

# 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 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 major, minor and CLAS advisors 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.

- 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 9 MATH credit hours.
- Students must complete a minimum of 12 upper-division (3000-level and above) credit hours, including a minimum of six upper-division MATH credits. Most upper-division courses have lower-division prerequisites.
- Students must earn a minimum grade of C- (1.7) in all courses that apply to the minor 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. Courses taken using pass/fail grading cannot apply to minor requirements.
- Students must complete a minimum of six 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 3810 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.

Code	Title	Hours
<b>Complete the following program requirements:</b>		<b>18</b>
<i>Complete the following required courses:</i>		<i>12</i>
MATH 1376	Programming for Data Science or CSCI 1410 Fundamentals of Computing & CSCI 1411 and Fundamentals of Computing Laboratory or ISMG 4400 Programming Fundamentals with Python	
MATH 2830	Introductory Statistics or MATH 3301 Statistical Theory or MATH 3800 Probability and Statistics for Engineers	
MATH 3376	Data Wrangling & Visualization	
MATH 4830	Applied Statistics or MATH 4387 Applied Regression Analysis	
<i>Complete six credits of electives from the following list of approved courses:</i>		<i>6</i>
MATH 3191	Applied Linear Algebra	
MATH 3195	Linear Algebra and Differential Equations	
MATH 3200	Elementary Differential Equations	
MATH 3301	Introduction to Optimization	
MATH 3302	Simulation in Operations Research	
MATH 3810	Introduction to Probability	
MATH 4337	Intro to Statistical and Machine Learning	
MATH 4388	Machine Learning Methods	
MATH 4390	Game Theory	
MATH 4394	Experimental Designs	
MATH 4408	Applied Graph Theory	
MATH 4650	Numerical Analysis I	
MATH 4660	Numerical Analysis II	
MATH 4733	Partial Differential Equations	
MATH 4791	Continuous Modeling	
MATH 4792	Probabilistic Modeling	
MATH 4793	Discrete Math Modeling	
MATH 4794	Optimization Modeling	
MATH 6330	Workshop in Statistical Consulting	
ECON 4030	Data Analysis with SAS	
ECON 4811	Introduction to Econometrics	
CHEM 4521	Physical Chemistry: Quantum and Spectroscopy	
CHEM 4580	Molecular Informatics	
CHEM 4640	Artificial Intelligence in Chemistry and Biochemistry	

CHEM 4845	Molecular Modeling and Drug Design
CSCI 3287	Database System Concepts
CSCI 3963	Network Structures
CSCI 4455	Data Mining
CSCI 4580	Data Science
CSCI 4788	Bioinformatics
CSCI 4930	Machine Learning
CSCI 4931	Deep Learning
CSCI 4951	Big Data Systems
GEOG 4070	Remote Sensing II: Advanced Remote Sensing
GEOG 4080	Introduction to GIS
GEOG 4081	Cartography and Computer Mapping
GEOG 4085	GIS Applications for the Urban Environment
GEOG 4090	Environmental Modeling with Geographic Information Systems
GEOG 4091	Open Source Software for Geospatial Applications
GEOG 4092	GIS Programming and Automation
GEOG 4095	Deploying GIS Functionality on the Web
GEOG 4235	GIS Applications in the Health Sciences
ISMG 3000	Technology In Business
ISMG 3500	Enterprise Data and Content Management

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/>).