University of Colorado Denver

Department of Computer Science and Engineering

Computer Science Bachelor of Science Handbook
Rules of the program leading to a Bachelor of Science in Computer Science

These degree requirements are in effect starting from 2021-2022 Admission.

The CSE department offers a Bachelor of Science in Computer Science, a Bachelor of Arts in Computer Science, a Minor in Computer Science, an undergraduate certificate in Cybersecurity and Secure Computing, and a Masters in Computer Science as well as two doctorate degrees and graduate certificates in "Software Engineering" and "Cybersecurity and Defense". The department also offers a CS Scholars dual BS/MS program for students in the BSCS program. Curriculum for CSE undergraduate programs can be found in this handbook beginning on page 4.

Applying to the Department of Computer Science and Engineering:

If students are new and interested in our bachelor's degree program, students must apply directly through the CU Denver Office of Admissions, http://www.ucdenver.edu/admissions .

BSCS
Students currently admitted to the College of Engineering, Design and Computing and would like to change majors to computer science will need to complete a Change of Major Form and submit it to the Computer Science and Engineering (CSE) Department in the Lawrence Street Center, Ste 800. Change of major form must be completed prior to registering for 3000-level courses.

Students who would like to transfer from another school or college will need to complete an IUT form. The IUT from should be submitted to the Computer Science and Engineering (CSE) Department in the Lawrence Street Center, Ste 800. IUT form must be completed prior to registering for 3000-level courses.

Minor
Students declaring a Minor in Computer Science must complete a Minor Declaration Form. The minor declaration form must be completed prior to registering for 3000-level courses.

Undergraduate Certificate
Students applying to complete the undergraduate certificate in cybersecurity and secure computing should fill out a certificate declaration form located in the Computer Science and Engineering (CSE) Department in the Lawrence Street Center, Ste 800. The student's application is subject to the approval of the Computer Science and Engineering department chair.

Refer to this handbook for complete advising and degree requirements.

Faculty Advisor

Students are responsible for completing all requirements towards graduation. Regular visits with a CSE advisor are expected and will help to verify satisfactory progress towards a degree in computer science. Students must meet with their advisor every semester or attend an advising workshop in order to register for the upcoming semester. It is recommended that students get to know CSE faculty well enough that they can serve as references in the future for employment or when applying for an internship or graduate school.

Students should schedule an appointment with their advisor by contacting the CSE department at 303-315-1408.

30-Hour Senior Checkout

After completing approximately 100 semester hours toward the BSCS degree, students must request a 30-hour senior checkout. Students should have no more than 3 semesters before graduating when requesting the 30-hour senior checkout. Students should complete the 30 hour checkout form prior to the appointment and plan out their remaining semesters to fulfill graduation requirements.

Graduation Plan

Prior to the last semester before graduation students must meet with their advisor and complete a graduation plan. This identifies the courses that need to be satisfactorily completed during the final semester of your program.

Students need to apply for graduation on their portal before census date the semester they will be graduating.

CU Denver students taking courses elsewhere

Students must take all your courses at CU Denver once you're admitted to the College of Engineering, Design and Computing. Students must obtain prior departmental approval through an approved petition for any exception regarding courses outside CU Denver. If approved, the credit hours earned will be included in your program via your requests for formal transfer advising.

- **Formal transfer advising** can be done only after the CU Denver Office of Admissions has issued an Applicant Transfer Credit Evaluation and students have been admitted to the College of Engineering, Design and Computing.
- If students wish to receive **transfer advising for credits related to the computer science curriculum**, call the CSE office to make an appointment with an advisor. Please bring the course syllabus and course descriptions for evaluation.
- If students are pre-engineering intending to transfer and major in CS, students must meet with an advisor in the Student Academic Success Office. All your non-CS transfer credits for science, general education, and Math will be evaluated in that office.

