BS in Computer Science with Human-Centered Computing Concentration

To earn a Bachelor of Science in Computer Science, with an HCC Concentration, students need to complete university, college, and department degree requirements. The Department of Computer Science degree requirements are outlined below. Students should consult the College of Engineering section for additional degree requirements and college academic policies.

### Degree Requirements

#### Summary of Requirements

| Required Outside the College of Engineering | 57 |
| Required in the College of Engineering | 54 |
| Technical Electives | 3 |
| Required Mathematics Courses | 6 |
| Free Electives | 8 |
| **Total Hours** | **128** |

#### Required Outside College of Engineering

**Required Courses**

- ENGL 160 Academic Writing I: Writing in Academic and Public Contexts 3
- ENGL 161 Academic Writing II: Writing for Inquiry and Research 3

**General Education Core**

Select one course from each of the following categories: a

- Exploring World Cultures 15
- Understanding the Creative Arts
- Understanding the Past
- Understanding the Individual and Society
- Understanding US Society

**Humanities/Social Sciences/Art Electives**

At least three of the selected courses must be from the following: (Please note: In order to enroll in some of these courses, students will have to go to the respective departments to get an override on prerequisites and/or enrollment restrictions.) b

- PSCH 100 Introduction to Psychology
- PSCH 242 Introduction to Research in Psychology (prerequisite PSCH 100)
- ART 150 Introduction to New Media Arts
- ART 454 3D Space I: Modeling
- ART 456 Embedded Media: Physical Computing
- DES 452 Informational Aesthetics I
- COMM 316 Writing for the Electronic Media
- COMM 430 Media, Information and Society
- COMM 460 Visual Communication
- MATH 180 Calculus I c 4

#### Required in the College of Engineering

**Required Courses**

- ENGR 100 Engineering Orientation a 1
- CS 111 Program Design I 3
- CS 141 Program Design II 3
- CS 151 Mathematical Foundations of Computing 3
- CS 211 Programming Practicum 2
- CS 251 Data Structures 4
- CS 261 Machine Organization 3
- CS 301 Languages and Automata 3
- CS 341 Programming Language Design and Implementation 3
- CS 342 Software Design 3
- CS 361 Computer Systems 3
- CS 362 Computer Design 3
- CS 377 Communication and Ethical Issues in Computing 3
- CS 385 Operating Systems Concepts and Design 3
- CS 401 Computer Algorithms I 3
- CS 422 User Interface Design and Programming 3
- CS 499 Professional Development Seminar 0

Select at least three of the following: 9

- CS 415 Computer Vision I
- or ECE 415 Image Analysis and Computer Vision I
- CS 411 Artificial Intelligence I
- CS 421 Natural Language Processing
- CS 424 Visualization and Visual Analytics
- CS 425 Computer Graphics I
- CS 426 Video Game Design and Development

**Total Hours** 54

- a ENGR 100 carries one equivalent semester hour, but awards no credit toward graduation.
Technical Electives

Courses
Select one of the following:  3
- CS 398 Undergraduate Design/Research
- CS 411 Artificial Intelligence I a
- CS 412 Introduction to Machine Learning
- CS 415 Computer Vision I a
  or ECE 415 Image Analysis and Computer Vision I
- CS 421 Natural Language Processing a
- CS 424 Visualization and Visual Analytics a
- CS 425 Computer Graphics I a
- CS 426 Video Game Design and Development a
- CS 440 Software Engineering I
- CS 441 Engineering Distributed Objects For Cloud Computing
- CS 450 Introduction to Networking
- CS 455 Design and Implementation of Network Protocols
- CS 466 Advanced Computer Architecture
- CS 469 Computer Systems Design
- CS 473 Compiler Design
- CS 474 Object-Oriented Languages and Environments
- CS 476 Programming Language Design
- CS 477 Public Policy, Legal, and Ethical Issues in Computing, Privacy, and Security
- CS 478 Software Development for Mobile Platforms
- CS 480 Database Systems
- CS 485 Networked Operating Systems Programming
- CS 486 Secure Operating System Design and Implementation
- CS 487 Building Secure Computer Systems
- ECE 452 Robotics: Algorithms and Control
- CS 489 Human Augmentics
- MCS 320 Introduction to Symbolic Computation
- MCS 471 Numerical Analysis
- MCS 481 Computational Geometry
- STAT 471 Linear and Non-Linear Programming
- MATH 419 Models in Applied Mathematics

Total Hours  3

a May be used as either a selective course (above) or a technical elective but not both.

Required Mathematics Courses

Required Courses
- IE 342 Probability and Statistics for Engineers a  3
  or STAT 381 Applied Statistical Methods I
- MATH 310 Applied Linear Algebra  3
  or MATH 320 Linear Algebra I

Total Hours  6

a Students who take IE 342 will not receive credit for either STAT 381 or STAT 401.

