MANAGEMENT SCIENCE (MGSC)

MGSC 3010 Introduction to Business Analytics (3)
This course introduces students to using the computer as a business-modeling tool. The overarching goal is to teach students to use computers to analyze models and interpret data for integrated decision-making across multiple domains, including finance, marketing, accounting, strategy and operations. The course material consists of four modules. The first module concerns data modeling and builds on INFO 1010 by reviewing data modeling in Excel. The second module focuses on deterministic modeling, including decision-making under certainty, and the use of optimization models such as linear programming. This module also covers topics such as portfolio optimization, transportation and assignment, and introduces students to the concepts of problem formulation and sensitivity analysis. The third module focuses on spreadsheet automation, including concepts for programming in Excel. The fourth module covers probabilistic modeling. This module uses simulation and decision analysis principles in uncertain environments. In addition, students will learn to choose the appropriate probability distribution for a given problem.

Prerequisite(s): INFO 1010 and (MATH 1140 or 1230).

MGSC 4320 Advanced Business Analytics (3)
This course introduces the concepts, methods and software used in the emerging field of business analytics. Students use computer languages, software packages and statistical methods to collect and to analyze large data sets and to apply the results in business performance improvement and planning. The course employs examples, exercises and cases that demonstrate how business analytics has been transforming decision-making processes in many companies and industries. Students improve their knowledge of and skills in computing and data analysis and enhance their analytical capabilities and problem-solving abilities.

Prerequisite(s): MGSC 3010.

MGSC 4590 Business Data Exploration & Visualization (3)
This course provides a rigorous understanding of the principles and applications of business data exploration and visualization. Students will gain a deep understanding of data exploration and visualization tools, discovering their potential to find patterns in datasets and effectively convey those results for business intelligence and descriptive analytics. By exploring large data sets, students will complete an experiential learning group project to create charts, dashboards and stories in a data visualization software.

Prerequisite(s): MGSC 3010.

MGSC 4690 AI for Business (3)
Course Description: This course provides an in-depth understanding of the principles and applications of Artificial Intelligence (AI) and Machine Learning (ML) in the business context. Students will gain a deep understanding of AI and ML technologies, exploring their potential to transform business operations and strategies. The course is designed to blend theoretical knowledge with practical insights, preparing students to lead AI initiatives and foster innovation within their organizations.

Prerequisite(s): MGSC 3010.

MGSC 4790 Advanced Business Analytics with Python (3)
This course introduces students to Python as a business analytics tool. The overarching goal is to teach students to use programming techniques to establish business models across multiple domains, especially including finance and operations. The course will review 1) Descriptive Analytics; data essentials, imports, etc., 2) Prescriptive Analytics; optimization, probability distributions, and Monte Carlo simulations, 3) Predictive Analytics: forecasting, time series analysis with seasonality, and 4) Visualization throughout all subject matters. An experiential learning team project will be completed by the students, who will be asked to optimize and simulate portfolios of their choices. This is an applied analytics course with real-life data on various business problems. Foundational knowledge in any programming language is recommended in addition to the required pre-requisite for the course.

Prerequisite(s): MGSC 3010.

MGSC 5380 Business Study Abroad - MGSC (1-20)
Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

MGSC 5390 Business Study Abroad - MGSC (1-20)
Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

MGSC 6010 Introduction to Business Statistics (2)
This course is designed to equip students with a basic understanding of business problems, data analysis tools, and mathematical techniques. Students master essential statistics concepts, spreadsheet functions, build descriptive business data measures, and develop their aptitude for data modeling. They'll also explore basic probability concepts, including measuring and modeling uncertainty, using various data distributions and the Linear/Multiple Regression Model to analyze and inform business decisions. The overarching goal is to teach students to use statistics and spreadsheets to analyze models and data for integrated decision-making across multiple domains, including finance, marketing, accounting, strategy, and operations

MGSC 6020 Business Stats and Models (3)
Methods for summarizing, analyzing, and making inferences from statistical data germane to management are learned. Topics include descriptive statistics, probability concepts, discrete and continuous probability distributions, sampling distributions, confidence intervals, hypothesis testing, simple and multiple regressions, and chi-squared tests. The methods are applied to management problems drawn from finance, marketing, accounting, operations management, human resources management, economics, and strategic planning.

