecture</td>
<td>AL2</td>
<td>01:00 PM - 02:45 PM</td>
<td>M</td>
<td>1404 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

Restricted to Graduate - Urbana-Champaign.

CS 461  **Computer Security I**  credit: 4 hours.

Fundamental principles of computer and communications security and information assurance: ethics, privacy, notions of threat, vulnerabilities, and risk in systems, information warfare, malicious software, data secrecy and integrity issues, network security, trusted computing, mandatory and discretionary access controls, certification and accreditation of systems against security standards. Security mechanisms: authentication, auditing, intrusion detection, access control, cryptography, security protocols, key distribution. Same as ECE 422. 4 undergraduate hours. 4 graduate hours. Prerequisite: CS 241 or ECE 391.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>48199</td>
<td>Lecture-Discussion</td>
<td>AL4</td>
<td>12:30 PM - 01:45 PM</td>
<td>MW</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Bailey, M</td>
</tr>
<tr>
<td>63507</td>
<td>Discussion/Recitation</td>
<td>AY1</td>
<td>10:00 AM - 10:50 AM</td>
<td>R</td>
<td>1214 - Siebel Center for Comp Sci</td>
<td>Bailey, M</td>
</tr>
</tbody>
</table>
### CS 463  Computer Security II  
credit: 3 OR 4 hours.

Program security, trusted base, privacy, anonymity, non-interference, information flow, confinement, advanced auditing, forensics, intrusion detection, key management and distribution, policy composition and analysis, formal approaches to specification and verification of secure systems and protocols, and topics in applied cryptography. Same as ECE 424. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 461. Recommended: CS 475.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>48205</td>
<td>Lecture-Discussion</td>
<td>P3</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Gunter, C</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>48206</td>
<td>Lecture-Discussion</td>
<td>P4</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Gunter, C</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

### CS 465  User Interface Design  
credit: 3 or 4 hours.
A project-focused course covering fundamental principles of user interface design, implementation, and evaluation. Small teams work on a term-long project that involves: analysis of the problem domain, user skills, and tasks; iterative prototyping of interfaces to address user needs; conducting several forms of evaluation such as cognitive walkthroughs and usability tests; implementation of the final prototype. Non-technical majors may enroll as non-programmers who participate in all aspects of the projects with the possible exception of implementation. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>43587</td>
<td>Lecture-Discussion</td>
<td>M3</td>
<td>11:00 AM - 12:15 PM</td>
<td>MW</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Fu, W</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>43588</td>
<td>Lecture-Discussion</td>
<td>M4</td>
<td>11:00 AM - 12:15 PM</td>
<td>MW</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Fu, W</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65863</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Fu, W</td>
</tr>
</tbody>
</table>

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online - UIUC, MS: Mechanical Engineering - UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, NDEG:Undergrad Nondeg-CE-UIUC, or MENG:Mech Engineering Onl-UIUC. Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

**CS 466 Introduction to Bioinformatics**  credit: 3 OR 4 hours.
Algorithmic approaches in bioinformatics: (i) biological problems that can be solved computationally (e.g., discovering genes, and interactions among different genes and proteins); (ii) algorithmic techniques with wide applicability in solving these problems (e.g., dynamic programming and probabilistic methods); (iii) practical issues in translating the basic algorithmic ideas into accurate and efficient tools that biologists may use. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>54552</td>
<td>Lecture-Discussion</td>
<td>B3</td>
<td>09:00 AM - 09:50 AM</td>
<td>MWF</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Peng, J</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>54553</td>
<td>Lecture-Discussion</td>
<td>B4</td>
<td>09:00 AM - 09:50 AM</td>
<td>MWF</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Peng, J</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

**CS 468 Tech and Advertising Campaigns**  credit: 3 hours.
Same as ADV 492. See ADV 492.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>64124</td>
<td>Lecture-Discussion</td>
<td>U</td>
<td>09:30 AM - 10:50 AM</td>
<td>MW</td>
<td>182 - Armory</td>
<td>Yao, M</td>
</tr>
</tbody>
</table>
Restricted to Computer Engineering or Computer Science major(s). Restricted to students with Junior or Senior class standing. Meets with ADV 492. This project-based course will allow teams of media and computer science students to use technology platforms to solve problems supplied by industry clients. Each student will bring their expertise to the problem at hand. Media students will learn capabilities and limitations of different technology platforms will learn how the end user will be impacted by technology decisions, and how they can help achieve advertising objectives with their code design. Junior or Senior standing. Computer Science students should have a knowledge of coding in various platforms. Depending upon availability in the crosslisted ADV section, additional seats for CS468 may be released on November 17th.

