DSA-DATA SCIENCE AND ANALYTICS

DSA 3013   Machine Learning for Data Science   3 Credit Hours
Prerequisite: CS 1213 or CS 1313 or CS 1321 or CS 1323 or CS 1324, and departmental permission. Machine Learning for Data Science provides a broad overview of widely accepted and state-of-the-art machine learning approaches to automatically extract information from a variety of data types. This course will include conceptual background on data, methods, and application approaches; coverage of issues of data security, privacy, and ethics related to machine learning; and practical, hands-on exercises. (Irreg.)

DSA 3023   Big Data Engineering   3 Credit Hours
Prerequisite: DSA 3013, and CS 1213 or CS 1313 or CS 1321 or CS 1323 or CS 1324, and departmental permission. Students in this course will develop basic ability to design, build, and implement data pipeline systems to allow efficient access to data and databases. Several topics will be covered including data wrangling, data ingestion, and storage engines. Cloud based systems for data processing and distributed computing will also be discussed. (Irreg.)

DSA 4003   Applied Data Science   3 Credit Hours
Prerequisite: DSA 3013 and DSA 3023, and CS 1213 or CS 1313 or CS 1321 or CS 1323 or CS 1324; and departmental permission. In this course you will complete multiple larger-scale team projects on real-world complex data sets. The projects will allow you to develop and continue to refine your skills in problem identification, data visualization, data wrangling, data organization, machine learning, communication, and presentation. (Irreg.)

DSA G4413   Algorithm Analysis   3 Credit Hours
(Crosslisted with C S 4413) Prerequisites: C S 2413 and C S 2813; or MATH 2513; or DSA 5005; and departmental permission. Design and analysis of algorithms and measurement of their complexity. This course introduces various algorithm design strategies--divide and conquer, greedy principle and dynamic programming--to solve a variety of problems using algorithms of various types: deterministic and randomized, serial and parallel, centralized and decentralized, and program based and circuit based. (F)

DSA G4513   Database Management Systems   3 Credit Hours
(Crosslisted with C S 4513) Prerequisites: C S 2413 and C S 2813; or MATH 2513; or DSA 5005; and departmental permission. The design and implementation of a DBMS including data models, query languages, entity-relationship diagrams, functional dependencies, normalization, storage structures, access methods, query processing, security and transaction management, and applications. The impact of databases on individuals, organizations, and society, and legal and professional responsibilities including security and privacy will be discussed. A commercial DBMS is used. Students practice written communication skills. (F)

DSA 5001   Data Analytics and Media   1 Credit Hour
Prerequisites: Departmental permission; graduate standing. This course covers the application of data analytics to the media environment. Students will learn the application and usage of data analytics in media and its effectiveness; and how data analytics provides research tools to collect audiences' opinion on political, social, public issues, and consumers' responses to the brand. (Irreg)

DSA 5005   Computing Structures   5 Credit Hours
(Crosslisted with C S 5005) Prerequisite: CS 2334, MATH 1914 or MATH 1823 or with permission of graduate liaison. This course has three parts: discrete mathematics, object-oriented programming in C++, and data structures in C++. As part of the discrete mathematics students will be introduced to combinatorics, logic, relations, functions, computational complexity, automata, and graph theory. Students will be introduced to the fundamentals of object-oriented programming and learn to design, build, and analyze data structures using object-oriented principles and techniques. Credit hours earned for this course cannot be used to fulfill degree requirements for the B.S., M.S. or Ph.D. programs in computer science. (Irreg.)

DSA 5011   Introduction to R   1 Credit Hour
Prerequisites: departmental permission; graduate standing. R is a free open source statistical programming language used by professionals in every field and industry. This introductory course aims to provide students with the fundamentals of R and R Studio. Instead of passively watching videos, students will apply R to solve real data problems while receiving instant and personalized feedback that guides them to the correct solution. (Irreg.)

DSA 5013   Fundamentals of Engineering Statistical Analysis   3 Credit Hours
(Crosslisted with ISE 5013) Prerequisite: graduate standing. Introduction to probability, expectation, discrete and continuous distributions, sampling and descriptive statistics, parameter estimation, and statistical tests to aid decision making. The student will learn analysis techniques for verification of systems parameters. (F, Sp)

DSA 5021   Data Analytics Applied to Meteorology Data   1 Credit Hour
Prerequisites: departmental permission; graduate standing. This course focuses on meteorology data that is stored regularly in space and time, so-called gridded data. For example, satellite or forecast data that is stored in a specific latitude-longitude grid, and available at uniform increments in time. Analysis of gridded data is abetted by programming in Python, offering an array syntax that exploits the uniformity of data. (Irreg.)

DSA 5031   Econometrics for DSA   1 Credit Hour
Prerequisite: Graduate standing and departmental permission. The main goal of this course is to learn a set of econometrics tools that can be applied in empirical research related to economic issues. The course will emphasize applying different estimation techniques, or quasi-experimental methods, to establish causal relationships in observational data. (Irreg.)

DSA 5041   Advanced R   1 Credit Hour
Prerequisite: Graduate standing in DSA/C S/ISE and DSA 5011, or departmental permission. R is a free open source statistical programming language used by professionals in every field and industry. This course will provide students with detailed knowledge of R and R Studio. Instead of passively watching videos, students will apply R to solve real data problems while receiving instant and personalized feedback that guides them. (Irreg.)

DSA 5051   Data Visualization   1 Credit Hour
Prerequisite: Graduate standing in DSA/C S/ISE and departmental permission; DSA 5103 and DSA 4513 recommended. Aspiring data scientists need to be able to communicate the stories of data to communities of interest. This usually requires the depiction of data in visualizations. The course combines an overview of best practices for visualizations with practical knowledge, including the use of Tableau and how to gather user requirements. (Irreg.)

