Computer Science Major Checksheet - Modified March 2022	Computer science is about creating innovative solutions to complex, real-world problems. Students in this major study step-by-step computational methods for solving problems by encoding, storing, tracking and transforming information. Computer science is much broader than just programming. It is informed by the theory and architecture of computing devices, and the tools and practices used to design and implement software.

Status	AUCC (All-University Core Curriculum)	Course	Credits
	1A) Intermediate Writing	CO 150 or HONR 193	3
	1B) Quantitative Reasoning	MATH 156 or MATH 160	4
	2) Advanced Writing		3
	3A) Biological and Physical Science w/ lab (from CS list)		4
	3A) Biological and Physical Science (from CS list)		3
	3B) Arts & Humanities	CS 201/PHIL 201	3
	3B) Arts & Humanities		3
	3C) Social & Behavioral Sciences	(Rec. PSY 100 , esp. for HCC)	3
	3D) Historical Perspective		3
	3E) Diversity & Global Awareness		3
		Total	32

Status	CS Common Core	Course Description	Credits
	MATH 369 or DSCI 369	Linear Algebra	4
	STAT 301, 307, or 315 (†)	Statistics	3
	CS 163 or CS 164	CS1 - Java	4
	CS 165	CS2 - Java	4
	CS 220	Discrete Structures	4
	CS 253	Problem Solving with C++	4
	CS 270	Computer Organization	4
	CS 314	Software Engineering	3
	CS 320	Algorithms: Theory & Practice	3
	CS 370	Operating Systems	3
		Total	36

Computer Science Major includes above AUCC courses and CS common core, plus a concentration as defined on the following sheet.

† STAT 302A can also be used if a student already has credit for STAT 201 or 204

120 total credits required

42 upper division credits required

CS Major and Concentration Choices	Description
CS General Concentration	The general Computer Science major provides students with a broad background in the field of computer science as well as optionally gives students the opportunity to complement their computer science major with a minor in a field of their choosing. Students will find that there is a great need for knowledge in the combination of computer science with other disciplines.
Artificial Intelligence and Machine Learning Concentration	Artificial intelligence (AI) and machine learning (ML) are about creating intelligent systems – systems that perceive and respond to the world around them. AI and ML systems are everywhere, in our cars and smartphones, and businesses of all sizes are investing in these areas. The AI/ML concentration combines a rigorous computer science degree with coursework in AI, ML, and big data. This concentration also provides you the necessary foundational coursework and skills in math, statistics, and data science.
Computing Systems Concentration	Computer systems are integrated devices that input, output, process, and store data and information. Computing systems encompass a wide range, from simple sensors and hardware components to phones, laptops, desktops, and entire data centers. Computer systems specialists are challenged to provide ever increasing levels of performance from these systems. The computer systems concentration provides you the necessary tools to solve important and demanding systems problems at scale. You will learn how to design and assess computer systems from a holistic perspective that encompasses distributed and parallel algorithms, big data, systems software, networking, compiler design, and artificial intelligence/machine learning.
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 you will learn techniques for human-computer interaction using gestures, mobile devices, large surfaces, and virtual environments. You 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.
Networks and Security Concentration	Networks connect computers and other devices so they can share information. The networks and security concentration involves designing, building, and maintaining networks and protecting them from cyberattacks. Network and security technology is vitally important to almost every modern field of human endeavor including biology, physics, agriculture, medicine, defense, and more. There is explosive demand for professionals who can understand the underlying principles of networks and security, incorporate them into products and practices, and provide defensive capabilities against cyber threats.
Software Engineering Concentration	Software engineering involves designing, implementing, and maintaining computer programs. Developing modern software systems requires more than programming skills and core computer science concepts. It requires software engineering skills, which are in high demand in the software industry. The software engineering concentration focuses on the concepts, techniques, and tools necessary for software analysis, design, testing, maintenance, and teamwork. Your courses will include hands-on work with the software engineering tools used in industry.

