MASTER OF SCIENCE IN BUSINESS ANALYTICS

Business Analytics refers to the skills, technologies, applications and practices for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning by using data and statistical methods. A variety of industries are in need of professionals who can take on positions of responsibility for collecting, analyzing and interpreting data in order to make sound strategic business decisions.

The MS in Business Analytics (MSBA) seeks to fill the talent gap in the area and to prepare graduates for this fast-growing field by developing students' critical skills in data- and model-driven management decision-making in the context of a firm's strategic vision. The program is designed to be completed either in one year's time (full time) or over two years (part time). The program may be taken either asynchronously online or in-person, and students can choose either one for any course. Students may opt to use their elective courses to earn a specialization that is tailored to their career interests. Available specializations include: Artificial Intelligence, Financial Planning and Analysis, Healthcare, Leadership, Marketing Analytics, Quantitative Finance, and, for those who have an undergraduate degree in Accounting or the equivalent, Accounting.

The overarching learning goals of the program are - at the end of the program - for students to be able to:

Goal I: Translate back-and-forth between messy real-world situations and tractable formal models, in problem formulation and solution interpretation, application, and communication.

Goal II: Fluently apply well-defined quantitative and mathematical techniques, including knowing when each one applies and when it does not, and testing such assumptions in the real world.

Goal III: Have both the technical competence and the confidence to both learn and apply novel technologies as needed to solve business problems.

Program

Requirements

The requirements for the MSBA fall into the broad categories of Essentials, Foundations, Professions, Electives, and the Capstone.

Code	Title	Credits
Essentials		
These two Essentials courses are prerequisites for later courses. Either one or both may waived with successful completion of an online test-out exam. For students pursuing the MSBA without a specialization, either one or both of these courses may count towards the three electives:		
DATA 5400	Applied Business Statistics (no prerequisites)	
DATA 5405	Python Fundamentals (no prerequisites)	
Foundations		
Each of these three Foundations courses are required for all MSBA students and form the basis and prerequisites for the Professions courses:		9
DATA 6500	Leading with Analytics (no prerequisites) [1]	
DATA 6505	Data Munging in Python (prerequisite: DATA 5405)	
DATA 6510	Data Warehousing and Visualization (no prerequisites)	
Professions		
Professions courses introduce students to the various fields and disciplines that use analytics in the real world as well as the skills most necessary for those professions. Each course has its own specific prerequisites. Students choose any three of the following courses to fulfill their Professions requirement:		9
DATA 6520	Analytics Consulting and Strategy	
DATA 6530	Statistics and Forecasting [1]	
DATA 6540	Business Intelligence and Data Storytelling	
DATA 6545	Data Science and MLOps	
DATA 6550	Big Data Management and Data Ops	
Electives		
Students are required to complete an additional 9 credits (3 courses) of graduate work. Students may choose elective courses either to fulfill the requirements of one of the specializations listed below, or to enrich their background in an area of interest. If no specialization is chosen, either or both of the Essentials courses DATA 5400 and DATA 5405 may count towards these electives. Otherwise, the courses must be at the 6500-level.		
Capstone		
Students must complete the capstone course after completing their Foundations and Professions requirements. The MSBA Capstone Experience infuses preparatory elements of the capstone course into the Foundations and Professions courses so that MSBA students are essentially ready to propose their capstone research project at the beginning of the capstone course.		
DATA 6999	Capstone: Business Analytics Applications (prerequisite: 18 or more credits of DATA courses at the 5000-level or higher)	3
Total Credits		**21**

[1]   Designated research course.

[2]   Students are required to complete an additional 9 credits (3 courses) of graduate work at the 6000-level. Students may choose elective courses either to fulfill the requirements of one of the specializations listed below, or to enrich their background in an area of interest. Please note: Students must complete the appropriate prerequisite(s) before taking 6000-level graduate courses chosen as MS Business Analytics program electives.

Accounting Specialization

To be eligible to pursue this specialization, students must have an undergraduate degree (BS or BA) with a major in accounting or the equivalent. The equivalent of an undergraduate degree in accounting includes the successful completion of: intermediate accounting (six credits), advanced accounting (three credits), cost accounting (three

credits), auditing (three credits), and U.S. taxation (three credits). Deficiencies will be handled on a case-by-case basis.

