DATA SCIENCE UNDERGRADUATE CERTIFICATE

Please click here (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/mathematical-statistical-sciences/) to see Mathematical and Statistical Sciences department information.

Introduction

Data scientists will have essential competencies in several areas related to analysis of data. In particular, a data scientist should: have strong programming ability in a language popular in data science (e.g., Python, R, Julia); be able to extract, manipulate, and visualize data; have an understanding of probability and statistics in order to quantify uncertainty; be able to build complex models for finding patterns and explaining data. This certificate should provide students with essential skills for introductory data science.

Program Delivery

- This is an on-campus program.

Declaring This Certificate

- See the program advisor for an application form.

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These program requirements are subject to periodic revision by the academic department, and the College of Liberal Arts and Sciences reserves the right to make exceptions and substitutions as judged necessary in individual cases. Therefore, the College strongly urges students to consult regularly with their Data Science advisor to confirm the best plans of study before finalizing them.

General Requirements

Students must satisfy all requirements as outlined below and by the department offering the certificate.

- Click here (http://catalog.ucdenver.edu/cu-denver/undergraduate/academic-policies-procedures/) for information about Academic Policies.

Program Requirements

1. Students must complete a minimum of 12 credit hours from approved courses.
2. Students must complete a minimum of six upper division (3000-level and above) credit hours.
3. Students must earn a minimum grade of C- (1.7) in all courses that apply to the certificate and must achieve a minimum cumulative certificate GPA of 2.25. All graded attempts in required and elective courses are calculated in the certificate GPA. Courses taken using P +/P/F or S/U grading cannot apply to certificate requirements.
4. Students must complete a minimum of nine upper division level credit hours with CU Denver faculty.

Code	Title	Hours
In order to ensure adequate programming skills for data science, students complete one of the following courses that develops strong programming skills in a programming language popular in data science (e.g., Python, R, Julia).		*3*
MATH 1376	Programming for Data Science	
CSCI 1410 & CSCI 1411	Fundamentals of Computing and Fundamentals of Computing Laboratory	
MATH 4650	Numerical Analysis I	
ISMG 4400	Programming Fundamentals with Python	
In order to ensure that students can accurately quantify the likelihood of various outcomes and quantify uncertainty related to estimation and prediction, students complete one of the following courses that covers basic probability and statistics.		*3*
MATH 2830	Introductory Statistics	
MATH 3382	Statistical Theory	
MATH 3800	Probability and Statistics for Engineers	
In order to ensure that students are able to comfortably work with and visualize data, students complete the following course, developing skills related to obtaining, manipulating, and visualizing data.		*3*
MATH 3376	Data Wrangling & Visualization	
In order to ensure that students are able to build reasonably complex models for explaining or identifying patterns in data, students take one of the following courses that largely focuses on describing the behavior of data (whether synthetic or observed) via tools like simulation, direct model building, association, or a complementary approach.		*3*
MATH 3301	Introduction to Optimization	
MATH 4387	Applied Regression Analysis	
MATH 4830	Applied Statistics	
Total Hours		**12**

To learn more about the Student Learning Outcomes for this program, please visit our website (https://clas.ucdenver.edu/mathematical-and-statistical-sciences/undergraduate-certificate-data-science-essentials/).