

# COMPUTER SCIENCE - MASTER OF SCIENCE (MS) ONLINE

The Master of Science in Computer Science (MS-CS) program hosted online through the Coursera platform offers stackable graduate-level courses, a graduate certificate, and a fully accredited master's degree in computer science. MS-CS on Coursera students earn the same credentials as on-campus students. There are no online or Coursera designations on official CU transcripts or diplomas.

The Department of Computer Science has embraced this degree as an ideal opportunity to expand access to the excellent graduate-level courses offered by the department's highly reputed faculty beyond CU Boulder's physical campus. The goal of the MS-CS on Coursera program is to produce creative, workforce-ready graduates equipped with versatile specialized skills and technical leadership.

Students pursuing this degree will also have access to a wide range of courses taught as part of other CU Boulder degrees offered on the Coursera platform, including topics such as data science, engineering management, and electrical engineering

## Program Policies

This CU Boulder on Coursera program does not align with standard campus policies. Please refer to the Online Programs (<https://catalog.colorado.edu/online/>) section of the catalog for more information.

## Requirements

### Admission

The MS-CS on Coursera uses *performance-based admissions*, which means students earn program admission simply by performing well in a three-course pathway. Students enroll in and complete their preferred three-course pathway with a grade of B or better in each of the three courses to be admitted to the program. Pathway courses are a required part of the curriculum, which means students make direct progress toward the degree while they work toward program admission.

There is no traditional application for admission to the degree. The University of Colorado Boulder never asks for transcripts, previous test scores (like GRE or TOEFL), application essays, letters of recommendation, or application fees. A prior degree is not required for admission. Because this program is fully online, students do not need to complete a background check to enroll.

A student must complete four required protocols to earn admission to the MS-CS on Coursera:

1. Earn at least a grade of B in each for-credit course within one of the following pathway specializations:
  - *Foundations of Data Structures and Algorithms* –  
CSCA 5414 Dynamic Programming, Greedy Algorithms  
CSCA 5424 Approximation Algorithms and Linear Programming  
CSCA 5454 Advanced Data Structures, RSA and Quantum Algorithms
  - *Network Systems: Principles and Practices (Linux and Cloud Networking)* –  
CSCA 5063 Network Systems Foundation

CSCA 5073 Network Principles in Practice: Linux Networking  
CSCA 5083 Network Principles in Practice: Cloud Networking

2. Have a cumulative GPA of at least 3.00 for all for-credit courses taken to date.
3. Declare intent to seek the degree via the enrollment form. This can be done before, during or after completing any work in a pathway specialization.

Upon completion of these three steps, the student is admitted to the MS-CS on Coursera. Students may successfully complete a designated pathway specialization and declare intent at any point in their academic journey. Completion of a pathway specialization is not required for students to begin earning academic credit, only to earn the degree.

Non-degree-seeking students may also enroll in for-credit courses. All courses attempted and/or completed for credit will appear on official CU Boulder transcripts (unless dropped by the drop deadline) and will count toward the cumulative GPA.

### Prerequisite Knowledge

There are no course prerequisites or corequisites for MS-CS courses on Coursera. Nevertheless, it is important that students are prepared for individual courses. Course descriptions will advise students of assumed incoming knowledge, and students are strongly encouraged to take course sequences in the order they are presented on the Coursera platform.

*Students are also encouraged to take a non-credit version in some form before moving to the for-credit version to test whether they can succeed, especially if they are unsure whether they have the background knowledge required for a course*

### Program Requirements

The MS-CS on Coursera is a non-thesis degree program that requires 30 credit hours of graduate-level coursework. This includes 15 credits of breadth coursework and a choice of 15 credits hours of elective coursework from the options listed below. Students must complete 5 elective specializations or a combination of 4 complete elective specializations and three 1-credit elective courses totaling 15 credits.

Up to 6 graduate-level credit hours of courses offered by other CU degrees on Coursera may be applied as elective credits toward the MS-CS on Coursera degree. All courses must be graduate level, offered through Coursera, and meet all applicable academic standards. This includes all courses offered by the ME-EM (<https://catalog.colorado.edu/graduate/colleges-schools/engineering-applied-science/programs-study/engineering-management/engineering-management-master-engineering-me-online/>), MS-DS (<https://catalog.colorado.edu/graduate/colleges-schools/interdisciplinary-programs/data-science-master-science-ms-online/>), and MS-EE (<https://catalog.colorado.edu/graduate/colleges-schools/engineering-applied-science/programs-study/electrical-engineering/electrical-engineering-master-science-online-msee/>) programs on Coursera that do not start with a "CSCA" prefix, with the exception of the following courses. Credit from these courses cannot be applied toward MS-CS on Coursera requirements:

- DTSA 5302 Cybersecurity for Data Science
- DTSA 5303 Ethical Issues in Data Science
- DTSA 5501 Algorithms for Searching, Sorting, and Indexing
- DTSA 5502 Trees and Graphs: Basics

- DTSA 5707/CSCA 5812 Deep Learning Applications for Computer Vision

Courses may not be double-counted toward two credentials of the same level. This means students can apply credit from a particular course toward one graduate certificate and one graduate degree, but they cannot apply credit from a particular course toward two graduate certificates or two graduate degrees. CU certificates on Coursera are automatically conferred once all requirements are met.