**CS 473  Algorithms**  credit: 4 hours.
Design and analysis techniques, approximation algorithms, randomized algorithms and amortized analysis, and advanced topics such as network flow, linear programming, and dynamic data structures, among others. Same as CSE 414 and MATH 473. 4 undergraduate hours. 4 graduate hours. Prerequisite: CS 374, and one of CS 361, MATH 461, or STAT 400.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31548</td>
<td>Lecture-Discussion</td>
<td>S4</td>
<td>05:00 PM - 06:15 PM</td>
<td>TR</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Mehta, R</td>
</tr>
</tbody>
</table>

**CS 477  Formal Software Devel Methods**  credit: 3 OR 4 hours.
Mathematical models, languages, and methods for software specification, development, and verification. Same as ECE 478. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: CS 225; CS 373 or MATH 414.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>39588</td>
<td>Lecture-Discussion</td>
<td>B3</td>
<td>09:30 AM - 10:45 AM</td>
<td>WF</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Gunter, E</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>39589</td>
<td>Lecture-Discussion</td>
<td>B4</td>
<td>09:30 AM - 10:45 AM</td>
<td>WF</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Gunter, E</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

**CS 482  Simulation**  credit: 3 or 4 hours.
Same as IE 413. See IE 413.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>53265</td>
<td>Laboratory</td>
<td>AB1</td>
<td>04:00 PM - 04:50 PM</td>
<td>MW</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Jacobson, S</td>
</tr>
</tbody>
</table>

Restricted to students in the Industrial&Enterprise Sys Eng or Computer Science department.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>51398</td>
<td>Lecture-Discussion</td>
<td>AE3</td>
<td>03:00 PM - 03:50 PM</td>
<td>MW</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Jacobson, S</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to students in the Industrial&Enterprise Sys Eng or Computer Science department. Restricted to Undergrad - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>51399</td>
<td>Lecture-Discussion</td>
<td>AE4</td>
<td>03:00 PM - 03:50 PM</td>
<td>MW</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Jacobson, S</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to students in the Industrial&Enterprise Sys Eng or Computer Science department. Restricted to Graduate - Urbana-Champaign.

**CS 483  Applied Parallel Programming**  credit: 4 hours.
Same as CSE 408 and ECE 408. See ECE 408.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>56564</td>
<td>Laboratory</td>
<td>AB</td>
<td>ARRANGED -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56562</td>
<td>Lecture</td>
<td>AL</td>
<td>09:30 AM - 10:50 AM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Hwu, W</td>
</tr>
<tr>
<td>68235</td>
<td>Laboratory</td>
<td>CB</td>
<td>ARRANGED -</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Restricted to O/C Engineering City Scholars students.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>68236</td>
<td>Lecture</td>
<td>CL</td>
<td>09:30 AM - 10:50 AM</td>
<td>TR</td>
<td>A - Illini Center</td>
<td>Hwu, W</td>
</tr>
</tbody>
</table>

Restricted to O/C Engineering City Scholars students.

**CS 491  Seminar**  credit: 0 TO 4 hours.
Seminar on topics of current interest as announced in the Class Schedule. 0 to 4 undergraduate hours. 0 to 4 graduate hours. Approved for S/U grading only. May be repeated in the same or separate terms if topics vary to a maximum of 4 hours. Prerequisite: As specified for each topic offering, see Class Schedule or departmental course description.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>54144</td>
<td>Lecture</td>
<td>CB</td>
<td>05:00 PM - 06:50 PM</td>
<td>M</td>
<td>301 - Coordinated Science Lab</td>
<td>Bashir, M</td>
</tr>
<tr>
<td>64481</td>
<td>Laboratory</td>
<td>WF</td>
<td>01:00 PM - 01:50 PM</td>
<td>M</td>
<td>0218 - Siebel Center for Comp Sci</td>
<td>Beckman, A</td>
</tr>
</tbody>
</table>

Credit Hours: 2 hours
IAT Seminar
Course meets in 301 CSL Topic: Information Assurance and Trust Seminar. This course is an undergraduate seminar for students admitted to the Illinois Cyber Security Scholar Program. In addition, this course would be open and serve as an orientation seminar to all college of engineering undergraduate student interested in topics of information assurance and trust. The seminars will feature information assurance subject matter expert guest speakers from industry and government, community leaders, distinguished external researchers, faculty, and students discussing both the technical challenges and limitations of IA. Standard information assurance topics such as authentication, data integrity, ethics, and cyber security will be covered.
Credit Hours: 1 hours
Adv Competitive Algorithm Prog
This course introduces advanced algorithms and data structures concepts useful for competing effectively in the ACM International Collegiate Programming Contest (ICPC) World Finals and similar contests. This course assumes familiarity with and proficiency in solving intermediate-difficulty algorithmic programming problems using dynamic programming, graph algorithms, mathematics, computational geometry, combinatorial games, and standard library data structures. This course is recommended for students hoping to learn how to solve difficult problems that appear in the ACM ICPC World Finals contest and later stages of multi-stage programming contests. The course requires completion of short problem sets and participation in practice contests.

CS 492  Senior Project I  credit: 3 hours.
First part of a project course in computer science. Students work in teams to solve typical commercial or industrial problems. Work involves planning, design, and implementation. Extensive oral and written work is required both on-campus and possibly off-campus at sponsors’ locations. CS 492 must be taken as a sequence with either CS 493 or CS 494. 3 undergraduate hours. No graduate credit. Credit is not given for both CS 492 and a project course in another engineering department for the same project. Prerequisite: For Computer Science majors with senior standing.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65799</td>
<td>Lecture-Discussion</td>
<td>CS</td>
<td>12:30 PM - 01:50 PM</td>
<td>W</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Woodley, M</td>
</tr>
</tbody>
</table>

Restricted to Computer Science or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s). Restricted to students with Junior or Senior class standing. Restricted to Undergrad - Urbana-Champaign.