MGSC 6030 Analytics for Managers (2)
Business analytics refers to the skills, technologies, and practices for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning. Business analytics focuses on developing new insights and understanding of business performance based on data and statistical methods. Business analytics has been widely adopted in different functional areas (i.e., accounting, finance, operations, marketing, and human resources) as well as a wide range of different industries (energy, healthcare, sports, government, etc.). For example, banks, such as Capital One, use analytics to segment customers based on credit risk, usage behavior and other characteristics and then to match customer characteristics with appropriate product offerings. Harrah's, the gaming firm, uses analytics based on tracking consumer behavior to improve its customer loyalty programs. This course provides students with the fundamental concepts, techniques, and applications needed to understand the emerging role of business analytics in organizations, and the ability to communicate with analytics professionals to effectively use and interpret analytics models and results for making better business decisions. This course will also familiarize students with R (analyses software) and Tableau (visualization software) which are widely used in the industry.

Prerequisite(s): MGSC 6010.

MGSC 6040 Supply Chain and Operations Management (2)
To achieve a competitive advantage, firms must thoroughly understand the complex processes underlying the manufacturing of products as well as the delivery of services. This course provides students with concepts, tools, and techniques to design, analyze, and improve the operational capabilities of organizations and supply chains. We will look at the operations function in both manufacturing and service industries and investigate how it can provide a competitive advantage along the dimensions of cost, quality, delivery, and flexibility. We will then look more broadly at the importance of coordination and risk mitigation for supply chains. The course will introduce several key topics in operations and supply chain management that are essential to any organization. Operations management is largely based on statistics. Consequently, we will devote a substantial amount of time to mastering analytical methods. The deeper issues surrounding operations and supply chain strategy and ESG implications, however, must be addressed through a broad and conceptual approach. Hence, this course will provide a mix of quantitative and qualitative treatments of the subject using lectures, case discussions, articles, instructional games, and exercises.

Prerequisite(s): MGSC 6010.

MGSC 6090 Operations and Supply Chain Management (3)
The management of technology, people, and business processes presents one of the most critical challenges to business leaders. To achieve competitive advantage, managers must thoroughly understand the complex processes underlying the development, manufacture, and distribution of products as well as the creation and delivery of services. This course will expose students to topics and techniques related to operations, design, and management of supply chains by means of qualitative and quantitative techniques. The course material is applicable to a broad range of industries such as electronics, online services, insurance, healthcare, retail, fashion, automotive, manufacturing, and more. The topics covered include: process, capacity, inventory, revenue, supply chain, quality, and project management.

Prerequisite(s): MGSC 6020 or 7330.

MGSC 7000 Bus Analytics Practicum (3)
This course introduces business analytics. It involves three components: (1) an overview of business analytics, (2) introduction to tools for business analytics and (3) field trips to companies and follow-up sessions on how business analytics creates value in the real-world.

MGSC 7100 SQL Database Fundamentals and Business Intelligence (3)
The effective use of data across firms to deliver fast and intelligent services presents one of the most critical challenges to today's business leaders. This course is designed to introduce students to basic concepts and techniques in the theory, design, implementation and administration of relational databases. Topics to be covered include, the database design process, the entity-relationship (ER) model, normalization, queries in Structured Query Language (SQL), distributed and client-server databases, database administration, and big data analysis. We will build a database application as a completion project. This course focuses on the skills and concepts needed to design and query databases and therefore contribute to companies' competitive positions.

MGSC 7310 Modeling and Analytics (3)
The widespread proliferation of IT-mediated economic activity generates a large amount of micro-level data about consumer, supplier, and competitor preferences. This has led to the emergence of a new form of competition based on the extensive use of analytics, experimentation, and fact-based decision-making. In nearly every industry, the competitive strategies that organizations are employing today rely extensively on data analysis to predict the consequences of alternative course of action, and to guide executive decision-making. This course provides a hands-on introduction to the concepts, methods, and processes of business analytics. Students will learn how to obtain and draw business inferences from data by asking the right questions and using the appropriate tools. Topics include data preparation, statistical tools, data mining, and the overall process of using analytics to solve business problems. Students will work with real-world business data and analytics software such as R. Students should also have a basic familiarity with elementary probability and be comfortable with basic data manipulation.