Computer Science Major Concentration Requirements
Modified March 2022

Status	Computer Science Major - General	Credits
	△Select 2 CS course numbered 300- or above	6-8
	1)	
	2)	
	△Select 3 CS courses numbered 400- or above	12
	1)	
	2)	
	3)	
	Choose Option #1 or #2	
	Option #1:	
	△CS course numbered 400- or above	4
	1)	
	✛Select 6 credits of Technical Electives (At least 3 credits must be upper division)	6-8
	Option #2:	
	Minor or Second Major (at least 12 credits must be unique from CS major requirements. See CS Advisor to discuss further)	~21
	Total	>=28

Status	Computer Science Major, Computing Systems Concentration	Credits
	△Select 2 CS Courses numbered 300- or above	6-8
	1)	
	2)	
	Select 3 Systems Courses from: CS 435, 453, 455, 457, 475	16
	1)	
	2)	
	3)	
	Select 1 system elective: CS 440, 445, 422	4
	1)	
	✛Select 3 credits of Technical Elective	3-4
	Total	29-32

Status	Computer Science Major, Software Engineering Concentration	Credits
	CS 356	3
	CS 414	4
	CS 415	4
	△Select 1 Software Engineering Upper Division Elective course: CS 312, CS 345, CS 400- or above	3-4
	1)	
	Select 2 Breadth courses: CS 430, 435, 440, 453, 455, 462, 464	8
	1)	
	2)	
	CIS 320	3
	CIS 360	3
	Total	28-29

Status	Computer Science Major, Artificial Intelligence and Machine Learning Concentration	Credits
	MATH 161 or 256	4
	CS 345	3
	△Select 1 CS Course numbered 300- or above	3-4
	1)	
	Select 2 capstone courses: from CS 425, 440, 445	8
	1)	
	2)	
	Select 1 CS course from: CS 425, 430, 435, 440, 445, 455, 462, 464, 475	4
	1)	
	Select 1 CS systems course from: CS 435, 455, 475	4
	1)	
	✛Select 6 credits AI/ML List Technical Electives (At least 3 credits must be upper division)	6-8
	Total	32-35

Status	Computer Science Major, Human-Centered Computing Concentration	Credits
	CS 345	3
	△Select 1 course from: CS 310H/IDEA 310H; CS 312, CS 400- or above	3-4
	1)	
	△Select 1 CS Course numbered 300- or above	3-4
	1)	
	CS 464	4
	Select 2 CS Depth Courses from: CS 440, 445, 462	8
	1)	
	2)	
	✛Select 9 credits of HCC Technical Electives (at least 6 credits must be upper division)	9
	Total	30-32

Status	Computer Science Major, Networks and Security Concentration	Credits
	CS 356	3
	△Select 1 CS Course numbered 300- or above	3-4
	1)	
	CS 456	4
	CS 457	4
	Select 1 course from: CS 430, CS 458	4
	1)	
	△Select 1 CS course numbered 400- or above	4
	1)	
	✛Select 6 credits Technical Electives (At least 3 credits must be upper division)	6-8
	Total	28-31

Computer Science Major, Education Concentration (Starting Fall 22)
See CS Advisor to discuss if interested.

△CS course numbered 300- or above; or 400- or above excludes CS 380-399 and CS 480-499 unless explicitly stated

✛Double counting of technical elective credits with other required courses not allowed (for CS Common Core or AUCC); including MATH 369, DSCI 369, or IDEA 210

CS Upper Division Courses		
Course Number	Course Name	Semester Offered
CS 310H	Design Thinking Toolbox: Mixed Reality Design	Every other F, even years
CS 312	Modern Web Applications	S
◇ CS 314	Software Engineering	F / S
◇ CS 320	Algorithms: Theory & Practice	F / S
CS 345	Machine Learning Foundations	F / S
CS 356	System Security	F / S
◇ CS 370	Operating Systems	F / S / SS
CS 414	Object Oriented Design	F
CS 415	Software testing	S
CS 420	Introduction to Analysis of Algorithms	*S
CS 422	Automata, Logic, and Computation	*F
CS 425	Introduction to Bioinformatics Algorithms	S
CS 430	Database Systems	S / SS
CS 435	Introduction to Big Data	F
CS 440	Introduction to Artificial Intelligence	F
CS 445	Introduction to Machine Learning	S
CS 453	Introduction to Compiler Construction	*S
CS 455	Introduction to Distributed Systems	S
CS 456	Modern CyberSecurity	F
CS 457	Computer Networks and the Internet	F
CS 458	Blockchain Principles and Applications	S
CS 462	Engaging in Virtual Worlds	F
CS 464	Principles of Human Centered Computing	S
CS 475	Parallel Programming	*F
CS 48x	Special offerings that often can sub for CS upper division requirement, example CS 481A4 Digital Forensics	*F, *S
◇ CS 486	Practicum (Internship)	F / S / SS
◇ CS 498	Research	F / S / SS

* Semester offered, if offered
# Applicable to Pre-Fall 2020, and Fall 2020 curriculum also
† Double counting of technical elective credits with other required courses not allowed; including MATH 369 and DSCI 369 or IDEA 210
§ Excludes 380-399 and 480-499 courses unless explicitly stated
Δ Excludes STAT 301, 302A, 307, 315, 380-399 and 480-499
◇ Cannot be used to fulfill concentration (CS Upper Division: CS 300- or above) or tech elective credits

