

DATA SCIENCE (DS)

DS 110. Introduction to Data Science. 3 Credits.

This course introduces students to the foundations of data science and the impact that data science has had on modern society. Topics include the history of data science, descriptive statistics, data collection, an introduction to algorithms and algorithmic thinking, and the ethics of data science. No prior experience in statistics or programming is required.

Prerequisites: Take MA 107, MA 140, MA 141, or MA 151. Or placement level of 3.

Offered: Every year, Fall and Spring

DS 201. Introduction to Python. 1 Credit.

This course is designed to bridge the gap between CSC 106 or CSC 110 and the CAS Data Science major. CSC 106 and CSC 110 provide an important introduction to concepts in computer science and programming. For new programmers, it can be difficult to apply these concepts to a new language. As such, DS 201 applies these important concepts to the Python programming language. This is a seven-week course, offered in the first half of the spring semester.

Prerequisites: Take MA 107, MA 140, MA 141, or MA 151 or receive a Math Placement score of 3 or higher; And take CSC 105, CSC 106 or CSC 110.

Offered: Every year, Spring

DS 205. Data, Data Everywhere. 3 Credits.

This course is the first of two courses leading to the Google Data Analytics Professional Certificate. In this first course, the student will complete Google courses 1-4: learn about the data life cycle and data analysis process, practical data analytic skills, data preparation, data ethics and data privacy. The student will use spreadsheets and SQL. This is a seven-week course, offered in the first half of the semester.

Prerequisites: None

Offered: Every year, All

DS 206. Data Analytics Scenarios. 3 Credits.

This course is a continuation of DS 205. Upon successful completion of DS 206 the student will earn the Google Data Analytics Professional Certificate. In this second course, the student will complete Google courses 5-8: learn to organize and analyze data, visualize and present data findings, examine case study scenarios. The student will use Tableau and R. This is a seven-week course, offered in the second half of the semester.

Prerequisites: Take DS 205.

Offered: Every year, All

DS 230. Intermediate Special Topics. 3 Credits.

This course covers special topics in data science at the intermediate level.

Prerequisites: None

Offered: As needed, All

DS 299. Independent Study Data Science. 1-6 Credits.

This individual study in a specialized area is open to juniors and seniors by special arrangement with the department chairperson. This is a structured program of reading, problem solving and experiments established through conferences with a member of the data science faculty. Graded by examination or term project.

Prerequisites: None

Offered: As needed, All

DS 300. Tools for Data Science. 3 Credits.

The course is designed to give students the tools to hit the ground running in a data science/computation production environment. Topics include collaboration and version control systems (git), Linux (Unix) command line programming, cloud computing (AWS), SQL/databases, and more. Some programming experience is required.

Prerequisites: Take CSC 110 or CSC 106 or CIS 245 or BAN 300; Minimum grade C-.

Offered: As needed

DS 310. Algorithms for Data Science. 4 Credits.

Algorithms and computation are at the core of data science. This course introduces students to the underlying principles behind digital computation and algorithmic development for scientific purposes.

Students also learn foundational algorithms for four common tasks: solving linear systems, determining least squares solutions, implementing unconstrained optimization, and using random number generation for simulation and statistical inference. Throughout the course, the advantages and disadvantages of each algorithm are explored, particularly as they relate to a dataset's properties.

Prerequisites: Take DS 110 and DS 201 and MA 151 and MA 229 and either MA 285 or EC 272. Minimum grade C-.

Offered: Every year, Fall

DS 330. Advanced Special Topics. 3 Credits.

This course covers special topics in data science at the advanced level.

Prerequisites: None

Offered: As needed

DS 350. Big Data. 3 Credits.

The term "Big Data" means many different things to many different people. For the purposes of this class, it will take on the following meaning - problems and data that are constrained by local memory. This is perhaps one of the largest problems for the modern data scientist. In industry, companies collect petabytes of data on customers and wish to extract value from it. Social sciences such as economics and political science, increasingly use large-scale micro-data to analyze individual behavior. And, of course, hard sciences like physics and genomics have struggled with massive datasets for decades. We will take both a theoretical and practical approach to addressing this issue. Specifically, this course will cover parallel algorithms, distributed computing, databases, cloud resources and computing, and "big data" technologies like Apache Spark.

Prerequisites: Take DS 310; Minimum grade C-.

Offered: As needed, Fall

DS 380. Data Mining. 3 Credits.

This course equips students with practical skills in Python for data science, focusing on data preparation, cleaning, munging, visualization, and descriptive statistics. Students explore classification techniques, including Logistic Regression, K-Nearest Neighbors (KNN), Linear Discriminant Analysis (LDA), and Support Vector Machines (SVM), along with selected advanced data mining topics.

Prerequisites: Take DS 201 and EC 365; Minimum grade C-.

Offered: Every year, Spring

DS 385. Machine Learning. 3 Credits.

This course introduces students to the theory of machine learning and practical applications. Topics include supervised learning, unsupervised learning, learning theory, regularization models, validation and models.

Prerequisites: Take DS 380. Minimum grade C-

Offered: Every year, Fall

DS 399. Applied Time Series Analysis and Forecasting. 3 Credits.

Most real-world phenomena involve systems that change through time (e.g., stock market indices, population sizes, salinity levels in a body of water, etc.). Often, the past behavior of these phenomena provides predictive power for future behaviors. This course introduces students to time series analysis, a field of statistics that centers on mathematical relationships between the past and future and how to predict the future through forecasting. Topics include autocorrelation and partial autocorrelation functions, autoregressive models, moving average models, ARMA, ARIMA, and ARMAX. Additional topics may include seasonal models, state-space models and Kalman filtering, volatility models, and machine learning models for forecasting. In all cases, real-world applications and computer implementations in R or similar software are explored.

Prerequisites: Take MA 285 or EC 272; Minimum grade C-

Offered: As needed

DS 480. Data Science Capstone. 3 Credits.

This course serves as a culminating experience for the Data Science major. Students work on an independent project that will allow them to integrate knowledge from their previous courses in the major and apply that knowledge to a problem in a domain of their interest. This course counts as the university's Integrative Capstone requirement for Data Science majors.

Prerequisites: Take DS 385.

Offered: Every year, Spring