

DATA ANALYTICS (DA)

DA 101 - Introduction to Data Analytics (4 Credit Hours)

Many of the most pressing problems in the world can be addressed with data. We are awash in data and modern citizenship demands that we become literate in how to interpret data, what assumptions and processes are necessary to analyze data, as well as how we might participate in generating our own analyses and presentations of data. Consequently, data analytics is an emerging field with skills applicable to a wide variety of disciplines. This course introduces analysis, computation, and presentation concerns through the investigation of data driven puzzles in wide array of fields – political, economic, historical, social, biological, and others. No previous experience is required.

DA 199 - Introductory Topics in Data Analytics (1-4 Credit Hours)

A general category used only in the evaluation of transfer credit.

DA 200 - Data Analytics Colloquium (1 Credit Hour)

The Data Analytics colloquium involves three central learning components. 1) regular engagement with guest presentations and community activities in data analytics, 2) group discussion featuring critical analysis and connection of themes found in the guest presentations and in related data analytics topics, and 3) preparation and refinement of professional communication skills necessary for the required internship component of the data analytics major. This course provides an opportunity for students to connect on data analytics ideas and applications, using a range of perspectives that may or may not be normally encountered in a traditional course. Students will develop the knowledge, skills, and methods they need to progress to more advanced learning, while also creating bridges with members of the data analytics community within and outside of Denison. The course must be taken twice by majors: once as a sophomore, and again as either a junior or senior.

Prerequisite(s): DA 101 (may be taken concurrently).

DA 210 - Data Systems (4 Credit Hours)

This course provides a broad perspective on the access, structure, storage, and representation of data. It encompasses traditional database systems, but extends to other structured and unstructured repositories of data and their access/acquisition in a client-server model of Internet computing. Also developed are an understanding of data representations amenable to structured analysis, and the algorithms and techniques for transforming and restructuring data to allow such analysis.

Prerequisite(s): CS 109 or CS 110 or CS 111 or CS 112.

Crosslisting: CS 181.

DA 220 - Applied Statistics (4 Credit Hours)

Statistics is the science of reasoning from data. This course will introduce the fundamental concepts and methods of statistics using calculus-based probability. Topics include a basic study of probability models, sampling distributions, confidence intervals, hypothesis testing, categorical data analysis, ANOVA, multivariate regression analysis, logistic regression, and other statistical methods. Scopes of conclusion, model building and validation principles, and common methodological errors are stressed throughout.

Prerequisite(s): Either MATH 145 or both MATH 135 and DA 101.

Crosslisting: MATH 220.

DA 245 - Topics in Data Analytics (4 Credit Hours)

This course provides a venue to explore intermediate topics in Data. Topics courses will vary in content according to the interests of the faculty offering the course and possibly to introduce new classes into the curriculum. Courses at this level should be appropriate for students with introductory work in DA and/or related courses.

DA 271 - Theory and Practice of Data Visualization (4 Credit Hours)

Data visualization turns data and analysis into something people can see, and something they can comprehend. The practice of data visualization is built on the science of perception and the art of visual metaphors. While data visualization is a skillset demanded of any role involving data and analytics, there is also a field of study and discipline dedicated to the design and creation of graphical representations of data. This course introduces the discipline of data visualization, design principles and theory, and the way data visualization is used in a variety of fields. As part of this course, you will create and refine your own portfolio of dashboards and infographics, and learn to evaluate data visualization through workshops involving peer-to-peer feedback.

Prerequisite(s): DA 101.

DA 272 - Ethics of Data and Information (4 Credit Hours)

This course is a problem-driven, technically informed engagement with the ethics of data and information as well as an investigation of the moral dimensions of collecting, analyzing, and protecting data. It aims to equip students with the ethical frameworks and philosophical tools necessary to effectively engage with the urgent questions posed by data-driven technology in its various forms. Students will hone their understanding of the ethics of surveillance, scientific research, algorithmic bias, and policy decision-making. We will also investigate how familiar moral notions like privacy, property, fairness, and equality are challenged or illuminated by computational tools and the advent of novel possibilities for data collection and analysis. Projects in the course will seek to put into practice the ethical principles and moral theories in hopes of tackling data-driven decisions prudently and permissibly.

DA 299 - Intermediate Topics in Data Analytics (1-4 Credit Hours)

A general category used only in the evaluation of transfer credit.