To complete a specialization in Accounting, students will take any three graduate Accounting or Taxation courses at the 6000-level for their required electives. Students trying to meet educational requirements for CPA certification are encouraged to consult with the Director of Graduate Accounting Programs in selecting their graduate Accounting or Taxation courses.

Artificial Intelligence Specialization

Code	Title	Credits
To complete a specialization in Artificial Intelligence, select three courses from the following:		9
DATA 6545	Data Science and MLOps (if not already taken in Professions)	
DATA 6550	Big Data Management and Data Ops (if not already taken in Professions)	
DATA 6560	Sports Analytics (no prerequisites)	
DATA 6570	Artificial Intelligence Applications (no prerequisites)	
DATA 6575	Deep Learning and Artificial Intelligence (prerequisite: DATA 6545)	
DATA 6900	Contemporary Topics Seminar	
Total Credits		**9**

Financial Planning and Analysis Specialization

Code	Title	Credits
To complete a specialization in Financial Planning and Analysis, the following courses are required:		9
ACCT 6500	Accounting Information for Decision-Making	
FNCE 6500	Stakeholder Value	
FNCE 6530	Corporate Finance	
Total Credits		**9**

Healthcare Specialization

Code	Title	Credits
To complete a specialization in Healthcare, select three courses from the following:		9
NURS 7602	Healthcare Economics and Marketing	
NURS 7605	Advanced Health Policy	
NURS 7613	Finance and Quality Management in Healthcare Organizations	
NURS 7614	Information Technology for Healthcare Improvement	
Total Credits		**9**

Leadership Specialization

Code	Title	Credits
To complete a specialization in Leadership, select three courses from the following:		9
MGMT 6500	Leadership (prerequisite: MGMT 5400)	
MGMT 6504	Managing People for Competitive Advantage	
MGMT 6505	Human Resource Strategies: An Analytics Approach	
MGMT 6508	Strategic Management of Technology and Innovation: The Entrepreneurial Firm	
MGMT 6530	Entrepreneurship	
MGMT 6540	Cross Cultural Management and Sustainable Leadership	
MGMT 6584	Global Competitive Strategy	
Total Credits		**9**

Marketing Analytics Specialization

Code	Title	Credits
To complete a specialization in Marketing Analytics, the following courses are required:		
MKTG 6520	Research for Marketing Insights and Decisions	3
MKTG 6580	Multivariate Analysis for Consumer Insights	3
Select one course from the following:		3
MKTG 6525	Customer Experience	
MKTG 6560	Category Management and Shopper Insights	
MKTG 6570	Digital Marketing and Analytics	
MKTG 6583	Pricing Strategies and Analytics	
MKTG 6590	Experimental Research	
MKTG 6900	Contemporary Topics	
Total Credits		**9**

Note: MKTG 5400 or its equivalent is a required prerequisite for all upper-level marketing courses.

Quantitative Finance Specialization

Code	Title	Credits
To complete a specialization in Quantitative Finance, the following course is required:		
FNCE 6540	Investment Analysis	3
Select two courses from the following:		6
FNCE 6545	Portfolio Management	
FNCE 6565	Derivative Securities	
FNCE 6570	Fixed Income Securities	
FNCE 6580	Financial Risk Management	
FNCE 6595	Research Methods in Finance	
Total Credits		**9**

Dual Degree MBA and MS in Business Analytics

Students may pursue dual degrees, earning both a Master in Business Administration and a Master of Science in Business Analytics, in less time and with fewer credits than if they were to complete both degrees separately. Please see the Dual Degree MBA/MSBA section of this catalog for details.

Dual Degree MS in Finance and MS in Business Analytics

Students may pursue dual degrees, earning both a Master of Science in Finance and a Master of Science in Business Analytics, in less time and with fewer credits than if they were to complete both degrees separately. Please see the Dual Degree MSF/MSBA section of this catalog for details.