Petitions

The CS program requirement are enforced. Any deviations from the published curriculum must be approved via an approved CS department petition. Petitions must be submitted to the CSE department office. Please note that it takes about two weeks to process any petition and may take longer at the beginning or end of the semester.

CS Technical Electives

Students must take five courses (15 semester hours) chosen from any CSCI 3000 or 4000-level courses that are not part of the required bachelor of science in computer science (BSCS) curriculum. Additional courses from the breadth areas will count toward satisfying the five CS elective courses. *Students may also enroll for graduate courses from a list of approved courses with approval of their advisor.*

Required cumulative GPA

To remain in good standing with the College of Engineering, Design and Computing you must maintain at least 2.0 cumulative GPA for all courses and a minimum 2.0 GPA for all courses that are counted as part of the study program.

Laptop Requirement

Undergraduate students in the CSE Department are required to have a personal laptop with the following specifications before starting 3000 level classes.

	Minimum	Recommended
Operating System	Windows 10 1809+	Windows 10 1809+
CPU	Intel Core i5 dual-core 1.6 GHz or Intel Core i5 quad core 1.4 GHz	Intel Core i5/i7 2.2 GHz or faster
RAM	8GB (upgradable to 16GB)	12 to 16GB
Disk Space	256GB Hard Disk Drive (HDD) with 100GB free Upgradable to 512GB SSD	512GB Solid State Drive (SSD) with 100GB free
Hard Disk Speed		Install Windows and Applications on a SSD
Graphic Card	Integrated Graphics Card	Dedicated Graphics Card
Display	1280x720 Resolution	1920x1024 Resolution
Network Connectivity	Ethernet +Wifi	Ethernet +Wifi

Dual BS / MS Program: CS Scholars

Current full-time Bachelor of Science in Computer Science Students wishing to continue to a Master of Science in Computer Science have an additional option to combine both efforts.

Admission to the Computer Science Scholars program allows the student to take up to four 5000-level MS courses counting as both electives for their BS and towards their MS degree. Students must apply for the CS Scholars Program before their last year of courses to receive dual credit for 5000 level courses:

- If accepted, students remain in an Undergraduate status until receiving the BS degree, then move into a Graduate status with an intent of completing the MS in Computer Science within a year.

- Students can take up to four graduate courses while in an Undergraduate status.

- Students must meet with a CS Graduate advisor within a semester of acceptance into the CS Scholars Program.

In order to apply for the CS Scholars Program, students must:

a) Complete at least 60 credits toward the BS degree;

b) Complete the following three courses: CSCI: 3412: Algorithms, CSCI 3453: Operating Systems Concepts, and CSCI 3287: Database Systems;

c) Have a minimum cumulative GPA of 3.3 or a 3.5 GPA in CS major coursework.

Students must complete a Computer Science Scholars Program Application, which can be picked up from the Computer Science Department, Lawrence 800. Students should meet with their advisor to discuss possible courses and submit the application. Students may submit an application in the semester that they will meet the requirements, but final decisions will be pending final semester grades.

The Computer Science Graduate committee will review the application, and notify the students of their decision. All graduate program rules apply to graduate courses, including a requirement for a B- or better to count toward the MS degree.

University and college requirements

These rules of the undergraduate program of the CSE department are complementary to the policies, regulations and requirements of the University of Colorado Denver and the College of Engineering, Design and Computing. The relevant information about these rules and policies is published annually in the University of Colorado Denver catalog, which is available on the CU Denver website www.ucdenver.edu.

Curriculum

All newly admitted students must follow the curriculum that is in place at the time they are admitted into the computer science program. Under some conditions, it is possible to switch to the requirements of a new curriculum if the revision(s) occurred after your admittance.

Prerequisite requirements are strictly enforced for all computer science (CSCI) courses.