CS 497  CS Team Project  credit: 1 TO 3 hours.
Student teams work with CS faculty to complete a significant project requiring advanced knowledge of CS principles. Project topics vary. 1 to 3 undergraduate hours. No graduate credit. May be repeated in the same term up to 6 hours, if topics vary; may be repeated in separate terms. Prerequisite: For majors only; junior or senior standing required.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>66389</td>
<td>Independent Study</td>
<td>ARRANGED -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Instructor Approval Required
Students must see the CS Department to receive the appropriate CRN for the instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>66406</td>
<td>Lecture</td>
<td>DAF</td>
<td>ARRANGED -</td>
<td></td>
<td></td>
<td>Forsyth, D</td>
</tr>
</tbody>
</table>

CS 498  Special Topics  credit: 1 to 4 hours.
Subject offerings of new and developing areas of knowledge in computer science intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. 1 to 4 undergraduate hours. 1 to 4 graduate hours. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>61698</td>
<td>Laboratory</td>
<td>AB1</td>
<td>09:00 AM - 10:50 AM</td>
<td>F</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Bambeneck, J</td>
</tr>
</tbody>
</table>

Digital Forensics II
This lab section will meet in 0222 Siebel Center
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65904</td>
<td>Laboratory</td>
<td>AB2</td>
<td>11:00 AM - 12:50 PM</td>
<td>F</td>
<td>0222 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
<tr>
<td>61697</td>
<td>Lecture</td>
<td>AL1</td>
<td>09:00 AM - 09:50 AM</td>
<td>MW</td>
<td>1302 - Siebel Center for Comp Sci</td>
<td>Bambenek, J</td>
</tr>
</tbody>
</table>

**Digital Forensics II**

Credit Hours: 4 hours
Digital Forensics II
This is a course for graduate students and advanced undergraduates wanting to develop greater depth and breadth in digital forensics and assumes a basic knowledge of the material covered in Digital Forensics I. Topics include standards of evidence, investigatory procedures, forms of investigation, legal procedures, reasoning about evidence, psychology of cyber crime, anti-forensics, multimedia forensics, computer forensics, web browser forensics, embedded systems forensics, network forensics, cloud forensics, applications forensics, and fraud examination. It introduces known barriers and open challenges in the field. Prerequisite: Completion of Digital Forensics I or special permission granted by the instructor.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>65685</td>
<td>Lecture</td>
<td>AML</td>
<td>03:30 PM - 04:45 PM</td>
<td>TR</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Forsyth, D</td>
</tr>
</tbody>
</table>

**Applied Machine Learning**

Credit Hours: 3 hours
Applied Machine Learning
Techniques of machine learning, with applications to various signal problems. Techniques covered will be: regression including linear regression, multiple regression, regression forests and nearest neighbors regression; classification with various methods including logistic regression, support vector machines, nearest neighbors, simple boosting and decision forests; clustering with various methods including basic agglomerative clustering and k-means; resampling methods, including cross-validation and the bootstrap; model selection methods, including AIC, stepwise selection and the lasso; hidden Markov models; model estimation in the presence of missing variables; and neural networks, including deep networks. The course is intended to support students who wish to apply machine learning methods, and will focus on tool-oriented and problem-oriented exposition. Application areas include computer vision, natural language, interpreting accelerometer data, and understanding audio data. Prereq: A course in probability or statistics, a course in linear algebra, and some programming experience.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>67942</td>
<td>Online</td>
<td>AMO</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Forsyth, D</td>
</tr>
</tbody>
</table>

**Applied Machine Learning**

Credit Hours: 4 hours
Applied Machine Learning
Restricted to MCS: Computer Sci Online - UIUC.
This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply. Description: Techniques of machine learning, with applications to various signal problems. Techniques covered will be: regression including linear regression, multiple regression, regression forests and nearest neighbors regression; classification with various methods including logistic regression, support vector machines, nearest neighbors, simple boosting and decision forests; clustering with various methods including basic agglomerative clustering and k-means; resampling methods, including cross-validation and the bootstrap; model selection methods, including AIC, stepwise selection and the lasso; hidden Markov models; model estimation in the presence of missing variables; and neural networks, including deep networks. The course is intended to support students who wish to apply machine learning methods, and will focus on tool-oriented and problem-oriented exposition. Application areas include computer vision, natural language, interpreting accelerometer data, and understanding audio data.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>67780</td>
<td>Lecture-Discussion</td>
<td>CPS</td>
<td>ARRANGED -</td>
<td>ARR - Illini Center</td>
<td>Caccamo, M</td>
<td></td>
</tr>
</tbody>
</table>

