

DSC - DATA SCIENCE & COMPUTING

DSC 110 Survey of Software Tools (1 Credit Hours)

This course facilitates the development of proficiency with the tools of computational and data science. Critical topics about the computing ecosystem that could make students' lives significantly easier are covered. These topics include but are not limited to the command-line, the use of text editors, and version control systems. Students will spend hundreds of hours using these tools throughout their education (and possibly thousands over their careers). Mastering such tools enables students to be more efficient at the problem-solving process and provides unique knowledge and skills.

Academic Level: Undergraduate

Enrollment is limited to students with a major in Data Science.

DSC 130 Exploring Data (3 Credit Hours)

This course is an introduction to data science using the R programming language with a focus on data acquisition and wrangling, exploratory data analysis, data visualization, inference, modeling, and effective communication of results. Students will create beautiful visualizations and models, and use them to gain insights and make predictions. In this model-based course, students are introduced to statistical analysis and models through examples. From the first class students will perform meaningful analysis on real data. This course assumes no prior experience with programming and requires no specific statistical or mathematical knowledge beyond high school algebra.

Academic Level: Undergraduate

Enrollment is limited to Undergraduate level students.

DSC 205 Introduction to Data Analysis and Modeling (3 Credit Hours)

This course is an introduction to the statistical and quantitative analysis of data for modeling, prediction, optimization, and problem solving. Microsoft Excel will be used extensively throughout the course for data processing, exploration, model implementation, and to develop and run simulations. Students will also develop analytical methods for problem solving and model analysis. A main goal of the course is to develop quantitative techniques for evidence-based decision making in a range of fields, including business, medical and health sciences, public policy, government, and problems within social and environmental frameworks. Topics include Excel functions and formulas; data formatting, sorting, and filtering, pivot tables, regression analysis, linear and integer programming, scheduling problems, data mining, queuing, network and cluster analysis, financial models, and time series forecasting.

Academic Level: Undergraduate

DSC 225 Programming 1 (3 Credit Hours)

Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment, including a robust debugger and profiler. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for data science students with no prior programming experience. Topics include flow control, decision structures, repetition, recursion, subroutines, functions, algorithm development, data structures, and basic object-oriented programming concepts. These essential computer programming concepts are used to develop computer programs that handle numerical data, whether it is obtained in a laboratory or the field or generated as the output of some mathematical function.

Academic Level: Undergraduate

DSC 234 Inside the Machine:AI Literacy (3 Credit Hours)

This course is an introduction to concepts, processes, and resources involved in machine learning and deep learning, without requiring any formal mathematics or coding background. Linear and generalized regression models, classification, clustering, and tree-based methods will be studied. Some discussion of resources required, big data, internet of things, large language models, facial recognition, animal tracking, business intelligence, and other applications will help students distinguish between practical applications of the different AI models, analyze and critique their current capabilities and social justice implications.

Academic Level: Undergraduate

DSC 260 Data Visualization (3 Credit Hours)

This course provides an introduction as well as hands-on experience in data visualization. It introduces students to design principles for creating meaningful displays of quantitative and qualitative data to facilitate managerial decision-making. Students will use data visualization software to examine patterns in data and create interactive dashboards and storytelling through data.

Academic Level: Undergraduate

DSC 301 Intro to Database Design/SQL (3 Credit Hours)

This course is an introduction to Database Design and Structured Query Language (SQL). Students will be exposed to relational databases including table design, relationships, dependencies, and normalization forms. Additionally, the course will cover data modeling using Entity-Relation (ER) models. Data models found in business, medicine, biology, and science will be considered and Structure Query Language (SQL).

Academic Level: Undergraduate

DSC 315 Hit It a Ton: The Impact of STEM fields on Sports (3 Credit Hours)

In this course, students will "[a] apply a range of relevant theoretical and/or explanatory perspectives using appropriate investigative and analytical methods to interpret and critically analyze source material," by investigating how advancing materials technology changed the performance of players' equipment and how the introduction of advanced statistics changed how the player, field, and game are managed and assessed in professional sports. Students will be exposed to and discuss the breakthroughs and achievements in select sports – such as baseball and golf but will actively investigate the impacts of these fields outside of covered sports. Course material will include documented accounts of the introduction of advanced statistics from players, coaches, and front office personnel, peer-review academic work on the impact of these advancements, and foundational science/statistics behind these improvements.

Academic Level: Undergraduate

DSC 325 Programming II (3 Credit Hours)

DCS 325 Programming II is an advanced course in programming in python and a continuation of DSC 225. Emphasis is placed on problem-solving and algorithm development in data science applications, especially natural language processing and text mining. Exposure to cloud computing, big data sets, and machine learning algorithms are included. Programming models including procedural, functional, and object-oriented will be discussed and applied. The course uses best practices to prepare students for industry.

Academic Level: Undergraduate

DSC 344 Machine Learning (3 Credit Hours)

This course is an introduction to techniques of statistical learning and their application to real problems. Linear and generalized regression models, classification, clustering, and tree-based methods are employed in both supervised and unsupervised learning contexts. Students will apply the techniques in data modeling problems from business, industry, sports, sciences, politics, marketing, social justice, or other areas.

Academic Level: Undergraduate

Enrollment is limited to Undergraduate level students.

DSC 360 Deep Learning (3 Credit Hours)

This course explores the design, building, training, and application of deep learning models for a range of applications, including predictive models for classification and regression, clustering, and image processing. Topics include sequential feed forward and convolution architectures; regularization and optimization schemes, and model implementation using python libraries such as Tensorflow, Keras, and Pytorch.

Academic Level: Undergraduate

DSC 410 Data Mining (3 Credit Hours)

This course introduces the methods and applications of data mining. Students will explore and extract meaningful patterns and knowledge from large datasets, including supervised learning and unsupervised learning. Emphasis will be placed on both theoretical foundations and software implementation. By the end of the course, students will be able to design, apply, and evaluate data mining techniques for real-world problems.

Academic Level: Undergraduate

DSC 471 Analysis of Algorithms (3 Credit Hours)

This course investigates methods for the design and benchmarking of algorithms, emphasizing methods useful in practice. Topic coverage includes induction, numerical optimization, divide-and-conquer, dynamic programming, network flow, randomization, complexity theory, greedy algorithms, searching and sorting algorithms, cryptographic algorithms, graph theory, hashing, and advanced data structures.

Academic Level: Undergraduate

DSC 480 Data Science Practicum (3 Credit Hours)

In this course students gain practical experience working with a company or other organization as well as a faculty advisor. Students will act as consultants on a data science project in health, business, sports, medicine, science, the environment, or some other field. The practicum gives students opportunities to apply skills developed over the course of their program in a professional context, to effectively collaborate with others in addressing an organizational need, and to develop domain expertise in the field. Students will engage end-to-end in the modeling and problem solving process, and in reporting and communicating results. May be repeated for credit.

Academic Level: Undergraduate

Enrollment is limited to students with a program in Data Science.

DSC 490 Topics in Data Science (3 Credit Hours)

This course explores advanced and emerging topics in data science, with content varying year to year. Topics may include natural language processing, generative AI, network analysis, Bayesian inference, causal inference, time series models, probabilistic models, simulation, and visualization. This course is intended for students with prior coursework in data science or statistics.

May be repeated for credit.

Academic Level: Undergraduate