# Requirements for BS in CS w/ Human-Centered Computing Concentration – Total 128 credit hours

## Non-engineering and General Education Requirements (59 Credit hours)

<table>
<thead>
<tr>
<th>Course #</th>
<th>Hours</th>
<th>Course Title</th>
<th>Pre-Requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 160</td>
<td>3</td>
<td>Academic Writing I</td>
<td>Satisfactory performance on dept. placement test</td>
</tr>
<tr>
<td>ENGL 161</td>
<td>3</td>
<td>Academic Writing II</td>
<td>ENGL 160 or the equivalent</td>
</tr>
<tr>
<td>MATH 180</td>
<td>5</td>
<td>Calculus I</td>
<td>‘C’ or better in MATH 121 or appropriate performance on the dept. placement test</td>
</tr>
<tr>
<td>MATH 181</td>
<td>5</td>
<td>Calculus II</td>
<td>‘C’ or better in MATH 180</td>
</tr>
<tr>
<td>MATH 210</td>
<td>3</td>
<td>Calculus III</td>
<td>‘C’ or better in MATH 181</td>
</tr>
<tr>
<td>MATH 220</td>
<td>3</td>
<td>Differential Equations</td>
<td>‘C’ or better in MATH 210</td>
</tr>
<tr>
<td>PHYS 141</td>
<td>4</td>
<td>General Physics I (Mechanics)</td>
<td>‘C’ or better in MATH 180</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>4</td>
<td>General Physics II (Electricity and Magnetism)</td>
<td>‘C’ or better in MATH 181 and PHYS 141</td>
</tr>
<tr>
<td>EWC</td>
<td>3</td>
<td>Exploring World Cultures course</td>
<td>See General Education section for approved list</td>
</tr>
<tr>
<td>UCA</td>
<td>3</td>
<td>Understanding the Creative Arts course</td>
<td>See General Education section for approved list</td>
</tr>
<tr>
<td>UP</td>
<td>3</td>
<td>Understanding the Past</td>
<td>See General Education section for approved list</td>
</tr>
<tr>
<td>UIS</td>
<td>3</td>
<td>Understanding the Individual Society</td>
<td>See General Education section for approved list</td>
</tr>
<tr>
<td>UUSS</td>
<td>3</td>
<td>Understanding the U.S. Society course</td>
<td>See General Education section for approved list</td>
</tr>
<tr>
<td>H/SS/A</td>
<td>12</td>
<td>Humanities / Social Sciences / Art Electives</td>
<td>Must select from list approved by CS dept.: see below</td>
</tr>
<tr>
<td>SE</td>
<td>2</td>
<td>Science Electives</td>
<td>See below for details</td>
</tr>
</tbody>
</table>

## Required Courses in CS & COE (54 Credit hours)

<table>
<thead>
<tr>
<th>Course #</th>
<th>Hours</th>
<th>Course Title</th>
<th>Pre-Requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 100</td>
<td>0</td>
<td>Engineering Orientation</td>
<td>Admission to the College of Engineering</td>
</tr>
<tr>
<td>CS 111</td>
<td>3</td>
<td>Program Design I</td>
<td>None</td>
</tr>
<tr>
<td>CS 141</td>
<td>3</td>
<td>Program Design II</td>
<td>CS 109 or CS 111; and credit or concurrent registration in MATH 180</td>
</tr>
<tr>
<td>CS 151</td>
<td>3</td>
<td>Mathematical Foundations of Computation</td>
<td>MATH 180; and ‘C’ or better in CS 111</td>
</tr>
<tr>
<td>CS 211</td>
<td>2</td>
<td>Programming Practicum</td>
<td>‘C’ or better in CS 141</td>
</tr>
<tr>
<td>CS 251</td>
<td>4</td>
<td>Data Structures</td>
<td>CS 151 or CS 201; and credit or concurrent registration in CS 211</td>
</tr>
<tr>
<td>CS 261</td>
<td>3</td>
<td>Machine Organization</td>
<td>Credit/concurrent registration in CS 211</td>
</tr>
<tr>
<td>CS 301</td>
<td>3</td>
<td>Languages and Automata</td>
<td>‘C’ or better in CS 151 or 201; and credit or concurrent registration in CS 251</td>
</tr>
<tr>
<td>CS 341</td>
<td>3</td>
<td>Programming Language Design and Implementation</td>
<td>CS 251 and CS 261; or approval of the department</td>
</tr>
<tr>
<td>CS 342</td>
<td>3</td>
<td>Software Design</td>
<td>CS 251</td>
</tr>
<tr>
<td>CS 361</td>
<td>3</td>
<td>Computer Systems</td>
<td>CS 251 and CS 261</td>
</tr>
<tr>
<td>CS 362</td>
<td>3</td>
<td>Computer Design</td>
<td>CS 261</td>
</tr>
<tr>
<td>CS 377</td>
<td>3</td>
<td>Communication and Ethical Issues in Computing</td>
<td>CS 251</td>
</tr>
<tr>
<td>CS 385</td>
<td>3</td>
<td>Operating Systems Concepts and Design</td>
<td>CS 361; or CS 201 &amp; ECE 267</td>
</tr>
<tr>
<td>CS 401</td>
<td>3</td>
<td>Computer Algorithms I</td>
<td>‘C’ or better in CS 251 or MCS 360</td>
</tr>
<tr>
<td>CS 422</td>
<td>3</td>
<td>User Interface Design and Programming</td>
<td>CS 342</td>
</tr>
<tr>
<td>CS 499</td>
<td>0</td>
<td>Professional Development Seminar</td>
<td>Senior &amp; in last semester of study</td>
</tr>
</tbody>
</table>