**Cyber Physical-Systems**

Credit Hours: 3 hours
Cyber Physical-Systems
In this course, we will delve into topics that deal with the design and temporal analysis of cyber-physical and embedded systems. The goal of this course is to provide a deep understanding about resource management, analysis and safety of modern embedded systems that interact with the physical world, especially those that have different degrees of criticality and stringent timing requirements. Examples of such systems include modern automobiles, avionics and flight systems, space vehicles and satellites, medical equipment, power distribution grid, and robotics devices among others. This course has a mixed structure with both
regular lectures and some research paper presentations. Students will give one in class presentation about state-of-art research papers published in top conferences and journals. The course is structured to improve students’ ability for critical thinking. In-class discussion will focus on classic real-time systems theory and some state-of-art research work on cyber-physical and real-time embedded systems. Part of studied theory will be applied to the design of a simple control system for an Unmanned (Aerial) Vehicle. Course requirements include a project to be completed by students organized as teams. Prerequisites: This class admits both senior undergrads and graduate students. The prerequisite for this class is CS241 (System Programming), or consent of the instructor. Restricted to O/C Engineering City Scholars students.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>68232</td>
<td>Online</td>
<td>Applied Machine Learning</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>68121</td>
<td>Lecture</td>
<td>Data Science &amp; Analytics</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>65868</td>
<td>Online</td>
<td>Cloud Computing Applications</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>67978</td>
<td>Lecture-Discussion</td>
<td>Learning and Computer Science</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>67979</td>
<td>Lecture-Discussion</td>
<td>Learning and Computer Science</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
interactive discussions, the course will provide an overview of what we know (and what we don't know!) about how people learn, in general and in computer science specifically. Topics include organizing knowledge, creating concepts, interacting with visual displays, and managing cognitive load. Students will also learn how to design and perform educational research studies with the course culminating in students writing the core of a National Science Foundation grant proposal. Prerequisites: CS 225 or consent of Instructor.

<table>
<thead>
<tr>
<th>Course</th>
<th>Type</th>
<th>Location</th>
<th>Time</th>
<th>Days</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>55504</td>
<td>Lecture</td>
<td>MS3</td>
<td>10:00 AM - 11:20 AM</td>
<td>W</td>
<td>Snir, M</td>
</tr>
<tr>
<td>55505</td>
<td>Lecture</td>
<td>MS4</td>
<td>10:00 AM - 11:20 AM</td>
<td>W</td>
<td>Snir, M</td>
</tr>
<tr>
<td>65864</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED</td>
<td>-</td>
<td>Forsyth, D</td>
</tr>
<tr>
<td>39660</td>
<td>Lecture</td>
<td>PS3</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>Smaragdis, P</td>
</tr>
<tr>
<td>67074</td>
<td>Lecture</td>
<td>PS4</td>
<td>12:30 PM - 01:45 PM</td>
<td>TR</td>
<td>Smaragdis, P</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Parallel Algorithms
Topic: The course will survey the algorithmic foundations of parallel computing. This includes basic parallel programming models; operation and communication complexity; basic parallel algorithms for linear algebra, FFT, sorting and graph algorithms; networks and routing. Restrictions: Restricted to Computer Science major(s). Restricted to students with Senior or Graduate class standing. Prerequisite: CS 374

Credit Hours: 4 hours
Parallel Algorithms
Restricted to Graduate - Urbana-Champaign.
Topic: The course will survey the algorithmic foundations of parallel computing. This includes basic parallel programming models; operation and communication complexity; basic parallel algorithms for linear algebra, FFT, sorting and graph algorithms; networks and routing. Restrictions: Restricted to Computer Science major(s). Restricted to students with Senior or Graduate class standing. Prerequisite: CS 374

Applied Machine Learning
Restricted to online non-degree, online MCS, online MSAE, online MSME, and online MSCE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

Credit Hours: 3 hours
Audio Computing Lab
This course will cover the computational foundations of modern audio applications. This will be a lab-like course in which students will be required to bring in their laptops in class and collectively implement a variety of core audio operations that are commonplace today. In this class we will cover the necessary theory to start working on audio processing, and implement a variety of applications such as room and 3D/virtual audio rendering, pitch manipulations and autotuning, denoising for communications and forensics, audio classification, music information retrieval based on audio, rudimentary speech recognition, speech and audio coding, applications of machine learning to audio scene recognition, audio restoration, missing data recovery, and many more. Students will need to have a good grasp of programming in Python (or MATLAB) and will be required to bring to class their laptops and headphones to participate in lab exercises. Suggested prerequisites include MATH416 (or equivalent) and CS241.

Credit Hours: 4 hours
Audio Computing Lab
Restricted to Graduate - Urbana-Champaign.
This course will cover the computational foundations of modern audio applications. This will be a lab-like course in which students will be required to bring in their laptops in class and collectively implement a variety of core audio operations that are commonplace
today. In this class we will cover the necessary theory to start working on audio processing, and implement a variety of applications such as room and 3D/virtual audio rendering, pitch manipulations and autotuning, denoising for communications and forensics, audio classification, music information retrieval based on audio, rudimentary speech recognition, speech and audio coding, applications of machine learning to audio scene recognition, audio restoration, missing data recovery, and many more. Students will need to have a good grasp of programming in Python (or MATLAB) and will be required to bring to class their laptops and headphones to participate in lab exercises. Suggested prerequisites include MATH416 (or equivalent) and CS241.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>67775</td>
<td>Lecture-Discussion</td>
<td>TC3</td>
<td>02:00 PM - 03:15 PM</td>
<td>WF</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Chan, T</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Computational Geometry

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>67785</td>
<td>Lecture-Discussion</td>
<td>TC4</td>
<td>02:00 PM - 03:15 PM</td>
<td>WF</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Chan, T</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Computational Geometry
Restricted to Graduate - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>50232</td>
<td>Lecture</td>
<td>VR3</td>
<td>04:00 PM - 05:15 PM</td>
<td>MW</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Angrave, L</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Virtual Reality

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>50234</td>
<td>Lecture</td>
<td>VR4</td>
<td>04:00 PM - 05:15 PM</td>
<td>MW</td>
<td>1320 - Digital Computer Laboratory</td>
<td>Angrave, L</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Virtual Reality
Restricted to Graduate - Urbana-Champaign.