Prerequisite(s): MGSC 6010, 6020, 7330[*] or ENRG 7110[*].
[*] May be taken concurrently.

MGSC 7320 Advanced Spreadsheet Modeling (3)
This course covers the use of Microsoft Excel and the programming language Visual Basic for Applications (VBA) within Excel for obtaining, managing, and processing information. Example areas covered include (1) automatically producing customized mass emails and summary reports, (2) updating Excel databases with 100 or more sheets, (3) copying from a user's workbook to a separate master workbook for analysis and returning solutions, and (4) solving a series of optimization models for various exchange rates. Most of the managerial problems used for illustration involve financial and operations applications. Illustrations from actual company projects demonstrate the power and versatility of course concepts. No prior exposure to VBA or any other programming language is required.

Prerequisite(s): ENRG 7110, MGSC 6010, 6020 or 7310.

MGSC 7330 Business Statistics and Modeling with R (3)
This course introduces students to the foundations of business analytics. The course is designed to teach business managers how to use data to make good decisions in complex decision-making situations. In fact, a good decision is not the same as a good outcome. A good outcome can sometimes result as a matter of luck, and, conversely, a bad outcome does not necessarily suggest that a manager has made a bad decision. Students will develop sound reasoning skills and learn how to utilize information to arrive at good decisions.

Prerequisite(s): MGSC 7000[*].
[*] May be taken concurrently.

MGSC 7340 Web Analytics (3)
This course will provide students an overview of web analytics so that they can measure business goals and find areas of improvement. Students will learn how to apply value measurements to the website, analyze user behavior and optimize the content for the best possible search engine ranking and conversion. In this course students will be given a comprehensive overview of key concepts, tools and techniques related to analysis of quantitative internet data to optimize websites and web marketing initiatives.

MGSC 7520 Advanced Modeling and Analytics (3)
This course intends (1) to expose students to advanced theories and techniques in business analytics and (2) to familiarize students with advanced tools and packages. The advanced theories and techniques will cover the following broad areas: data preparation and exploration, advanced models, deep learning, and other frontier topics. Python packages for analytics – NumPy, Pandas, scikit-learn, TensorFlow/Keras – are the main tools used. Other advanced techniques and tools ay be covered depending on interest and time availability.

Prerequisite(s): MGSC 7310.

MGSC 7530 Advanced Data Management (3)
This course is designed to satisfy the job-market demand for advanced data/database management topics. Topics to be covered include database design with entity-relationship (ER) model and relational data model, advanced Structured Query Language (SQL) with a focus to answer complex business questions, SQL interface with Data Visualization (with R), Normalization, Data Warehouse, SQL interface with Cloud and Big Data, and Textual Data Analytics (with Python). This course focuses on the skills and advanced concepts needed to manage data in both traditional and big data environments which contribute to companies' data analytics strategy.

Prerequisite(s): MGSC 7100.

MGSC 7650 Applied Machine Learning (3)
Machine learning is a fast-growing field - more businesses are employing machine learning techniques to solve big data analytics problems. This course focuses on teaching learners a blend of machine learning techniques and application development. Students will learn how to identify an appropriate machine learning technique and how to apply the technique to a real-world business dataset. The emphasis will be on application of machine leaning technique rather than statistical theory behind the technique. By the end of the course, students will be able to develop an end-to-end interactive machine learning application using an enterprise technology platform.

Prerequisite(s): MGSC 7310 and 7330.

MGSC 7870 Business Analytics Projects (3)
In this semester-long experiential learning course, students work in teams on various analytics projects sponsored by faculty and industry partners. Each team needs to apply analytics techniques and tools on real-world problems. In addition to gaining real-world experience, students develop communication, presentation and leadership skills pertinent to business analytics.

Prerequisite(s): (MGSC 7310 and 7330) or MGSC 7520[*].
[*] May be taken concurrently.

MGSC 7960 Independent Study (1-3)
Independent study: Management Science.