**Selectives** | 9 | At least three of the following 3 hour courses – remainder can be chosen to satisfy technical electives |

<table>
<thead>
<tr>
<th>Course #</th>
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<th>Pre-Requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 411</td>
<td>3</td>
<td>Artificial Intelligence I</td>
<td>CS 251</td>
</tr>
<tr>
<td>CS 415</td>
<td>3</td>
<td>Computer Vision I</td>
<td>CS 251 or MCS 360</td>
</tr>
<tr>
<td>CS 421</td>
<td>3</td>
<td>Image Analysis and Computer Vision I</td>
<td>MATH 310; or “C” or better in ECE 310</td>
</tr>
<tr>
<td>ECE 415</td>
<td>3</td>
<td>Natural Language Processing</td>
<td>CS 301 or MCS 441</td>
</tr>
<tr>
<td>CS 424</td>
<td>3</td>
<td>Visualization and Visual Analytics</td>
<td>CS 251; or consent of the instructor</td>
</tr>
<tr>
<td>CS 425</td>
<td>3</td>
<td>Computer Graphics I</td>
<td>CS 251</td>
</tr>
<tr>
<td>CS 426</td>
<td>3</td>
<td>Video Game Design and Development</td>
<td>CS 251; or consent of the instructor</td>
</tr>
</tbody>
</table>

## Technical Electives (3 Credit hours)

<table>
<thead>
<tr>
<th>Course #</th>
<th>Hours</th>
<th>Course Title</th>
<th>Pre-Requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 398</td>
<td>3</td>
<td>Undergraduate Design/Research</td>
<td>Consent of the instructor</td>
</tr>
<tr>
<td>CS 412</td>
<td>3</td>
<td>Introduction to Machine Learning</td>
<td>CS 251; &amp; IE 342 / STAT 381; or consent of instructor</td>
</tr>
<tr>
<td>CS 440</td>
<td>3</td>
<td>Software Engineering I</td>
<td>CS 342</td>
</tr>
<tr>
<td>CS 441</td>
<td>3</td>
<td>Distributed Object Programming Using Middleware</td>
<td>‘C’ or better in ((CS 341 or 342) and CS 361)</td>
</tr>
</tbody>
</table>

Updated: February 2016
### Required Mathematics courses (6 credit hours)

<table>
<thead>
<tr>
<th>Course #</th>
<th>Hours</th>
<th>Course Title</th>
<th>Pre-Requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE 342*</td>
<td>3</td>
<td>Probability and Statistics for Engineers</td>
<td>MATH 181</td>
</tr>
<tr>
<td>or STAT 381</td>
<td></td>
<td>Applied Statistical Methods</td>
<td>‘C’ or better in MATH 210; or approval of department</td>
</tr>
<tr>
<td>MATH 310</td>
<td>3</td>
<td>Applied Linear Algebra</td>
<td>‘C’ or better in MATH 210</td>
</tr>
<tr>
<td>or MATH 320</td>
<td></td>
<td>Linear Algebra I</td>
<td>Concurrent registration in MATH 215</td>
</tr>
</tbody>
</table>

*Students who receive credit in IE 342 will not receive credit for either STAT 381 or STAT 401

### Humanities / Social Science / Arts Electives (Must complete 12 credit hours total. DARS sometimes does not automatically recognize these classes, in those cases submit a petition in the college office SEO 123)

The HCC concentration requires at least three courses selected from the following list: PSCH 100, PSCH 242, ART 150, ART 454, ART 456, DES 452, COMM 316, COMM 430 and COMM 460 (to enroll in these courses students will have to go to the respective departments to get an override on pre-requisites/courses). Additional courses can come from the list or (i). Any of the courses contained in the EWC, UCA, UP, UIS and/or UUSS general education requirement course lists. (ii) Any course for which either a course in (1) or English 161 is a prerequisite. (iii) All courses in foreign languages; and (iv) All courses in the College of Architecture and Art (with some exceptions).

### Science Electives (2 hours)

Every student must take a total of at least 2 additional credit hours in the science area to make up a total of 10 credits. Additional courses may be other courses on this list, courses that have PHYS 141, PHYS 142, or any of these courses as prerequisites, or other courses from a list maintained by the Department of Computer Science of certain additional courses in Engineering and quantitative social sciences.

<table>
<thead>
<tr>
<th>Course #</th>
<th>Hours</th>
<th>Course Title</th>
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<th>Hours</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 112</td>
<td>5</td>
<td>General College Chemistry I</td>
<td>BIOS 100</td>
<td>5</td>
<td>Biology of Cells and Organisms</td>
</tr>
<tr>
<td>or CHEM 116</td>
<td></td>
<td>Honors General College Chemistry I</td>
<td>BIOS 101</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>CHEM 114</td>
<td>5</td>
<td>General College Chemistry II</td>
<td>EAES 101</td>
<td>4</td>
<td>Global Environmental Change</td>
</tr>
<tr>
<td>or CHEM 118</td>
<td></td>
<td>Honors General College Chemistry II</td>
<td>EAES 111</td>
<td>4</td>
<td>Earth, Energy and the Environment</td>
</tr>
</tbody>
</table>

### Free Electives (6 credit hours)