DSA 5061   Python for Data Science and Analytics   1 Credit Hour
Prerequisite: Graduate standing, C S 1313 or C S 1323, and departmental permission. This course introduces core programming basics, including data types, control structures, and algorithm development with functions via the Python programming language for students without prior programming experience. The course discusses the fundamental principles of Object-Oriented Programming and their application in data science and analytics. (Irreg.)

DSA 5103   Intelligent Data Analytics   3 Credit Hours
(Crosslisted with ISE 5103) Prerequisite: graduate standing or permission of instructor; ISE 3293 or ISE 5013; CS 1313 or CS 1323. In our society, data is rapidly increasing in volume, velocity, and variety. At the same time computing power and the sophistication of data analysis techniques are increasing. However, even with the expanding capabilities, businesses and organizations often find themselves "data rich, but information poor." Intelligent Data Analysis is a holistic approach to addressing real-world data intensive problems that integrates human intuition with data analysis tools to best draw out meaningful insights. To this end, the course has four underlying themes: defining the Problem, understanding and coping with Data, selecting and using appropriate Analytical Tools, and discovering and communicating the Insight. Techniques covered include data cleansing and pre-processing, exploratory analysis and visualization, dimension reduction, linear and logistic regression, decision trees, and clustering. This course will introduce students to a powerful open source statistical programming language (R) and include extensive hands-on data analysis and team projects. (F)

DSA 5113   Advanced Analytics and Metaheuristics   3 Credit Hours
(Crosslisted with ISE 5113) Prerequisite: ISE 5013, graduate standing or permission of Instructor. Explores advanced techniques for addressing complex optimization problems. Focus is on formulating mathematical models and developing problem solving strategies using methods in the context of Data Science and Analytics. Topics include continuous and combinatorial optimization with an emphasis on both traditional and modern heuristic techniques. (Sp)

DSA 5133   Energy Analytics   3 Credit Hours
(Crosslisted with ISE 5133) Prerequisite: Graduate standing or permission of instructor. In today's data-driven world, the ability to extract knowledge and create successful future energy projections is critical for the energy sectors. In this regard, data science body of knowledge promises a strong set of analytical tools that can be used for demand/supply forecasting and price prediction. This course aims at teaching the students the fundamentals of data analysis and interpretation. (F)

DSA 5203   Time Series Analysis   3 Credit Hours
Prerequisite: DSA/ISE/C S graduate standing or Departmental permission. This course will cover data mining and time series analysis. Modules include: statistical estimation, transformations and decomposition of time series, quantifying correlation structure in standard models, forecasting methods, linear least squares method, and volatility models. Students will utilize MATLAB Time Series Tool Box and open source programs in R. (Irreg.)

DSA 5303   Financial Engineering Analytics   3 Credit Hours
Prerequisite: departmental permission or DSA/ISE/C S graduate standing. Course focuses on use of optimization and stochastic models to solve portfolio optimization problems; price derivative securities including energy and weather derivatives; and applications of financial engineering, including algorithmic trading, financial networks, pricing of real options, and the use of machine learning in pricing. Data driven models and big data mining in financial engineering will be also discussed. (Irreg.)

DSA 5403   Bayesian Statistics   3 Credit Hours
Prerequisite: Departmental permission or DSA graduate standing. Course topics are models, probability, Bayes' Rule and R; inference to a binomial probability; and the generalized linear model. (Irreg.)

DSA 5503   Healthcare Analytics   3 Credit Hours
(Crosslisted with ISE 5503) Prerequisite: Graduate standing and ISE 3293 or ISE/DSA 5013. This course gives an overview of the primary concepts and methods towards developing artificial intelligence (AI)-enabled healthcare systems. We will focus on foundational methods in machine learning and data analytics for prediction and pattern recognition, and apply them to specific areas in medicine and healthcare including, but not limited to, disease diagnosis, patient treatments and their outcomes prediction. (Sp)

DSA 5703   Machine Learning Practice   3 Credit Hours
(Crosslisted with C S 5703) Prerequisite: Graduate standing; C S 4013/5013, C S 5593, or ISE/DSA 5103; or permission of instructor. Machine learning is the data-driven process of constructing mathematical models that can be predictive of data observed in the future. In this course, we will study the use of a range of supervised, semi-supervised and unsupervised methods to solve both classification and regression problems. (F)

DSA 5900   Professional Practice   1-4 Credit Hours
1 to 4 hours. Prerequisite: Completed or concurrent enrollment in DSA 5103, DSA 5113, DSA 4413, and DSA 4513. Graduate standing and departmental permission. May be repeated; maximum credit four hours. Participation in a professional experience with an approved project sponsor and topic. A written report detailing the responsibilities and results of the experience is required upon completion along with an oral presentation. (F, Sp, Su)

DSA 5970   Special Topics/Seminar   1-3 Credit Hours
1 to 3 hours. Prerequisite: permission of instructor. May be repeated with a change of subject matter; maximum credit 12 hours. Selected topics of current research interest not covered by regularly scheduled coursework. (F, Sp, Su) (Irreg.)

DSA 5980   Research for Master's Thesis   2-9 Credit Hours
2 to 9 hours. Prerequisite: Graduate standing and departmental permission. Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. (F, Sp, Su)

DSA 5990   Independent Study   1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)

DSA 6980   Research for Doctoral Dissertation   2-16 Credit Hours
2 to 16 hours. Prerequisite: Graduate standing and permission of instructor; may be repeated. Directed research culminating in the completion of the doctoral dissertation. (F, Sp, Su)