MATHEMATICAL SCIENCES (MA)

MA 610 Optimization and Simulation for Business Decisions   (3 credits)
Pre-Req: GR 521, GR 521D, or GR 521P
Optimization and simulation methods are being used as effective tools in many environments that involve decision making. This course covers classical and modern optimization techniques used today in a business environment. Specifically, the focus will be on linear and nonlinear programming techniques with applications, as well as elective topics selected from game theory, agent-based modeling, and modern simulation and optimization techniques. Examples of application areas of optimization include portfolio selection in finance, airline crew scheduling in the transportation industry, resource allocation in healthcare industry, and minimizing the cost of an advertising campaign in marketing.

Typically Offered: Fall and Spring

MA 611 Time Series Analysis   (3 credits)
Pre-Req: ST 625. Not open to students who have completed EC 621
This course examines methods for analyzing time series. In many data modeling situations, observations are collected at different points in time and are correlated. Such time series data cannot typically be modeled using traditional regression analysis methods. This course provides a survey of various time series modeling approaches, including regression, smoothing and decomposition models, Box-Jenkins analysis and its extensions, and other modeling techniques commonly used, such as quantile estimation and value at risk. It makes use of statistical packages such as SAS, JMP, R andor SPSS.

Typically Offered: Fall and Spring

MA 700 Dir Study in Mathematics   (3 credits)
A Directed Study is designed for highly qualified students who, under the direction of a member of the sponsoring academic department, engage in an agreed-upon in-depth independent examination, investigation or analysis of a specialized topic.

Typically Offered: As needed

MA 705 Data Science   (3 credits)
Pre- or Co-Req: GR 521, GR 521D, or GR 521P
Working with and finding value in data has become essential to many enterprises, and individuals with the skills to do so are in great demand in industry. The required skill set includes the technical programming skills to access, process and analyze a large variety of data sets, including very large (big data) data sets, and the ability to interpret and communicate these results to others. Anyone with these abilities will provide benefit to their organization regardless of their position. This course presents the essentials of this skill set.

Typically Offered: Fall and Spring

MA 706 Design of Experiments for Business   (3 credits)
Pre-Req: ST 625
This class is planned for those interested in the design, conduct, and analysis of experiments, with an emphasis on business applications. The course will examine how to design experiments, carry them out, and analyze the data they yield. Various designs are discussed and their respective differences, advantages, and disadvantages are noted. In particular, factorial and fractional-factorial designs are discussed in great detail. It has been found to allow cost savings, while revealing the essential nature of the impact of the factors studied, in a manner readily understood by those conducting the experiment as well as those to whom the results will be reported.

Typically Offered: Spring

MA 707 Introduction to Machine Learning   (3 credits)
Pre or Co-Req: ST 635
Pre-Req: MA 705 or CS 602
or instructor permission
This course provides students with knowledge of the fundamental concepts in machine learning and several state-of-the-art developments with an emphasis on real-world application. Topics include the machine learning landscape; model selection, feature engineering, parameter tuning, and model validation; popular supervised learning methods; unsupervised learning including clustering, principal component analysis, and manifold learning; text analysis and topic modeling; neural networks and deep learning. Students will gain hands-on experience implementing a wide variety of methods using the computer programming language of Python.

Typically Offered: Every two or more years

MA 710 Data Mining   (3 credits)
Pre-Req: ST 635
This course introduces participants to the most recent data-mining techniques, with an emphasis on: (1) getting a general understanding of how the method works, (2) understanding how to perform the analysis using suitable available software, (3) understanding how to interpret the results in a business research context, and (4) developing the capacity to critically read published research articles which make use of the technique. Contents may vary according to the interest of participants. Topics will include decision trees, an introduction to neural nets and to self-organizing (Kohonen) maps, multiple adaptive regression splines (MARS), genetic algorithms, association (also known as market basket) analysis, web mining and text mining, and social networks.
Typically Offered: Fall and Spring

MA 795 Business Analytics Project Course   (3 credits)
ST 635, CS 605, MA 705
This course is a project course for students in the MS Business Analytics program. Students will work on either research projects or real-world problems, with faculty and/or a field supervisor advising. Students are provided with an opportunity to apply advanced skills to solve practical projects and they will learn how to tackle a business analytics problem from problem translation, data wrangling, statistical model building, translation of results, and achievable recommendation with statistical thinking and innovation.

Typically Offered: Fall

MA 799 Experimental Course in MA   (3 credits)
Prereq: ST 635, CS 605 and MA 611
Experimental courses explore curriculum development, with specific content intended for evolution into a permanent course. Topics may be offered twice before becoming a permanent course. Students may repeat experimental courses with a different topic for credit.

Typically Offered: As needed