

MAJOR IN COMPUTER SCIENCE, HUMAN-CENTERED COMPUTING CONCENTRATION

Human-centered computing (HCC) focuses on developing tools that improve the relationship between people and technology so that people can concentrate on the problem rather than the technology. The ultimate goal of HCC is to make the computer invisible.

Human-centered computing involves designing, developing, and deploying human-centric computer systems. In this concentration students will learn techniques for human-computer interaction using gestures, mobile devices, large surfaces, and virtual environments. Students will also learn how to design and conduct human-subject experiments and understand the role of HCC in developing human-centric artificial intelligence systems. The concentration provides rich interdisciplinary training in computer vision, machine learning, design and psychology.

Learning Objectives

Upon successfully completing this program, students will be able to:

1. Design interactive systems using state-of-the-art HCC techniques.
2. Design and conduct human-subject experiments.
3. Build complex 3D worlds for user interaction (e.g., virtual and augmented reality).
4. Confidently pursue graduate studies or professional employment in HCC and computer science.

Potential Occupations

In addition to the career opportunities open to all computer science graduates, the HCC concentration opens career paths that include: user experience designer, virtual and augmented reality developer, and human-centric developer for intelligent systems.

Requirements Effective Fall 2025

A minimum grade of C (2.000) is required in CO 150 and in all CS, DSCI, MATH, STAT, and Technical Elective courses which are required for graduation.

Freshman

		AUCC	Credits
CO 150	College Composition (GT-CO2)	1A	3
CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)	3B	3
MATH 156 or 160 ¹	Mathematics for Computational Science I (GT-MA1) Calculus for Physical Scientists I (GT-MA1)	1B	4
Select one group from the following: ²			5-9
Group A:			
CS 150A or 150B	Culture and Coding: Java (GT-AH3) Culture and Coding: Python (GT-AH3)	3B	
CS 162 or 164	CS1—Introduction to Java Programming CS1—Computational Thinking with Java		
Group B:			
CS 152	Python for STEM		
CS 162 or 164	CS1—Introduction to Java Programming CS1—Computational Thinking with Java		
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)		3B	
Group C:			
CS 163	CS1—No Prior Programming Experience		
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)		3B	
Select at least two courses totaling a minimum of 7 credits from the following (one course must be or include the sequenced laboratory):			3A
AA 100 & AA 101	Introduction to Astronomy (GT-SC2)	3A	
ANTH 120 & ANTH 121	Human Origins and Variation (GT-SC2)	3A	
BZ 110 & BZ 111	Principles of Animal Biology (GT-SC2)	3A	
BZ 120	Principles of Plant Biology (GT-SC1)	3A	

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CHEM 107 & CHEM 108	Fundamentals of Chemistry (GT-SC2)	3A	
CHEM 111 & CHEM 112	General Chemistry I (GT-SC2)	3A	
GEOL 120 & GEOL 121	Geology and Society (GT-SC2)	3A	
GEOL 122 & GEOL 121	Geoscience--Climate and Environmental Change (GT-SC2)	3A	
GEOL 124 & GEOL 121	Earth Resources and Sustainability (GT-SC2)	3A	
GEOL 150	Dynamic Earth (GT-SC2)	3A	
HONR 292A	Honors Seminar: Knowing in the Sciences	3A	
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	
LIFE 103	Biology of Organisms-Animals and Plants (GT-SC1)	3A	
LIFE 201A	Introductory Genetics: Applied/Population/Conservation/Ecological (GT-SC2)	3A	
LIFE 201B	Introductory Genetics: Molecular/Immunological/Developmental (GT-SC2)	3A	
LIFE 220/LAND 220	Fundamentals of Ecology (GT-SC2)	3A	
NR 150	Oceanography (GT-SC2)	3A	
PH 121	General Physics I (GT-SC1)	3A	
PH 122	General Physics II (GT-SC1)	3A	
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc) Electives ³		1C	3 1-5
Total Credits			30
Sophomore			
CS 165	CS2--Data Structures		4
CS 220	Discrete Structures and the Applications		4
Select one group from the following:			4-5
Group A			
CS 214	Software Development		
CT 301	C++ Fundamentals		
Group B			
CS 253	Software Development with C++		
Select one course from the following:			4
CS 250	Computer Systems Foundations		
CS 270	Computer Organization		
Select one course from the following:			3-4
DSCI 369	Linear Algebra for Data Science		
MATH 369	Linear Algebra I		
Select one course from the following:			1-3
STAT 301	Introduction to Applied Statistical Methods		
STAT 302A	Statistics Supplement: General Applications		
STAT 307	Introduction to Biostatistics		
STAT 315	Intro to Theory and Practice of Statistics		
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		3C	3
Electives			0-4
Total Credits			30

Junior

CS 314	Software Engineering	4A,4B	3
CS 320	Algorithms–Theory and Practice		3
CS 345	Machine Learning Foundations and Practice		3
CS 370	Operating Systems		3
Select one course from the following:			3-4
CS 310H/IDEA 310H	Design Thinking Toolbox: Mixed Reality Design		
CS 312	Modern Web Applications		
Any CS course numbered 400- or above excluding CS 480-499			
Technical Electives (see list below)			6
Advanced Writing (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)		2	3
Electives			5-6
Total Credits			30

Senior

Select one course from the following:			4
CS 464	Principles of Human-Computer Interaction	4C	
CS 465	Multimodal Interaction for 3D User Interfaces	4C	
Select two courses from the following:			8
CS 410	Introduction to Computer Graphics		
CS 440	Introduction to Artificial Intelligence		
CS 445	Introduction to Machine Learning		
CS 462	Engaging in Virtual Worlds		
CS course numbered 300- or above, excluding 380-399 and 480-499			3-4
Technical Electives (see list below)			3
Electives ⁴			11-12
Total Credits			30
Program Total Credits:			120

¹ MATH 156 recommended for computer science majors who do not already have MATH 160 credit.