DA 301 - Practicum in Data Analytics (4 Credit Hours)

Utilizing Denison as a model of society, this practicum will explore questions of collective import through the analysis of new and existing sources of data. A problem-driven approach will lead to the acquisition of new, appropriate data analytic skills, set in an ethical context that carefully considers the implications of data display and policy recommendations on community members. A significant component of the course is working in teams to collect and analyze new data to address a puzzle or problem for a real client. Groups or organizations that serve as clients may come from the campus community, local non-profits, or businesses and groups across the region or country. The practicum also develops exposure to policymaking, implementing data driven insights, program management theory, interacting with leaders and professionals, and developing presentation skills appropriate for professional communication with the public. Though a significant learning opportunity itself, this course should also be seen as a prelude to a community internship or research experience in the post-junior year summer. Students should be aware that some off-campus travel may be necessary to meet with specific clients as necessary. Final presentations to the client, in lieu of a scheduled exam, requires flexibility and scheduling outside of the exam schedule.

Prerequisite(s): DA 101, DA 210 and DA 220, or consent of instructor.

DA 345 - Advanced Topics in Data Analytics (4 Credit Hours)

This course provides a venue to explore advanced topics in Data. Topics courses will vary in content according to the interests of the faculty offering the course and possibly to introduce new classes into the curriculum. Courses at this level should be appropriate for students with significant work in DA and/or related courses and may require other prerequisites.

DA 350 - Advanced Methods for Data Analytics (4 Credit Hours)

This course is designed to develop students' understanding of the cutting-edge methods and algorithms of data analytics and how they can be used to answer questions about real-world problems. These methods can learn from existing data to make and evaluate predictions. The course will examine both supervised and unsupervised methods and will include topics such as dimensionality reduction, machine learning techniques, handling missing data, and prescriptive analytics.

Prerequisite(s): DA 210 and DA 220 or consent of instructor.

DA 351 - Advanced Descriptive Methods in Data Analytics (4 Credit Hours)

Advanced Descriptive Methods (DA 351), in parallel with DA 352 and 353, is designed to develop students' understanding of the cutting-edge methods and algorithms of data analytics and how they can be used to answer questions about real-world problems. While all advanced methods for Data Analytics can be applied in a variety of capacities, descriptive analytics emphasizes using natural language processing (NLP) methods to work with text as data, modeling for interpretability, and designing and deploying computer vision systems. In DA 351 students will examine both supervised and unsupervised methods, including topics such as advanced regression, K nearest neighbors, hierarchical clustering, ranked cosine similarity, and deep learning.

Prerequisite(s): DA 210 or CS 181 and MATH 220 or DA 220 or MATH 242.

DA 352 - Advanced Predictive Methods in Data Analytics (4 Credit Hours)

Advanced Predictive Methods (DA 352), in parallel with DA 351 and 353, is designed to develop students' understanding of the cutting-edge methods and algorithms of data analytics and how they can be used to answer questions about real-world problems. While all advanced methods for Data Analytics can be applied in a variety of capacities, predictive methods emphasize learning from existing data to make predictions about new data. In DA 352 students will examine both supervised and unsupervised methods and will include topics such as clustering, classification, and network analysis.

Prerequisite(s): DA 210/CS 181; DA 220/MATH 220/MATH 242.

DA 353 - Advanced Prescriptive Methods in Data Analytics (4 Credit Hours)

Advanced Prescriptive Methods (DA 353), in parallel with DA 351 and 352, is designed to develop students' understanding of the cutting-edge methods and algorithms of data analytics and how they can be used to answer questions about real-world problems. While all advanced methods for Data Analytics can be applied in a variety of capacities, prescriptive analytics emphasizes formulating decision criteria, using data to identify optimal actions, and balancing benefits and tradeoffs of different solutions. In DA 353 students will examine both supervised and unsupervised methods and will include topics such as optimization and linear programming, reinforcement learning, simulation, and decision analysis.

Prerequisite(s): DA 210/CS 181; DA 220/MATH 220/MATH 242.

DA 361 - Directed Study (1-4 Credit Hours)**DA 362 - Directed Study (1-4 Credit Hours)****DA 363 - Independent Study (1-4 Credit Hours)****DA 364 - Independent Study (1-4 Credit Hours)****DA 399 - Advanced Topics in Data Analytics (1-4 Credit Hours)**

A general category used only in the evaluation of transfer credit.

DA 401 - Seminar in Data Analytics (4 Credit Hours)

This is a capstone seminar for the Data Analytics major in which students work on independent research projects in a collaborative seminar setting. Problems may derive from internship experiences, courses of study at Denison, or another source subject to instructor approval. Heavy emphasis will be placed on providing ongoing research reports and collective problem solving and review.

DA 451 - Senior Research (4 Credit Hours)**DA 452 - Senior Research (4 Credit Hours)**