Lab Science Sequence and Science Electives

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.

Required Courses
Select two hours from the following: a  2
- BIOS 100 Biology of Cells and Organisms
- BIOS 101 Biology of Populations and Communities
- CHEM 122 General Chemistry I Lecture
  & CHEM 123nd General Chemistry Laboratory I b
- CHEM 124 General Chemistry II Lecture
  & CHEM 125nd General Chemistry Laboratory II b
- CHEM 116 Honors and Majors General and Analytical Chemistry I
- CHEM 118 Honors and Majors General and Analytical Chemistry II
- EAES 101 Global Environmental Change
- EAES 111 Earth, Energy, and the Environment

Total Hours  2

a These courses are approved for the Analyzing the Natural World General Education category.

b General Education credit is only given for successful completion of both CHEM 122 and CHEM 123 or both CHEM 124 and CHEM 125.

Free Electives

Electives
Select 8 hours of Free Electives  8

Total Hours  8

Sample Course Schedule

Course Title Hours
Freshman Year
First Semester
- MATH 180 Calculus I  4
- CS 111 Program Design I  3
- ENGL 160 Academic Writing I: Writing in Academic and Public Contexts  3

General Education Core course  3
General Education Core course  3
- ENGR 100 Engineering Orientation a  1

Hours  16

Second Semester
- MATH 181 Calculus II  4
- ENGL 161 Academic Writing II: Writing for Inquiry and Research  3
- CS 141 Program Design II  3
- CS 151 Mathematical Foundations of Computing  3

General Education Core course  3

Hours  16
### Sophomore Year

#### First Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 210</td>
<td>Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 141</td>
<td>General Physics I (Mechanics)</td>
<td>4</td>
</tr>
<tr>
<td>CS 211</td>
<td>Programming Practicum</td>
<td>2</td>
</tr>
<tr>
<td>CS 251</td>
<td>Data Structures</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>General Education Core course</td>
<td></td>
</tr>
</tbody>
</table>

| Hours       | 16                                 |

#### Second Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 261</td>
<td>Machine Organization</td>
<td>3</td>
</tr>
<tr>
<td>CS 301</td>
<td>Languages and Automata</td>
<td>3</td>
</tr>
<tr>
<td>MATH 220</td>
<td>Introduction to Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>General Physics II (Electricity and Magnetism)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Humanities/Social Sciences/Art Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

| Hours       | 16                                 |

### Junior Year

#### First Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 361</td>
<td>Computer Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 362</td>
<td>Computer Design</td>
<td>3</td>
</tr>
<tr>
<td>CS 342</td>
<td>Software Design</td>
<td>3</td>
</tr>
<tr>
<td>IE 342</td>
<td>Probability and Statistics for Engineers or Applied Statistical Methods I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Science Elective</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Humanities/Social Science/Art Elective</td>
<td>3-4</td>
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</tbody>
</table>

| Hours       | 17-18                              |

#### Second Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 341</td>
<td>Programming Language Design and Implementation</td>
<td>3</td>
</tr>
<tr>
<td>CS 385</td>
<td>Operating Systems Concepts and Design</td>
<td>3</td>
</tr>
<tr>
<td>CS 422</td>
<td>User Interface Design and Programming</td>
<td>3</td>
</tr>
<tr>
<td>MATH 310 or MATH 320</td>
<td>Applied Linear Algebra or Linear Algebra I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Humanities/Social Science/Art Elective</td>
<td>3-4</td>
</tr>
</tbody>
</table>

| Hours       | 15-16                              |

### Senior Year

#### First Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 377</td>
<td>Communication and Ethical Issues in Computing</td>
<td>3</td>
</tr>
<tr>
<td>CS 401</td>
<td>Computer Algorithms I</td>
<td>3</td>
</tr>
<tr>
<td>CS 424</td>
<td>Visualization and Visual Analytics</td>
<td>3</td>
</tr>
<tr>
<td>CS 425</td>
<td>Computer Graphics I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>General Education Core course</td>
<td></td>
</tr>
</tbody>
</table>

| Hours       | 15                                 |

#### Second Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 426</td>
<td>Video Game Design and Development</td>
<td>3</td>
</tr>
<tr>
<td>CS 499</td>
<td>Professional Development Seminar</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Technical Elective</td>
<td></td>
</tr>
</tbody>
</table>

| Hours       | 3                                  |

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**Humanities/Social Science/Art Elective**

3-4

**Free Elective**

3

**Free Elective**

3

**Hours**

15-16

**Total Hours**

128

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**Notes:**

- ENGR 100 carries one equivalent hour but awards no credit towards graduation.
- One of the following electives: PSCH 100, PSCH 242; ART 150, ART 454, ART 456; DES 452; COMM 430, COMM 316, COMM 460.