DATA SCIENCE - MASTER OF SCIENCE (MS) ONLINE

The online Master of Science degree in Data Science (MSDS) on Coursera is an interdisciplinary degree program offered through the University of Colorado Boulder and hosted online through Coursera's learning platform. With performance-based admissions and no application process, the MSDS is ideal for individuals with a broad range of undergraduate education and/or professional experience in computer science, information science, mathematics and statistics.

The MSDS on Coursera provides learners with a strong foundation in acquiring, cleaning and managing data. Students will learn to analyze large datasets using data mining and machine learning techniques. Students will also design, conduct, and run statistical experiments and models; draw rational conclusions from data using probability theory and statistics; and more.

Graduates of the online Master of Science degree in Data Science on Coursera program will be well-prepared to apply data science skills to a specific domain area. Graduates will also be able to clearly communicate the results of data science analysis to a non-technical audience; structure effective meetings and projects using collaboration skills; and act ethically in the role of professional data scientist.

Topic Areas

General Data Science

Data science is a multidisciplinary field that uses scientific methods, processes, applications, algorithms and systems to extract knowledge and insights from structured and unstructured data.

Applied Mathematics

The Department of Applied Mathematics in the College of Arts and Sciences offers a range of courses and research opportunities in many areas, including computational mathematics, mathematical biology, nonlinear phenomena, physical applied mathematics, and probability and statistics.

Computer Science

Computer science is an exciting and challenging field that has an impact on many parts of our lives. Computer scientists craft the technologies that enable the digital devices we use every day. They develop the large-scale software that powers business and industry, advance the computational techniques and write the software that supports scientists in their study of the world around us. Many new applications of computing technology remain to be discovered. Computing will be at the heart of future revolutions in business, science and society. Students who study computer science will be at the forefront of these important advances.

Information Science

Information science considers the relationships between people, places and technology and the information those interactions yield. The internet is a broad example of a socio-technical system that is comprised of hardware and software, but in daily life is better understood as a constantly changing social infrastructure upon which complex forms of human-human and human-information interaction rest. Scholars and students of information science develop new methods to study these socio-technical phenomena and translate those findings to the design and development of useful and meaningful technology.

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 Requirements

Students are automatically admitted to the degree program after meeting all admission requirements below.#All admitted students receive an official offer letter via email. See the program website for details.

- Pass one pathway with a pathway GPA of 3.0 or higher
- Earn a C or better in all pathway courses within their chosen pathway
- Earn an overall cumulative GPA of 3.0 or higher
- Indicate interest in degree admission (via the enrollment form)

Performance-Based Admission

To be admitted as a degree-seeking student, students must enroll in and complete a pathway with a 3.00 GPA or better. A pathway is a series of 3 one-credit courses with a focus on either statistics or computer science—students choose the pathway that is right for them. Pathway courses are an important part of the required curriculum, so students make direct progress toward their degree as they complete their pathway.

Prerequisite Knowledge

There are no formal prerequisites, but students should be knowledgeable in the following:

- Python
- R programming
- Calculus including derivatives and integrals
- Linear algebra including matrix multiplication, matrix inversion and solving linear systems using matrices

If students do not yet feel ready to complete their pathway courses, the program suggests reviewing courses on the Coursera platform. Students can enroll in a pathway as a non-credit learner, which gives them the option of previewing course content.Then, they can upgrade to the for-credit version and pay tuition when they are ready.

Required Courses and Credits

The MSDS is a non-thesis degree that requires 30 credit hours of coursework. Students must complete 21 credits of core coursework in statistics, computer science and general core concepts, as well as 9 credits of elective coursework. Students will also participate in practical, hands-on projects that utilize cloud-based programming environments and Jupyter Notebooks. Coursework includes access to real-world big data sets to prepare students for their future careers.

Learner Journeys

Students may complete courses in any order but are advised to follow one of the recommended learner journeys below.

Statistics Pathway

We recommend that students who are skilled in statistics complete their courses in the following order.

Code	Title	Credit Hours
Data Science Foundations: Statistical Inference Courses		**3**
DTSA 5001	Probability Theory: Foundation for Data Science	
DTSA 5002	Statistical Inference for Estimation in Data Science	
DTSA 5003	Hypothesis Testing for Data Science	
Vital Skills for Data Scientists Courses		**4**
DTSA 5301	Data Science as a Field	
DTSA 5302	Cybersecurity for Data Science	
DTSA 5303	Ethical Issues in Data Science	
DTSA 5304	Fundamentals of Data Visualization	
Core Courses		
Complete in any order		
Statistical Modeling for Data Science Courses		*3*
DTSA 5011	Modern Regression Analysis in R	
DTSA 5012	ANOVA and Experimental Design	
DTSA 5013	Generalized Linear Models and Nonparametric Regression	
Foundations of Data Structures & Algorithms Courses		*3*
DTSA 5501	Algorithms for Searching, Sorting, and Indexing	
DTSA 5502	Trees and Graphs: Basics	
DTSA 5503	Dynamic Programming, Greedy Algorithms	
Data Mining: Foundations & Practice		*3*
DTSA 5504	Data Mining Pipeline	
DTSA 5505	Data Mining Methods	
DTSA 5506	Data Mining Project	
Machine Learning Courses		*3*
DTSA 5509	Introduction to Machine Learning - Supervised Learning	
DTSA 5510	Unsupervised Algorithms in Machine Learning	
DTSA 5511	Introduction to Deep Learning	
Databases Courses		*2*
DTSA 5733	Relational Database Design	
DTSA 5734	The Structured Query Language (SQL)	
Data Science Elective Courses		**9**
Total Credit Hours		**30**