CS 499  Senior Thesis  credit: 3 hours.
Research and thesis development experience in computer science underguidance of a faculty member. Literature search, oral presentation, analysis and implementation, paper preparation, and completion of a written thesis. 3 undergraduate hours. No graduate credit. May be repeated to a maximum of 6 hours. Prerequisite: Consent of instructor.

This course satisfies the General Education Criteria for a:
Advanced Composition

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10465</td>
<td>Independent Study</td>
<td>ARRANGED -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Advanced Composition course.
Instructor Approval Required
Students must see the CS Department to receive the appropriate CRN for the instructor.

CS 511  Advanced Data Management  credit: 4 hours.
Advanced concepts in data management and information system design and implementation, and recent developments in the field.
1) Relational roots, objects and extensibility, query languages, data indexing, query processing, transaction processing, benchmarks,
and 2) semi-structured data and unstructured data, information extraction, information integration, web search and mining, and other emerging directions in the field. Prerequisite: CS 411.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>40748</td>
<td>Online</td>
<td>ONL</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Chang, K</td>
</tr>
</tbody>
</table>

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online - UIUC, MS: Mechanical Engineering - UIUC, MS: Aerospace Eng-Online-UIUC, NDEG:Grad Nondegree-CE/UIUC, or MENG:Mech Engineering Onl-UIUC. Restricted to online graduate non-degree, online MCS, online MSME, online MSCEE, and online MSAE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

31602 | Lecture-Discussion | P | 02:00 PM - 03:15 PM | WF | 0216 - Siebel Center for Comp Sci | Chang, K |

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

CS 512  **Data Mining Principles**  credit: 4 hours.
An advanced course on principles and algorithms of data mining. Data cleaning and integration; descriptive and predictive mining; mining frequent, sequential, and structured patterns; clustering, outlier analysis and fraud detection; stream data, web, text, and biomedical data mining; security and privacy in data mining; research frontiers. Prerequisite: CS 412.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31604</td>
<td>Lecture-Discussion</td>
<td>F</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Han, J</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

47139 | Online | ONL | ARRANGED - | - | Han, J |

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online - UIUC, MS: Mechanical Engineering - UIUC, MS: Aerospace Eng-Online-UIUC, NDEG:Grad Nondegree-CE/UIUC, or MENG:Mech Engineering Onl-UIUC. Restricted to online graduate non-degree, online MCS, online MSME, online MSCEE, and online MSAE students. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

CS 525  **Advanced Distributed Systems**  credit: 4 hours.
Peer-to-peer systems, sensor networks, and fundamental theoretical distributed computing. Review of classical work in each area, and application of design methodologies to explore overlaps among them. Emphasis on protocol design, systems issues, and theory. Reading selections are roughly two-third classical to one-third contemporary. Students write critiques, make presentations, and create a conference paper in a systematic manner. Prerequisite: One of CS 423, CS 425, CS 438.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>46186</td>
<td>Lecture</td>
<td>S</td>
<td>03:30 PM - 04:45 PM</td>
<td>MW</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Gupta, I</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
CS 533  **Parallel Computer Architecture**  credit: 4 hours.
Theoretical aspects of parallel and pipeline computation; time and processor bounds on classes of computations; data alignment network speed and cost bounds; conflict-free access memories; overall computer system ideas. Same as CSE 522. Prerequisite: CS 433.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31610</td>
<td>Lecture-Discussion</td>
<td>S</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1109 - Siebel Center for Comp Sci</td>
<td>Torrellas, J</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.

CS 538  **Advanced Computer Networks**  credit: 4 hours.
Advanced concepts in computer networks, including congestion control, quality of service, naming, routing, wireless networks, Internet architecture, measurement, network security, and selected recent research directions. Prerequisite: CS 438.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>63702</td>
<td>Lecture</td>
<td>N</td>
<td>11:00 AM - 12:15 PM</td>
<td>MW</td>
<td>1105 - Siebel Center for Comp Sci</td>
<td>Godfrey, P</td>
</tr>
</tbody>
</table>

Restricted to Graduate - Urbana-Champaign.

CS 543  **Computer Vision**  credit: 4 hours.
Same as ECE 549. See ECE 549.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>58391</td>
<td>Lecture-Discussion</td>
<td>ADD</td>
<td>ARRANGED -</td>
<td>TR</td>
<td>-</td>
<td>Lazebnik, S</td>
</tr>
</tbody>
</table>

Restricted to Graduate - Urbana-Champaign.

Overflow section for CS 543. Students in this section will complete this course completely online except for the following which must be completed on-campus: Exams (will be completed in the classroom with the instructor/TA), Homework/exam sessions.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>33995</td>
<td>Lecture-Discussion</td>
<td>R</td>
<td>11:00 AM - 12:15 PM</td>
<td>TR</td>
<td>1310 - Digital Computer Laboratory</td>
<td>Lazebnik, S</td>
</tr>
</tbody>
</table>

Restricted to Graduate - Urbana-Champaign.

