MANAGEMENT SCIENCE

Department Code: MAS

Introduction

Management Science uses the ideas and methods of science, mathematics, statistics, and computing, which collectively are often referred to as Business Analytics, to help managers make better business decisions. Management science techniques have been applied in a wide variety of areas including financial modeling, marketing research, organizational theory, transportation and logistics, health care, environmental protection, and manufacturing. Almost any decision can benefit from the methods of management science/analytics.

Educational Objectives

The Department of Management Science offers a major area of specialization in Business Analytics as well as a minor in Business Analytics. The Business Analytics curriculum is designed to give Miami Herbert Business School students the necessary educational background and experience to allow them to work as successful business analytics professionals.

Students pursuing the Bachelor of Business Administration (BBA) degree with a major area of specialization in Business Analytics are trained to combine quantitative, statistical, and computational tools and techniques to help companies understand, predict, and act on large amounts of data, improving decision-making in increasingly complex and interconnected business environments.

For students pursuing the Bachelor of Science in Business Administration (BSBA) degree program, the major in Business Analytics requires a solid background in the sciences and mathematics. Additionally, students are required to take sequences of courses in optimization, decision science, and data analytics. A number of the courses in the Business Analytics curriculum require projects, in which the student evaluates a real-world system or process. As the system is studied and modeled, the student applies management science methods to find ways to improve the process. In such a course, written and oral presentation of findings is part of the learning and evaluation process.

A major or minor area of specialization in Business Analytics is recommended to qualified students as preparation for direct entry into the field of Analytics or as preparation for future graduate studies.

Highly-motivated students interested in pursuing both the BBA/BSBA **and** the Master of Science in Business Analytics may qualify for the dual degree program in Business Analytics (http://bulletin.miami.edu/graduate-academic-programs/business/specialized-master-degrees/). Undergraduate students admitted to this program must be within thirty credit hours of completing the baccalaureate degree and have a minimum 3.0 GPA. The BBA/BSBA-MSBA program is designed in such a way that students can expect to complete both the Bachelor's and Master's degrees within 4 1/2 years. Students in this program can take up to twelve credits of graduate coursework in the senior undergraduate year and at least twenty credits of graduate coursework in the fall semester after completion of the undergraduate degree.

MAS 105. Quantitative Methods in Business I. 3 Credit Hours.
This course provides a background in algebra, linear equations, matrices, quadratic, exponential, and logarithmic functions appropriate for the successful understanding, interpretation, and use of these concepts and their application to business and economics within the Business School curriculum and in career endeavors. The course also provides an introduction to the mathematics of finance, interest rates, discounting of future returns, and linear programming.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 110. Quantitative Applications in Business. 3 Credit Hours.
Review of algebra emphasizing its application to supply and demand functions, market equilibrium, compound interest, and amoritization. Differential calculus emphasizing its applications to marginal cost and revenue functions, maximization, taxation in competitive markets, and elasticity of demand are discussed. The application of integral calculus to total cost and profit of demand, to total cost and profit functions, consumer's and producer's surplus, computation of present value, and constrained optimization using partial differentiation are also included.
Requisite:Mia Herbt Bus Schl And Prerequisite: ALEKS score>=76 Or SAT MTH score >=700 Or SAT Mth Section Score>=730 Or ACT Mth score>=31 Or score of 4 AP Calculus (AB) Or score of 3 in AP Calculus (BC) Or MTH 108 or MTH 107 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MAS 201. Introduction to Business Statistics. 3 Credit Hours.
Data analysis and presentation, cross tabulations, descriptive statistical meas ures, probability, sampling, statistical inference, hypothesis testing for one and two populations, covariance and correlation analysis. Utilization of microc omputer statistical packages is also included.
Prerequisites: MAS 110 or MTH 130 or MTH 141 or MTH 151 or MTH 161 or MTH 171.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MAS 202. Intermediate Business Statistics. 3 Credit Hours.
Chi-squared goodness of fit tests, and contingency tables, analysis of variance, simple linear regression, multiple regresion, time series, forecasting, statistical methods of quality. Utilization of microcomputer statistical packages, case analyses, and presentations are also included.
Prerequisite: MAS 201 or MAS 311 or MTH 224 or ISE 311 or PSY 291 or PSY 292 and Requisite: Miami Herbert Business School.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MAS 311. Applied Probability and Statistics. 3 Credit Hours.
Descriptive statistics, basic probability, probability distributions, distribution theory, point and interval estimation, and single sample hypothesis testing.
Prerequisite: MTH 162 or MTH 172. Or Corequisites: MTH 162 or MTH 172 including equivalents.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

MAS 312. Statistical Methods and Quality Control. 3 Credit Hours.
Two sample hypothesis testing, simple and multiple regression, analysis of variance, design of experiments, and statistical quality control.
Prerequisite: MAS 311 or ISE 311 or Equivalent and Requisite: Miami Herbert Business School.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