Curriculum for B.S. in Computer Science (CSCI-BS)

The required minimum number of hours is 128. The student must satisfactorily complete all the course work in the curriculum shown below, satisfy all the graduation requirements, and maintain at least a 2.0 grade-point average in all courses. The courses below are listed together with their prerequisites. Prerequisite courses must be completed with a letter grade of C- or better.

REQUIRED COMPUTER SCIENCE & SYSTEMS CORE COURSES (46 SEMESTER HOURS)

COMPUTER SCIENCE COURSES

CSCI 1410-3 Fundamentals of Computing	Pre: Freshman status, Co: CSCI 1411
CSCI 1411-1 Fundamentals of Computing Lab	Pre: Freshman status, Co: CSCI 1410
CSCI 2312-3 Object Oriented Programming	Pre: CSCI 1410 & 1411
CSCI 2421-3 Data Structures & Program Design	Pre: CSCI 1410, 1411 Co: 2312
CSCI 2511-3 Discrete Structures	Pre: MATH 1401
CSCI 3287-3 Database Systems	Pre: ENGL 1020, CSCI 2312 & 2421
CSCI 3412-3 Algorithms	Pre: CSCI 2312, 2421 & 2511
CSCI 3508-3 Introduction to Software Engineering	Pre:CSCI 3412
CSCI 4034-3 Theoretical Foundations of Computer Science	Pre:CSCI 3412

COMPUTER SCIENCE SYSTEMS COURSES

CSCI 1510-3 Logic Design	Pre: Freshman status: MATH 1120 or 1130 or equivalent
CSCI 2525-3 Assembly Language & Computer Organization	Pre: CSCI 1410, 1411 & 1510
CSCI 3415-3 Principles of Programming Languages	Pre: CSCI 2312, 2421 & 2525
CSCI 3453-3 Operating Systems Concepts	Pre: CSCI 3412 & 2525
CSCI 3761: Introduction to Computer Networks	Pre: CSCI 2312 & 2421
CSCI 4551: Parallel & Distributed Systems	Pre: MATH 3195, CSCI 3415 & 3453
CSCI 4591-3 Computer Architecture	Pre: CSCI 2525

CS BREADTH COURSES (21 SEMESTER HOURS)

CAPSTONE PROJECT (take two)

CSCI 4738: Senior Design Project I	Pre: CSCI 3287, 3415, 3453 & 3508
CSCI 4739: Senior Design Project II	Pre: CSCI 4738

DATA SCIENCE (take one)

CSCI 4455: Data Mining	Pre: MATH 3195, CSCI 3287, 3412, & 3560
CSCI 4580: Data Science	Pre: MATH 3195, CSCI 3287 & 3412
CSCI 4930: Machine Learning	Pre: MATH 3195, CSCI 3412 & 3560

SCIENTIFIC COMPUTING (take one)

CSCI 3560: Probability & Computing	Pre: MATH 2411 & CSCI 2511
CSCI 4560: Numerical Analysis I	Pre: MATH 2411, 3191 or 3195
CSCI 4110: Applied Number Theory	Pre: CSCI 2511 or MATH 3000

SECURE COMPUTING (take one)

CSCI 3741: Principles of Cyber Security	Pre: CSCI 3761
CSCI 5741: Cybersecurity Programming	Pre: CSCI 3415
CSCI 5742: Cyber and Infrastructure Defense	Pre: CSCI 3761

SYSTEM SOFTWARE (take two)

CSCI 3511: Hardware/Software Interface	Pre: CSCI 2525
CSCI 4287: Embedded Systems Programming	Pre: CSCI 3453
CSCI 4565: Introduction to Computer Graphics	Pre: CSCI 3412 & MATH 3191 or 3195

COMPUTER SCIENCE TECHNICAL ELECTIVES (15 SEMESTER HOURS)

Students must take five courses (15 semester hours) chosen from any CSCI 3000 or 4000-level courses that are not part of the required bachelor of science in computer science (BSCS) curriculum.