CS 546  **Machine Learning in NLP**  credit: 4 hours.
Central learning frameworks and techniques that have emerged in the field of natural language processing and found applications in several areas in text and speech processing: from information retrieval and extraction, through speech recognition to syntax, semantics and language understanding related tasks. Examination of the theoretical paradigms -- learning theoretic, probabilistic, and information theoretic -- and the relations among them, as well as the main algorithmic techniques developed within each paradigm and in key natural language applications. Prerequisite: CS 446 and CS 473.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
</table>

Restricted to Graduate - Urbana-Champaign.
CS 555  Numerical Methods for PDEs  credit: 4 hours.
Numerical techniques for initial and boundary value problems in partial differential equations. Finite difference and finite element discretization techniques, direct and iterative solution methods for discrete problems, and programming techniques and usage of software packages. Same as CSE 510. Prerequisite: CS 450 or CS 457.

CS 565  Human-Computer Interaction  credit: 4 hours.
In-depth coverage of advanced topics in human-computer interaction (HCI). Applied models of human performance and attention, design tools for creative design tasks, interruptions and peripheral displays, gestures, and bimanual input, and usability evaluation techniques. Students complete a research-oriented term project of their choosing. Prerequisite: CS 465.

CS 572  Extremal Graph Theory  credit: 4 hours.
Same as MATH 581. See MATH 581.

CS 574  Randomized Algorithms  credit: 4 hours.
Basic and advanced concepts in the design and analysis of randomized algorithms. Sampling; concentration inequalities such as Chernoff-Hoeffding bounds; probabilistic method; random walks, dimension reduction; entropy; martingales and Azuma's inequality; derandomization. Randomized algorithms for sorting and searching; graphs; geometric problems. Basics of pseudorandomness and randomized complexity classes. Prerequisite: CS 473; MATH 461 or STAT 400.
CS 575  **Methods of Combinatorics**  credit: 4 hours.  
Same as MATH 584. See MATH 584.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>47436</td>
<td>Lecture-Discussion</td>
<td>D1</td>
<td>12:00 PM - 12:50 PM</td>
<td>MWF</td>
<td>241 - Altgeld Hall</td>
<td>Balog, J</td>
</tr>
</tbody>
</table>

CS 579  **Computational Complexity**  credit: 4 hours.  
Turing machines; determinism and non-determinism; time and space hierarchy theorems; speed-up and tape compression; Blum axioms; structure of complexity classes NP, P, NL, L, and PSPACE; complete problems; randomness and complexity classes RP, RL, and BPP; alternation, polynomial-time hierarchy; circuit complexity, parallel complexity, NC, and RNC; relativized computational complexity; time-space trade-offs. Same as ECE 579. Prerequisite: CS 473 or CS 475.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>41446</td>
<td>Lecture-Discussion</td>
<td>F</td>
<td>03:30 PM - 04:45 PM</td>
<td>MW</td>
<td>1105 - Siebel Center for Comp Sci</td>
<td>Forbes, M</td>
</tr>
</tbody>
</table>

Restricted to Graduate - Urbana-Champaign.

CS 581  **Algorithmic Genomic Biology**  credit: 4 hours.  
Same as BIOE 540. See BIOE 540.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>66108</td>
<td>Lecture</td>
<td>A</td>
<td>02:00 PM - 03:15 PM</td>
<td>TR</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Warnow, T</td>
</tr>
</tbody>
</table>

