

DATA SCIENCES MINOR

Introduction

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 department information.

The demand for employees trained in data science has grown considerably in recent years. This minor will serve students by offering them specific training in data science.

Data science training should include components related to statistics, computing, and preferably, a specific field of application (e.g., business, biology, health, etc.). The minor is flexible in that it allows a student to get core training in data science programming and statistics, while allowing students to develop additional data science-related skills from other disciplines, or to focus on specific skills within data science.

These degree 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 major advisor and CLAS advisor to confirm the best plans of study before finalizing them.

Program Delivery

- This is an on-campus program.

Declaring This Minor

- Please see your CLAS advisor.
- Click here (<http://catalog.ucdenver.edu/cu-denver/undergraduate/records-registration/registration/declare-change-major-minor/>) to go to information about declaring a major/minor.

General Requirements

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

- CU Denver General Graduation Requirements (<http://catalog.ucdenver.edu/cu-denver/undergraduate/graduation/general-graduation-requirements/>)
- Click here (<http://catalog.ucdenver.edu/cu-denver/undergraduate/academic-policies-procedures/>) for information about Academic Policies

Program Requirements

- Students must complete a minimum of 18 credit hours, including a minimum of 12 MATH credit hours.
- Students must complete a minimum of 9 upper division (3000-level and above) MATH credit hours. Most upper-division courses have lower-division pre-requisites.
- Students must earn a minimum grade of C- (1.7) in all major courses taken at CU Denver and must achieve a minimum cumulative minor GPA of 2.0. All graded attempts in required and elective courses are calculated in the minor GPA. Students cannot complete minor or ancillary course requirements as pass/fail.

- Students must complete a minimum of 6 upper-division level MATH credit hours with CU Denver faculty.

Program Restrictions, Allowances and Recommendations

- Be aware of no co-credit policies. Here is a non-exclusive list of our most common no co-credit policies: no co-credit between:
 - MATH 3800 Probability and Statistics for Engineers and MATH 4810 Introduction to Probability,
 - MATH 3195 Linear Algebra and Differential Equations and MATH 3200 Elementary Differential Equations,
 - MATH 3191 Applied Linear Algebra and MATH 3195 Linear Algebra and Differential Equations,
 - MATH 4387 Applied Regression Analysis and MATH 4830 Applied Statistics.

Required Courses

Code	Title	Hours
<i>Take the following</i>		12
MATH 1376	Programming for Data Science	3
or ISMG 4400	Programming Fundamentals with Python	
MATH 2830	Introductory Statistics (or equivalent coursework with Undergraduate Committee approval)	3
or MATH 3382	Statistical Theory	
or MATH 3800	Probability and Statistics for Engineers	
MATH 3376	Data Wrangling & Visualization	3
MATH 4830	Applied Statistics	3
or MATH 4387	Applied Regression Analysis	

Elective Courses

Code	Title	Hours
<i>Take two courses from the following list of approved courses:</i>		6
CSCI 3287	Database System Concepts	3
CSCI 3963	Network Structures	3
CSCI 4455	Data Mining	3
CSCI 4580	Data Science	3
CSCI 4788	Bioinformatics	3
CSCI 4930	Machine Learning	3
CSCI 4931	Deep Learning	3
CSCI 4951	Big Data Systems	3
ECON 4030	Data Analysis with SAS	3
ECON 4811	Introduction to Econometrics	3
GEOG 4070	Remote Sensing II: Advanced Remote Sensing	3
GEOG 4080	Introduction to GIS	3
GEOG 4081	Cartography and Computer Mapping	3
GEOG 4085	GIS Applications for the Urban Environment	3
GEOG 4090	Environmental Modeling with Geographic Information Systems	3
GEOG 4091	Open Source Software for Geospatial Applications	3
GEOG 4092	GIS Programming and Automation	3
GEOG 4095	Deploying GIS Functionality on the Web	3
GEOG 4235	GIS Applications in the Health Sciences	3
ISMG 3000	Technology In Business	3

ISMG 3500	Enterprise Data and Content Management	3
MATH 3191	Applied Linear Algebra	3
MATH 3195	Linear Algebra and Differential Equations	4
MATH 3200	Elementary Differential Equations	3
MATH 3301	Introduction to Optimization	3
MATH 3302	Simulation in Operations Research	3
MATH 4337	Intro to Statistical and Machine Learning	3
MATH 4388	Machine Learning Methods	3
MATH 4390	Game Theory	3
MATH 4394	Experimental Designs	3
MATH 4408	Applied Graph Theory	3
MATH 4650	Numerical Analysis I	3
MATH 4660	Numerical Analysis II	3
MATH 4733	Partial Differential Equations	3
MATH 4791	Continuous Modeling	3
MATH 4792	Probabilistic Modeling	3
MATH 4793	Discrete Math Modeling	3
MATH 4794	Optimization Modeling	3
MATH 4810	Introduction to Probability	3
MATH 6330	Workshop in Statistical Consulting	3

To learn more about the Student Learning Outcomes for this program, please visit our website (<https://clas.ucdenver.edu/mathematical-and-statistical-sciences/undergraduate-goals-and-objectives/>).