The MS-CS on Coursera requires a minimum cumulative GPA of 3.00 and a grade of B or better in each breadth class (including the two required pathway specializations and the three additional required breadth specializations). Courses in which grades below C (2.0) are received may not be applied toward degree requirements.

Code	Title	Credit Hours
<b>Breadth Courses</b>		
Foundations of Data Structures and Algorithms (Pathway Specialization)		3
CSCA 5414	Dynamic Programming, Greedy Algorithms	
CSCA 5424	Approximation Algorithms and Linear Programming	
CSCA 5454	Advanced Data Structures, RSA and Quantum Algorithms	
Network Systems: Principles and Practice (Linux and Cloud Networking) (Pathway Specialization)		3
CSCA 5063	Network Systems Foundation	
CSCA 5073	Network Principles in Practice: Linux Networking	
CSCA 5083	Network Principles in Practice: Cloud Networking	
Machine Learning		3
CSCA 5622	Introduction to Machine Learning - Supervised Learning	
CSCA 5632	Unsupervised Algorithms in Machine Learning	
CSCA 5642	Introduction to Deep Learning	
Computing, Ethics, and Society		3
CSCA 5214	Computing, Ethics, and Society Foundations	
CSCA 5224	Ethical Issues in AI and Professional Ethics	
CSCA 5234	Ethical Issues in Computing Applications	
Foundations of Autonomous Systems		3
CSCA 5834	Modeling of Autonomous Systems	
CSCA 5844	Requirement Specifications for Autonomous Systems	
CSCA 5854	Verification and Synthesis of Autonomous Systems	
<b>Elective Courses</b>		
Take five specializations or combination of four complete specializations and three 1-credit courses totaling 15 credits		15
Software Architecture for Big Data		
CSCA 5008	Fundamentals of Software Architecture for Big Data	

CSCA 5018	Software Architecture Patterns for Big Data
CSCA 5028	Applications of Software Architecture for Big Data
Data Mining Foundations and Practice	
CSCA 5502	Data Mining Pipeline
CSCA 5512	Data Mining Methods
CSCA 5522	Data Mining Project
Natural Language Processing: Deep Learning Meets Linguistics	
CSCA 5832	Fundamentals of Natural Language Processing
CSCA 5842	Deep Learning for Natural Language Processing
CSCA 5852	Model and Error Analysis for Natural Language Processing
Human-Computer Interaction	
CSCA 5859	Ideating and Prototyping Interfaces
CSCA 5869	User Interface Testing and Usability
CSCA 5879	Emerging Topics in HCI: Designing for VR, AR, AI
Generative AI	
CSCA 5112	Introduction to Generative AI
CSCA 5122	Modern Applications of Generative AI
CSCA 5132	Advances in Generative AI
Internet Policy: Principles and Problems	
CSCA 5433	When to Regulate? The Digital Divide and Net Neutrality
CSCA 5443	Protecting Individual Privacy on the Internet
CSCA 5453	Cybersecurity in Crisis: Information and Internet Security
Object Oriented Analysis and Design	
CSCA 5428	Object-Oriented Analysis and Design: Foundations and Concepts
CSCA 5438	Object-Oriented Analysis and Design: Patterns and Principles
CSCA 5448	Object-Oriented Analysis and Design: Practice and Architecture
Introduction to Robotics with Webots	
CSCA 5312	Basic Robotic Behaviors and Odometry
CSCA 5332	Robotic Mapping and Trajectory Generation
CSCA 5342	Robotic Path Planning and Task Execution
Computer Visualization	
CSCA 5222	Introduction to Computer Vision
CSCA 5322	Deep Learning for Computer Vision
CSCA 5422	Computer Vision for Generative AI
Stand-Alone Electives	
CSCA 5702	Fundamentals of Data Visualization
Special Topics	
CSCA 7000	Special Topics

**Total Credit Hours**

**30**

The Department of Computer Science will continue to roll out additional program curriculum. Currently, the department is developing courses covering topics such as data center scale computing, high-performance and parallel computing, theory of computation, robotics, object-oriented analysis and design, network systems, and big data challenges and NoSQL solutions.

Faculty members who develop courses and/or serve as instructor of record for graduate level courses will have approved Graduate Faculty Appointments.

## Time Limit

Courses used toward the MS-CS on Coursera degree must have been completed within eight years of the degree conferral date. Courses taken more than eight years prior to graduation will appear on the transcript and be calculated in the cumulative GPA but may not be used toward the degree. Students may continue to pursue the degree even after eight years, but they must accrue 30 credits within an eight-year window in order to earn the degree.

The eight-year restriction is applied to courses on a rolling basis and is determined by the date that credit was awarded in the course.

## Learning Outcomes

By the completion of the program, students will be able to:

- Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
- Design, implement and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
- Communicate effectively in a variety of professional contexts.
- Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
- Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
- Apply computer science theory and software development fundamentals to produce computing-based solutions.