CS 583  **Approximation Algorithms**  credit: 4 hours.  
Approximation algorithms for NP-hard problems. Basic and advanced techniques in approximation algorithm design: combinatorial algorithms; mathematical programming methods including linear and semi-definite programming, local search methods, and others. Algorithms for graphs and networks, constraint satisfaction, packing and scheduling. Prerequisite: CS 573 or consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>59718</td>
<td>Lecture</td>
<td>AA</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1304 - Siebel Center for Comp Sci</td>
<td>Chekuri, C</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
CS 591  **Advanced Seminar**  credit: 0 TO 4 hours.
Seminar on topics of current interest as announced in the Class Schedule. Approved for S/U grading only. May be repeated in the same or separate terms if topics vary. Prerequisite: As specified for each topic offering, see Class Schedule or departmental course description.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31625</td>
<td>Lecture-Discussion</td>
<td>ACT</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Adve, V Garzaran, M Padua, D</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Restricted to Graduate - Urbana-Champaign.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>53701</td>
<td>Lecture-Discussion</td>
<td>FM</td>
<td>03:30 PM - 04:50 PM</td>
<td>F</td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Gunter, E</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Restricted to Graduate - Urbana-Champaign.
Topic: Formal Methods. This course will meet in 3405 SC.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31628</td>
<td>Lecture-Discussion</td>
<td>HCI</td>
<td>11:00 AM - 11:50 AM</td>
<td>T</td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Kirlik, A</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Restricted to Graduate - Urbana-Champaign.
Topic: Seminar in Human-Computer Interaction.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>40248</td>
<td>Lecture-Discussion</td>
<td>IG</td>
<td>03:00 PM - 03:50 PM</td>
<td>T</td>
<td>-</td>
<td>Gupta, I</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Topic: Advanced Seminar in Distributed Systems. Prerequisite: CS 425 or CS 598 IG or basic distributed systems knowledge. Class will meet in 3124 SC.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31649</td>
<td>Lecture-Discussion</td>
<td>JM</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Meseguer, J</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Restricted to Graduate - Urbana-Champaign.
Topic: Maude Seminar. Prerequisite: CS 476 or CS 477.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>40246</td>
<td>Lecture-Discussion</td>
<td>LVK</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Kale, L</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
Restricted to Graduate - Urbana-Champaign.
Topics in Parallel Programming with Migratable Objects.
<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>31644</td>
<td>Lecture-Discussion</td>
<td>MH</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Heath, M</td>
</tr>
<tr>
<td>31630</td>
<td>Lecture-Discussion</td>
<td>RHC</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Campbell, R</td>
</tr>
<tr>
<td>31634</td>
<td>Lecture-Discussion</td>
<td>SE</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Siebel Center for Comp Sci</td>
<td>Marinov, D Misailovic, S Xie, T</td>
</tr>
<tr>
<td>54573</td>
<td>Lecture-Discussion</td>
<td>TA</td>
<td>10:00 AM - 10:50 AM</td>
<td>F</td>
<td>218 - Ceramics Building</td>
<td>Bailey, B Beckman, A Chen, Y Goodman, M Johnson, B</td>
</tr>
<tr>
<td>31635</td>
<td>Lecture-Discussion</td>
<td>TCS</td>
<td>ARRANGED -</td>
<td>-</td>
<td></td>
<td>Erickson, J</td>
</tr>
<tr>
<td>64590</td>
<td>Lecture</td>
<td>TXT</td>
<td>ARRANGED -</td>
<td></td>
<td></td>
<td>Zhai, C</td>
</tr>
</tbody>
</table>

**CS 597 Individual Study**  credit: 2 TO 16 hours.
Individual study or reading in a subject not covered in normal course offerings. May be repeated. Prerequisite: Consent of instructor.
CS 598  **Special Topics**  credit: 2 TO 4 hours.
Subject offerings of new and developing areas of knowledge in computer science intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>67943</td>
<td>Online</td>
<td>CC1</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Gupta, I</td>
</tr>
<tr>
<td>68083</td>
<td>Online</td>
<td>CC2</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Farivar, R</td>
</tr>
<tr>
<td>67944</td>
<td>Online</td>
<td>DM1</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Zhai, C</td>
</tr>
<tr>
<td>68084</td>
<td>Online</td>
<td>DM2</td>
<td>ARRANGED -</td>
<td>-</td>
<td>-</td>
<td>Zhai, C</td>
</tr>
<tr>
<td>68277</td>
<td>Lecture-Discussion</td>
<td>ETC</td>
<td>03:00 PM - 05:50 PM</td>
<td>W</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Campbell, R</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Cloud Computing Capstone
Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.
This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply. CS 425 and CS 498 Cloud Computing Applications

Credit Hours: 4 hours
Data Mining Capstone
Restricted to MCS:Computer Sci Online -UIUC or NDEG:Computer Science Onl-UIUC.
This course is only for students that are in the Computer Science MCS-DS Program. Additional Coursera ID verification and ProctorU fees may apply. Pre-requisites: CS 410 and CS 412

Credit Hours: 4 hours
Ethical Thinking-Cyber Space
Restricted to Graduate - Urbana-Champaign.
Innovative approaches to cybersecurity education are needed to equip professionals to be technologically savvy as well as ethically minded and capable of meeting the heavy burden of responsibility that comes with increased technological skills and access to sensitive data. This course will address this need through a case study based ethics curriculum for cybersecurity. The curriculum will immerse students in real-life ethical dilemmas inherent to cybersecurity and engage them in open dialogue and debate within a community of ethical practice. The curriculum will be designed to develop critical reasoning skills in addition to other “soft skills” vital for cybersecurity professionals. Specific curricular objectives include: Increased awareness of the complex
web of consequences that cybersecurity professionals are prone to encounter Development of critical reasoning skills that will allow students to become more sophisticated in their ethical reasoning abilities and responses Development of collaborative problem solving and communication skills Fostering and establishing a culture of dialogue around complex ethical dimensions of cybersecurity