Technical Electives for General Concentration, Networks & Security Concentration, Computing Systems Concentration (#, †)

†,§, Δ Any CS, CT, DSCI, IDEA, MATH, or STAT course numbered 300- or above (§, Δ)
BZ 350, BZ 360
CIS 320, CIS 350, CIS 360, CIS 413, CIS 455
ECE 452
ENGR 422
JTC 372, 472
MATH 161, 256
MGT 330, MGT 340, MGT 420
NR 322
PHIL 410, 411, 415
PSY 252, PSY 352, PSY 452, PSY 454, PSY 456, PSY 458

Technical Electives for AI & ML Concentration

DSCI 320, DSCI 335, DSCI 336, DSCI 473, DSCI 475
MATH 261, MATH 301, MATH 331, MATH 360, MATH 430/ECE 430, MATH 450
STAT 341, STAT 342, STAT 400, STAT 420

Technical Electives for HCC Concentration

Any STAT course numbered 300- or above, excluding 301, 302A, 307, 315, 380-399 and 480-499
† IDEA 210, Any IDEA course numbered 300- or above, excluding 380-399 and 480-499
PSY 252, PSY 253, PSY 452, PSY 454, PSY 456, PSY 458

Biological & Physical Sciences (#)

AA 100 & AA 101
ANTH 120 & ANTH 121
BZ 110 & BZ 111; BZ 120
(CHEM 107 & CHEM 108) or (CHEM 111 & CHEM 112)
GEOL 120 & GEOL 121; GEOL 122 & GEOL 121; GEOLL 124 & GEOL 121; GEOL 150
HONR 292A
LIFE 102, LIFE 103, LIFE 201A; LIFE 201B; LIFE 220/LAND 220
NR 150
(PH 121 or PH 141); (PH 122 or PH 142)

Computer Science Course Prerequisites
For Computer Science Students
Fall 2021 start

Legend

- Solid: required prereq
- Dashed: choose one prereq

* **Colors of arrows are only for ease of reading**

- CS Core
- AUCC 3B
- AUCC 1B

Pick one of these courses as a prereq option
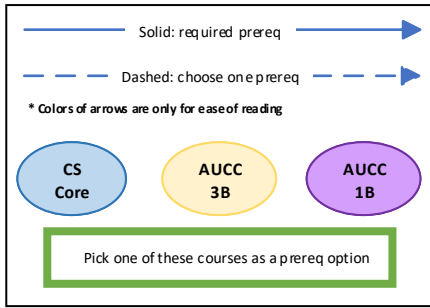
Important Notes:
- **This is a prereq chart ONLY – this does not indicate major requirements.**
- Check requirements for out of department courses. They are not listed.
- You must have completed 30+ credits before taking any 2++ CS courses.
- You must have completed 30+ credits to take the CS 152→CS 162 progression.
- All courses require a C or better as prerequisite.
  - MATH 124 must be completed with a B or better.

CS 150B — Culture and Coding (AUCC 3B)

CS 152 — Intro to Programing: Python

CS 164 — Computer Science 1

CS 162 — Intro to Java Programming

STAT 301

STAT 302A

ECE/STAT 303

STAT 307

STAT 315

MATH 160

MATH 155

MATH 156

MATH 124

CS 270 — Computer Organization

CS 165 — CS 2: Data Structures

CS 220 — Discrete Structures and their Applications

CS 345 — Machine Learning Foundations and Practice

DSCI 369

MATH 369

CS 370 — Operating Systems

CS 356 — System Security

CS 253 — Software Development with C++

CS 320 — Algorithms Theory and Practice

CS 457 — Computer Networks and the Internet

CS 456 — Modern CyberSecurity

CS 310H — Mixed Reality Design

CS 314 — Software Engineering

CS 312 — Modern Web Applications

CS 420 — Intro to Analysis of Algorithms

CS 425 — Intro to Bioinformatics

CS 440 — Artificial Intelligence

CS 422 — Automata, Logic, and Commputation

CS 445 — Intro to Machine Learning

CS 455 — Intro to Distributed Systems

CS 435 — Intro to Big Data

CS 430 — Database Systems

CS 453 — Intro to Compiler Construction

CS 475 — Parallel Programming

CS 414 — Object-Oriented Design

CS 415 — Software Testing

CS 458 — Blockchain Principles

CS 464 — Intro to Human-Computer Interaction

CS 462 — Engaging in Virtual Worlds