MAS 332. Data Acquisition, Preparation and Visualization. 3 Credit Hours.
This course provides an in depth view of working with data to extract and present valuable information. Students will learn to collect, clean, manipulate, analyze, and visualize data from various sources correctly and efficiently. Through hands-on application, students will gain an understanding of what problems can occur when dealing with a variety of data and what solutions exist. Computing is a major component of this course, and students will learn a number of in-demand technical skills.
Prerequisite: MAS 202 or MAS 312.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MAS 342. Introduction to Optimization and Decision Making. 3 Credit Hours.
This course introduces the principles and techniques of applied mathematical programming and computational methods for managerial decision-making. Computer software will be used extensively to solve both small-scale and large-scale optimization problems. The course covers theory and applications of Linear Programming, Mixed Integer Programming, Binary Programming, Non-linear Programming, Network Optimization.
Prerequisite: MAS 201 or MAS 311.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MAS 352. Sports Analytics. 3 Credit Hours.
In this course students investigate questions that sports organizations face in business operations (ticketing, pricing, sales, and finance), and in team operations (scouting, coaching, and player personnel). Students will learn statistical and machine learning techniques such as mixed-effects regression models, random forests, neural networks, clustering, and support vector machines. Focus of the course will be on data management, data visualization, predictive modeling, forecasting, as well as written and verbal communication of the results of analysis. The programming language R will be used extensively in this course.
Prerequisite: MAS 332.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 432. Data Analysis. 3 Credit Hours.
This course introduces students to the analysis of various data types, with an emphasis on interpreting and communicating result. The course begins with linear regression modeling of normally distributed outcomes, and extends the concepts to other important data types frequently encountered in practice. Students will gain a firm understanding of a wide range of statistical models, when each is appropriate, and how to implement, interpret, and communicate results.
Prerequisite: MAS 202 or MAS 312 or ISE 312 or equivalent.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MAS 442. Stochastic Models in Operations Research. 3 Credit Hours.
Introduction to probabilistic models and their applications. Topics include inventory theory, stochastic processes (queuing systems, Markov chains), and computer simulation. Lecture, 3 hours.
Prerequisite: MAS 311 or ISE 311 or equivalent.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MAS 496. Directed Studies in Business Analytics. 1-3 Credit Hours.
Supervised readings, individual research project, or independent investigation of selected non-STEM related problems in the discipline. Offered only by special arrangement with supervising faculty member, who approves topic and evaluation process at time of registration.
Components: THI.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 497. Directed Studies in Business Analytics. 1-3 Credit Hours.
Supervised readings, individual research project or independent investigation of selected STEM-related problems in the discipline. Offered only by special arrangement with supervising faculty member, who approves topic and evaluation process at time of registration.
Components: THI.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 498. Special Topics in Business Analytics. 3 Credit Hours.
Special topics in selected non-STEM areas of Business Analytics.
Requisite: Sophomore Standing or Higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 499. Special Topics in Business Analytics. 3 Credit Hours.
Special topics in selected STEM areas of Business Analytics.
Requisite: Sophomore Standing or Higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 547. Computer Simulation Systems. 3 Credit Hours.
Introduction to discrete-event computer simulation and hands-on development of simulation models. Topics include introduction to queuing theory, input and out put analysis, random number generation, and variance reduction techniques. Students practice their modeling skills using commercial state-of-the-art simulation software. Assigned readings of real-life simulation projects complement the material learned in the classroom. Lecture, 3 hours.
Prerequisite: MAS 311 or ISE 311 or equivalent.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MAS 548. Machine Learning for Analytics. 3 Credit Hours.
An introduction to the principles and techniques of machine learning. Topics covered include the machine learning process, data preprocessing, common machine learning techniques and methods for evaluating model performance. The course will involve a combination of lectures, labs, projects and case studies.
Prerequisite: MAS 432.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MAS 549. Big Data Analytics. 3 Credit Hours.
As firms have the ability to access and store large amounts of customer and business data, they are faced with the complexities associated with Big Data. This class will discuss the challenges and potential solutions in working with Big Data through use cases and applications. Hands-on tools and methodologies that are needed when handling, visualizing, and/or analyzing Big Data to solve business critical questions will be presented.
Prerequisite: MAS 332 and MAS 432.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 550. Management Science Internship. 1-3 Credit Hours.
Student is individually assigned to operating business firm or other organization to gain insight into management practice in area of career interest. Periodic reports and conferences are required. Permission of departme nt chair is required prior to registration.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 551. Business Analytics Capstone. 3 Credit Hours.
The goal of the Business Analytics Capstone course is to apply the skills learned throughout the undergraduate degree in Business Analytics to a single data analytics project. Students will work in groups on a project assigned to them by the instructor. Project topics will vary depending on availability, but reasonable efforts will be made to match projects with student interest. The project will expose students to the entire spectrum of Business Analytics; from initiating a project and defining the scope and goals, to data collection, cleaning, and exploration, to modeling and suggesting recommendations based on results. Along the way, students will practice effectively communicating with stakeholders who may or may not be familiar with the complex analytical methods implemented.
Prerequisite: MAS 332 and MAS 342 and MAS 432.
Components: EXP.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAS 555. Management Science Departmental Honors Research Project.. 3 Credit Hours.
Research project to fulfill requirements for Departmental Honors in Management Science.
Components: THI.
Grading: SUS.
Typically Offered: Offered by Announcement Only.