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Instructor</th>
<th>Days</th>
<th>Time</th>
<th>Location</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>65627</td>
<td>Lecture-Discussion</td>
<td>Agha, G</td>
<td>M</td>
<td>02:00 PM - 04:50 PM</td>
<td>1103 - Siebel Center for Comp Sci</td>
<td>4</td>
<td>Programming Languages Application Restricted to Graduate - Urbana-Champaign. Topic: Programming Languages for Next Generation Applications Programming next generation applications such as Mobile Cloud, the Internet of Things, Cyberphysical Systems (Self-Driving vehicles), Biocomputers (microfluidics, DNA computers), Synthetic Biology and Quantum Computers presents distinctive challenges. The course will study emerging applications with the goal of understanding the challenge of programming them. It will include a survey of programming languages currently used as well as novel programming languages proposed for applications in these domains. Students will be expected to do a course project exploring novel programming constructs for a specific domain of next generation applications.</td>
</tr>
<tr>
<td>68347</td>
<td>Lecture-Discussion</td>
<td>Campbell, R</td>
<td>W</td>
<td>01:00 PM - 02:50 PM</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>4</td>
<td>Health Data Analysis Restricted to Graduate - Urbana-Champaign. Prerequisite: One or more courses demonstrating a working knowledge of machine learning and data mining. Topic: There are about 10,000 known human diseases, yet human doctors are only able to recall a fraction of them at any given moment. Operational waste and inefficiencies in healthcare system is vastly overlooked. But maybe, with the help of data analytics, we can overcome all these issues. Today, in healthcare, large amounts of multi-modal health data is becoming more accessible. Electronic health records, genetic, imaging, and smartwatch data could be an enabling resource for deriving insights for improving care delivery and reducing waste. The enormity and complexity of these datasets present great challenges in analyses and subsequent applications to a practical clinical environment. The course will consist of paper readings, presentations, and student projects. Students write critiques, make presentations, and create an academic paper suitable for a workshop or conference. We will review the recent advances in the area of health data analysis. Reading selections broadly cover clinical, genetic, and image analysis. Students are expected to have a working knowledge of machine learning, data mining, and programming skills to carry an implementation of a final project (preferably in Python, but all languages are welcome). The project is extremely hands-on. You will experience firsthand all of the journey a data scientist goes through: data ambiguity, missing data, anomalies, skewness, predictive models, descriptive models, etc. Undergrad may register for this course with instructor approval.</td>
</tr>
<tr>
<td>39670</td>
<td>Lecture-Discussion</td>
<td>Parthasarathy, M</td>
<td>TR</td>
<td>11:00 AM - 12:15 PM</td>
<td>1105 - Siebel Center for Comp Sci</td>
<td>4</td>
<td>Topic: Algorithmic Software Verification. This course requires mathematical maturity, and some knowledge of automata theory (CS 273) and propositional logic. Credit: 4 hours</td>
</tr>
<tr>
<td>68141</td>
<td>Lecture-Discussion</td>
<td>Borisov, N</td>
<td>MW</td>
<td>11:00 AM - 12:15 PM</td>
<td>2013 - Electrical &amp; Computer Eng Bldg</td>
<td>4</td>
<td>Privacy Enhancing Technologies Restricted to Graduate - Urbana-Champaign.</td>
</tr>
<tr>
<td>68136</td>
<td>Lecture-Discussion</td>
<td>Lavalle, S</td>
<td>MW</td>
<td>04:00 PM - 05:15 PM</td>
<td>204 - Transportation Building</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours

page 49 - Computer Science, Spring 2018
Representations in Robotics
Restricted to Graduate - Urbana-Champaign.
This course will explain, discuss, and explore fundamental issues in robotics, centered on information and representation requirements for robot motion strategies. Prereq: ECE 470 Introduction to Robotics, or consent of instructor

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>43781</td>
<td>Lecture-Discussion</td>
<td>SS</td>
<td>09:30 AM - 10:45 AM</td>
<td>TR</td>
<td>1131 - Siebel Center for Comp Sci</td>
<td>Sinha, S</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Advance Bioinformatics
Restricted to Graduate - Urbana-Champaign.
Topic: Probabilistic Methods for Biological Sequence Analysis. This is an advanced topics course in bioinformatics. We will discuss (i) probabilistic techniques such as Expectation-Maximization, Hidden Markov Models, Bayesian inference, Monte carlo sampling (ii) computational assessment of sequence statistics (such as alignment scores and word frequencies), (iii) mathematical models of evolution and their use in sequence analysis, among other topics. Computational techniques will be discussed in the context of the important biological process of gene regulation, and problems such as “sequence alignment”, “motif finding”, and “module detection”, will be studied in detail. NO BACKGROUND IN BIOLOGY IS REQUIRED: biological concepts used will be introduced early in the course. The course will involve a research project. Prerequisites: Programming, basic probability and statistics.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>48248</td>
<td>Lecture-Discussion</td>
<td>TAR</td>
<td>12:30 PM - 01:45 PM</td>
<td>WF</td>
<td>0216 - Siebel Center for Comp Sci</td>
<td>Abdelzaher, T</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Social Sensing
Restricted to Graduate - Urbana-Champaign.
Topic: Distributed Social Sensing and Cyber-Physical Systems. In 2007, the President's Council of Advisors on Science and Technology (PCAST) named systems that interact with the physical world the number one research challenge for US competitiveness. An important emerging category of cyber-physical systems are those that function in social spaces. These systems are ushered in by the proliferation of "sensing" devices (e.g., on phones, in homes, on cameras, etc) in the possession of the average individual, as well as our ubiquitous mobile connectivity and the rise of new data broadcast media (namely, social networks). This course covers the unfolding research challenges and directions in distributed social sensing, overviews the broader landscape of cyber-physical systems, discusses common misconceptions, presents the underlying theoretical foundations, and sheds light on related recent technologies and publications.

CS 599  Thesis Research  credit: 0 TO 16 hours.
Approved for S/U grading only. May be repeated.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10469</td>
<td>Independent Study</td>
<td>ARRANGED</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Instructor Approval Required
Restricted to Computer Science major(s). Restricted to Graduate - Urbana-Champaign. Students must see the CS Department to receive the appropriate CRN for the instructor.