MATHEMATICS (12 SEMESTER HOURS)

MATH 1401-4 Calculus I	Pre: (MATH 1120 or 1130) and placement exam
MATH 2411-4 Calculus II	Pre: MATH 1401
MATH 3195-4 Linear Algebra and Differential Equations	Pre: MATH 2411

SCIENCE (10 SEMESTER HOURS)

Students must choose between 3 science tracks: (1) BIOL 2051 & 2071, 2061 & 2081, (2) CHEM 2031 & 2038, 2061 & 2068 or (3) PHYS 2311 & 2321, PHYS 2331 & 2341. Students who choose Biology or Chemistry: additional credits needed to reach 10 may come from an advanced science course beyond CHEM 2061 or BIOL 2061, an additional CS elective, or Math (beyond CALC II), or one of the engineering disciplines (not GEN-Ed. courses).

UNDERGRADUATE CORE CURRICULUM IN ENGINEERING: SOCIAL SCIENCES, HUMANITIES, ARTS, ETC. (24 SEMESTER HOURS)

The undergraduate core curriculum for engineering includes: social sciences 3 hrs, humanities 3 hrs, arts 3 hrs, international perspectives 3 hrs, cultural diversity 3 hrs, behavioral sciences 3 hrs, and intellectual competencies (English 1020 and English 2030), for a total of 24 hours. Refer to the current UC-Denver catalog for available courses and their prerequisite requirements.

Sample Academic Plan consistent with the prerequisite requirements
FIRST YEAR

fall semester		spring semester	
class	hrs	class	hrs
CSCI 1410 FUNDAMENTALS OF	3	**CSCI 2312** OBJECT ORIENTED	3
CSCI 1411 FUNDAMENTALS OF	1	**CSCI 2421** DATA STRUCTURES & PROGRAM	3
CSCI 1510 LOGIC DESIGN	3	**MATH 2411** CALCULUS II	4
MATH 1401 CALCULUS I	4	**ENGL 2030** CORE COMPOSITION II	3
ENGL 1020 CORE COMPOSITION I	3	**CORE CURRICULUM ELECTIVE**	3
CORE CURRICULUM ELECTIVE	3		
TOTAL	17	**TOTAL**	16

SECOND YEAR

fall semester		spring semester	
class	hrs	class	hrs
CSCI 2525 ASSEMBLY LANGUAGE &	3	**CSCI 3287** DATABASE SYSTEMS	3
CSCI 2511 DISCRETE STRUCTURES	3	**CSCI 3412** ALGORITHMS	3
SCIENCE CHOICE	3-4	**CSCI 3761:** INTRO TO COMP NETWORKS	3
SCIENCE CHOICE LAB	1	**CS ELECTIVE**	3
CORE CURRICULUM ELECTIVE	3	**SCIENCE** CHOICE	3-4
CORE CURRICULUM ELECTIVE	3	**SCIENCE** CHOICE LAB	1
TOTAL	16-17	**TOTAL**	16-17

THIRD YEAR

fall semester		spring semester	
class	hrs	class	hrs
CSCI 3415 PRIN PROGRAMMING LANG	3	**CSCI 3508** SOFTWARE ENGINEERING	3
CSCI 3453 OPERATING SYSTEMS	3	**CS BREADTH**	3

CS BREADTH	3		CS ELECTIVE	3
CS BREADTH	3		**MATH 3195** LINEAR ALGEBRA/DIFF EQU	4
CS ELECTIVE	3		**CORE CURRICULUM ELECTIVE**	3
TOTAL	15		**TOTAL**	16

FOURTH YEAR

fall semester			spring semester	
class	hrs		class	hrs
CSCI 4034 THEORETICAL FOUND OF CS	3		**CSCI 4591** COMPUTER ARCHITECTURE	3
CS BREADTH: SENIOR DESIGN 1	3		**CSCI 4739** SENIOR DESIGN PROJECT II	3
CSCI 4551 PARALLEL & DIST SYSTEMS	3		**CS BREADTH**	3
CS BREADTH	3		**CS ELECTIVE**	3
CS ELECTIVE	3		**CORE CURRICULUM ELECTIVE**	3
TOTAL	15		**TOTAL**	15

CORE CURRICULUM ELECTIVE is to be selected from the undergraduate General Education core.