Computer Science Pathway

We recommend that students who are skilled in computer science complete their courses in the following order.

Code	Title	Credit Hours
Foundations of Data Structures and Algorithms Courses		**3**
DTSA 5501	Algorithms for Searching, Sorting, and Indexing	
DTSA 5502	Trees and Graphs: Basics	
DTSA 5503	Dynamic Programming, Greedy Algorithms	
Vital Skills for Data Scientists Courses		**4**
DTSA 5301	Data Science as a Field	
DTSA 5302	Cybersecurity for Data Science	
DTSA 5303	Ethical Issues in Data Science	
DTSA 5304	Fundamentals of Data Visualization	
Core Courses		
Complete in any order		
Data Science Foundations: Statistical Inference for Data Science Courses		*3*
DTSA 5001	Probability Theory: Foundation for Data Science	
DTSA 5002	Statistical Inference for Estimation in Data Science	
DTSA 5003	Hypothesis Testing for Data Science	
Statistical Modeling for Data Science Courses		*3*
DTSA 5011	Modern Regression Analysis in R	
DTSA 5012	ANOVA and Experimental Design	
DTSA 5013	Generalized Linear Models and Nonparametric Regression	
Data Mining Foundations and Practice Courses		*3*
DTSA 5504	Data Mining Pipeline	
DTSA 5505	Data Mining Methods	
DTSA 5506	Data Mining Project	
Machine Learning Courses		*3*
DTSA 5509	Introduction to Machine Learning - Supervised Learning	
DTSA 5510	Unsupervised Algorithms in Machine Learning	
DTSA 5511	Introduction to Deep Learning	
Databases Courses		*2*
DTSA 5733	Relational Database Design	
DTSA 5734	The Structured Query Language (SQL)	
Data Science Elective Courses		**9**
Total Credit Hours		**30**

Other Electives

Students may apply up to six graduate-level credit hours of select courses offered by the engineering management and computer science degrees on Coursera toward the MSDS on Coursera degree. All courses are graduate level, offered through Coursera, and meet all applicable academic standards. Students wishing to complete degrees in more than one program must complete all the requirements for both degrees with no shared or overlapping coursework. Select courses include:

Engineering Management Electives

Code	Title	Credit Hours
Project Management Courses		**3**
EMEA 5031	Project Management: Foundations and Initiation	
EMEA 5032	Project Planning and Execution	
EMEA 5033	Agile Project Management	
Product Development Courses		**3**
EMEA 5021	Product Cost and Investment Cash Flow Analysis	

EMEA 5022	Project Valuation and the Capital Budgeting Process	
EMEA 5023	Financial Forecasting and Reporting	
Total Credit Hours		**6**

Computer Science Electives
Courses from the MSCS on Coursera (https://www.colorado.edu/cs/academics/online-programs/mscs-coursera/) program that start with a "CSCA" prefix *except* the following courses, which *cannot* be applied toward MSDS degree requirements: CSCA 5214, CSCA 5224 and CSCA 5234.

Courses that begin with a "DTSA" prefix and courses that are cross-listed with a DTSA-prefixed course are not considered outside electives and do not count against the six-credit limit.

Prior Learning Credit
The online Master of Science in Data Science (hosted on Coursera) may accept credit for prior learning in limited instances for students formally admitted to the degree program. Please visit the MSDS on Coursera Student Handbook (https://www.colorado.edu/program/data-science/media/104/) for more information on eligibility, requirements, and credit approval.

Learning Outcomes

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

- Develop proficiency in foundational and cutting edge data science tools.
- Conduct exploratory data analyses and apply statistical and probabilistic modeling techniques to draw insights and support decision-making in data-driven projects.
- Develop and implement efficient algorithms for processing and analyzing large-scale data sets, selecting appropriate computational approaches for complex problems.
- Apply machine learning and data mining techniques to analyze large data sets, identify patterns, make predictions and derive actionable insights.
- Recognize and address ethical issues and data security concerns, employing best practices to manage sensitive data responsibly and maintain privacy.
- Clearly communicate complex analytical findings and insights to both technical and non-technical audiences, bridging the gap between data science outputs and actionable understanding.