

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

Code	Title	Hours
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

Code	Title	Hours
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		15
Exploring World Cultures		
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		12
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	Information 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
MATH 181	Calculus II ^c	4
MATH 210	Calculus III ^c	3
MATH 220	Introduction to Differential Equations	3
PHYS 141	General Physics I (Mechanics) ^c	4
PHYS 142	General Physics II (Electricity and Magnetism) ^c	4
Science Elective (see below) ^d		2
Total Hours		57

- a *Students should consult the [General Education](#) section of the catalog for a list of approved courses in this category.*
- b *These electives must be selected from a list of approved courses provided by the CS department.*
- c *This course is approved for the Analyzing the Natural World General Education category.*
- d *All courses on the science elective list below are approved for the Analyzing the Natural World General Education category.*

Required in the College of Engineering

Code	Title	Hours
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	Systems Programming	3
CS 362	Computer Design	3
CS 377	Communication and Ethical Issues in Computing	3
CS 401	Computer Algorithms I	3
CS 422	User Interface Design and Programming	3
CS 461	Operating Systems Design and Implementation	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

Code	Title	Hours
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 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	
CS 489	Human Augmentics	
ECE 452	Robotics: Algorithms and Control	
ECE 469	Hardware Description Language Based Digital and Computer System Design	
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

Code	Title	Hours
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.

Code	Title	Hours
Required Courses		
Select two hours from the following: ^a		2
BIOS 110	Biology of Cells and Organisms	
BIOS 120	Biology of Populations and Communities	
CHEM 122	Matter and Energy	
& CHEM 123	and Foundations of Chemical Inquiry I ^b	
CHEM 124	Chemical Dynamics	
& CHEM 125	and Foundations of Chemical Inquiry 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

Code	Title	Hours
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		
MATH 210	Calculus III	3
PHYS 141	General Physics I (Mechanics)	4
CS 211	Programming Practicum	2
CS 251	Data Structures	4
General Education Core course		3
Hours		16

Second Semester		
CS 261	Machine Organization	3
CS 301	Languages and Automata	3
MATH 220	Introduction to Differential Equations	3
PHYS 142	General Physics II (Electricity and Magnetism)	4
Humanities/Social Sciences/Art Elective		3
Hours		16

Junior Year

First Semester		
CS 361	Systems Programming	3
CS 362	Computer Design	3
CS 342	Software Design	3
IE 342 or STAT 381	Probability and Statistics for Engineers or Applied Statistical Methods I	3
Science Elective		2
Humanities/Social Science/Art Elective ^b		3-4
Hours		17-18

Second Semester		
CS 341	Programming Language Design and Implementation	3
CS 422	User Interface Design and Programming	3
CS 461	Operating Systems Design and Implementation	3
MATH 310 or MATH 320	Applied Linear Algebra or Linear Algebra I	3
Humanities/Social Science/Art Elective ^b		3-4
Hours		15-16

Senior Year

First Semester		
CS 377	Communication and Ethical Issues in Computing	3
CS 401	Computer Algorithms I	3
CS 424	Visualization and Visual Analytics	3

CS 425	Computer Graphics I	3
Free Elective		2
General Education Core course		3
Hours		17
Second Semester		
CS 426	Video Game Design and Development	3
CS 499	Professional Development Seminar	0
Technical Elective		3
Humanities/Social Science/Art Elective ^b		3-4
Free Elective		3
Free Elective		3
Hours		15-16
Total Hours		128

a *ENGR 100 carries one equivalent hour but awards no credit towards graduation.*

b *One of the following electives: PSCH 100, PSCH 242; ART 150, ART 454, ART 456; DES 452; COMM 430, COMM 316, COMM 460.*