ENGL 1020 and ENGL 2030 are the only approved composition courses for the UC Denver Core Curriculum. ENGL 1020 should be taken the first semester a student is enrolled at UC Denver.

Curriculum for a Minor in Computer Science (CSCI-MIN)

The minor in computer science, consists of 22 credits of CS and 4 credits of CALC I, is designed to provide undergraduate students the fundamentals of computer science and programming, skills that can enhance most any career field. Any undergraduate student enrolled in a University of Colorado Denver degree program with a major other than computer science may earn a minor in computer science.

Requirements**:**
The following classes need to be taken with a grade of C- or better:

- MATH 1401 Calculus and Analytical Geometry I (4 credits)
- CSCI 1410 Fundamentals of Computing (3 credits)
- CSCI 1411 Fundamentals of Computing Laboratory (1 credit)
- CSCI 2312 Intermediate Programming (3 credits)
- CSCI 2421 Data Structures and Program Design (3 credits)
- Four additional CSCI courses, one of which may be at the 2000 level. All others must be 3000-level or higher.

All CSCI courses must be taught by the faculty of the Department of Computer Science and Engineering at CU Denver. Introductory transfer credits (at 1000- and 2000-level) with the approval of a computer science advisor will be allowed.

Once declared, students are required to meet with a computer science advisor to complete the Computer Science Minor Coursework form.

The minor requires at least a 2.0 overall GPA for all computer science courses

Curriculum for an Undergraduate Certificate in Cybersecurity and Secure Computing (CSSC)

The goal of the undergraduate certificate of Cyber Security & Secure Computing program is to reduce vulnerability in the national information infrastructure by promoting higher education and research to help prepare cyber defense professionals for careers in both the public and the private sector. The curriculum of this certificate has been created to meet all criteria of NICE (National Initiative for Cybersecurity Education) undergraduate level of certification.

Current students in good standing in BS-CS, BA-CS, and those completing their Minor in CS are eligible. Applications from other majors at CU Denver or non-degree will be evaluated based on their current transcript. The student's application is subject to the approval of the Chair of Computer Science and Engineering.

Students planning to pursue a Cyber Security & Secure Computing Certificate in Computer Science and Engineering should apply as early as possible to facilitate course planning, and in no case later than census date of the semester prior to graduation with a bachelor's degree.

[Pathways to complete the CSSC certificate](#) can be found on the CSE website.

Certificate Objectives
This certificate program focuses on both the technical and analytical aspects of advanced cyber security and defense.

Program Objectives
- Master the fundamental concepts of cyber security principles and techniques.
- Learn about potentials for cyber security threats and attacks.
- Master cyber-defense tools, methods, and components to secure systems.
- Learn how to take appropriate measures should a system compromise occur.
- Learn principles and practices for secure computing

Learning Outcomes
- Be able to describe and apply the fundamental concepts of cyber security principles and techniques.
- Be able to analyze potential cyber threats and attacks.
- Be able to use cyber defense tools, methods, and components to properly secure systems.
- Be able to effectively and quickly evaluate and mitigate if systems are threatened or compromised. Certificate Eligibility

Requirements
The following classes must be completed with a grade of C- or better:
- CSCI 3761 Introduction to Computer Networks
- CSCI 3453 Operating Systems Concepts
- CSCI 4034 Theoretical Foundations of Computer Science
- CSCI 4741 Principles of Cybersecurity
- CSCI 4743 Cyber and Infrastructure Defense

The cybersecurity and secure computing certificate requires a minimum cumulative GPA of 2.0.