² Recommended sequence for most incoming students is Group A: CS 150B to CS 164.

³ CS 192 or other seminar course is a recommended elective for incoming, first semester, students.

⁴ Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be Upper-Division (300- to 400-level).

Technical Electives

Select a minimum of 9 credits, of which 6 credits must be upper-division.

Code	Title	Credits
IDEA 210	Introduction to Design Thinking (GT-AH1)	3
IDEA 300-379		
IDEA 400-479		
PSY 252	Mind, Brain, and Behavior	3
PSY 253	Human Factors and Engineering Psychology	3

PSY 452	Cognitive Psychology	3
PSY 454	Biological Psychology	3
PSY 456	Sensation and Perception	3
PSY 458	Cognitive Neuroscience	3
STAT 300-379 excluding STAT 301, STAT 302A, STAT 307, STAT 315		
STAT 400-479		

Major Completion Map**Distinctive Requirements for Degree Program:**

To prepare for first semester: The curriculum for the Computer Science major assumes students enter college prepared to take calculus. Entering students who are not prepared to take calculus will need to fulfill pre-calculus requirements in the first semester. Those pre-calculus requirements are listed as benchmark courses in Freshman Semester 1 below. All students must maintain a C (2.000) or better in CO 150 and in all CS, DSCI, MATH, and STAT and Technical Elective courses which are required for graduation.⁴

Freshman

Semester 1	Critical	Recommended	AUCC	Credits
CO 150 College Composition (GT-CO2)	X		1A	3
First course from Group A, B, or C (See options in Concentration Requirements Tab)	X		3B	3
Department Approved Science (See list on Concentration Requirements Tab)	X		3A	3
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)	X		1C	3
Electives		X		1-5
MATH 117, MATH 118, and MATH 124 must be completed by the end of Semester 1, if necessary.	X			

Total Credits**13-17**

Semester 2	Critical	Recommended	AUCC	Credits
CS 201/PHIL 201 Ethical Computing Systems (GT-AH3)	X		3B	3
MATH 156 or 160 Mathematics for Computational Science I (GT-MA1) Calculus for Physical Scientists I (GT-MA1)	X		1B	4
Remaining course(s) from Group A, B, or C (See options in Concentration Requirements Tab)	X			2-6
Department Approved Science w/lab (See list on Concentration Requirements Tab)	X		3A	4
MATH 125 and MATH 126 must be completed by the end of Semester 2, if necessary.	X			

Total Credits**13-17****Sophomore**

Semester 3	Critical	Recommended	AUCC	Credits
CS 165 CS2--Data Structures	X			4
CS 220 Discrete Structures and the Applications	X			4
Select one course from the following:	X			1-3
STAT 301 Introduction to Applied Statistical Methods				
STAT 302A Statistics Supplement: General Applications				
STAT 307 Introduction to Biostatistics				
STAT 315 Intro to Theory and Practice of Statistics				
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		X	3C	3
Elective		X		0-2
MATH 156 or MATH 160 must be completed by the end of Semester 3.	X			

Total Credits**14**

Semester 4	Critical	Recommended	AUCC	Credits
Select one group from the following:	X			4-5
Group A				
CS 214 Software Development				
CT 301 C++ Fundamentals				
Group B				
CS 253 Software Development with C++				
Select one course from the following:	X			4
CS 250 Computer Systems Foundations				
CS 270 Computer Organization				
Select one course from the following:	X			3-4
DSCI 369 Linear Algebra for Data Science				
MATH 369 Linear Algebra I				
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		X	3D	3

Elective			X		0-2
CS 220 and (CS 250 or CS 270) and (DSCI 369 or MATH 369) must be completed by the end of Semester 4.		X			

Total Credits					16
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Junior

Semester 5		Critical	Recommended	AUCC	Credits
CS 320	Algorithms--Theory and Practice	X			3
CS 370	Operating Systems	X			3
Select one course from the following:		X			3-4
CS 310H/	Design Thinking Toolbox: Mixed Reality Design				
IDEA 310H					
CS 312	Modern Web Applications				
Any CS course numbered 400- or above excluding CS 480-499					
Technical Elective (See List on Concentration Requirements tab.)		X			3
Advanced Writing (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)			X	2	3
CS 253 must be completed by the end of Semester 5.		X			

Total Credits					15-16
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Semester 6		Critical	Recommended	AUCC	Credits
CS 314	Software Engineering	X		4A,4B	3
CS 345	Machine Learning Foundations and Practice	X			3
Technical Elective Course (See List on Concentration Requirements tab.)		X			3
Electives			X		5-6
CS 320 and CS 370 must be completed by the end of Semester 6.		X			

Total Credits					14-15
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Senior

Semester 7		Critical	Recommended	AUCC	Credits
Pick Two CS Depth Courses (See List on Concentration Requirements tab.)		X			8
Technical Electives (See List on Concentration Requirements tab.)		X			3
Elective			X		3

Total Credits					14
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Semester 8		Critical	Recommended	AUCC	Credits
Select one course from the following:		X			4
CS 464	Principles of Human-Computer Interaction			4C	
CS 465	Multimodal Interaction for 3D User Interfaces			4C	
CS*** Course numbered 300- or above. excluding 380-399		X			3-4
Electives			X		8-9
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.		X			

Total Credits					16
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Program Total Credits:					120
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