Courses

DATA 5400 Applied Business Statistics   3 Credits
Using spreadsheet software, this hands-on course teaches a variety of quantitative methods for analyzing data to help make decisions. Topics include: data presentation and communication, probability distributions, sampling, hypothesis testing and regression, and time series analysis. This course uses numerous case studies and examples from finance, marketing, operations, accounting, and other areas of business to illustrate the realistic use of statistical methods. Previously QA 0400, BUAN 5400.

DATA 5405 Python Fundamentals   3 Credits
This course is an introduction to Python, with an emphasis on general programming concepts (structure, logic, data, etc.) that apply to just about any general purpose programming language. Starting with a review of fundamental programming concepts, the course uses short lessons, quizzes, and coding challenges to cover the basics of how Python is used in a professional Business Analytics setting. The course concludes with a final project designed to demonstrate proficiency. Previously BA 0405, BUAN 5405.

DATA 5410 Analytics Programming for Business   1.5 Credits
This course focuses on quantitative modeling and analyzing business problems using spreadsheet software, such as Excel and its add-ins. Topics include descriptive analytics, visualizing and exploring data, predictive modeling, regression analysis, time series analysis, portfolio decisions, risk management, and simulation. Business models relevant to finance, accounting, marketing, and operations management are set up and solved, with managerial interpretations and "what if" analyses to provide further insight into real business problems and solutions. Open to MS Management students only. Previously BA 0410, BUAN 5410.

DATA 6100 Fundamentals of Analytics   3 Credits
This is an introductory level graduate course focusing on spreadsheet modeling to analyze and solve business problems. Topics include descriptive analytics, data visualization, predictive modeling, time series analysis, and data mining. Contemporary analytical models utilized in finance, marketing, accounting, and management are set up and solved through case studies. Previously IS 0500, ISOM 6500.

DATA 6500 Leading with Analytics   3 Credits
This course provides a broad overview to the analytics profession, with a focus on data driven leadership and hands-on analytical skills. Starting with a foundation of analytical framing and statistical analysis, the course moves on to more advanced topics like data visualization and summarization, descriptive and inferential statistics, spreadsheet modeling for prediction, linear regression, risk analysis using Monte-Carlo simulation, linear and nonlinear optimization, and decision analysis. The course culminates with a group research project using curated big data datasets, as well as individual exercises in problem framing intending to be a component of an analytics capstone experience. Previously BA 0500, BUAN 6500.

DATA 6505 Data Munging in Python   3 Credits
Prerequisite: DATA 5405 or placement exam.
In this course, we introduce Python as a language and tool for collecting, preprocessing, and visualizing data for business analytics. Since Python is one of the most popular programming languages in machine learning, its fundamental programming logic and knowledge is essential for students to apply in analytics and to succeed in the job market. Specifically, this course focuses on the data munging phase, which includes collecting, preprocessing, and visualizing data, with respect to applications in business modeling, optimization, and statistical analysis. In addition, important techniques such as web scraping and Application Programming Interface (API) usage are introduced. The course culminates with a final project in exploratory data analysis, as well as individual exercises in data munging intending to be a component of an analytics capstone experience. Previously BA 0505, BUAN 6505.

DATA 6510 Data Warehousing and Visualization   3 Credits
This course introduces datasets, databases, data warehouses, data management, and data visualization techniques. Starting from the relational data model and basic database fundamentals, the course offers a hands-on introduction to Structured Query Language (SQL) for defining, manipulating, accessing, and managing data, accompanied by the basics of data modeling and normalization needed to ensure data integrity, including entity relationship modeling and diagrams. Additionally, the course simultaneously offers hands-on learning with visualization and interactive dashboards in Tableau. The course concludes with a comprehensive data warehousing and visualization project that gives each student the opportunity to integrate and apply the new knowledge and skills learned from this class. Previously BA 0510, BUAN 6510.

DATA 6520 Analytics Consulting and Strategy   3 Credits
Prerequisite: DATA 6500 or ISOM 5400 or ISOM 6500.
With the rise of analytics for cutting-edge business innovation, the industry needs business leaders who can solve an organization's most important problems by asking and answering questions using data. These business consultants need to bridge both the data analytics and business fields. This class tries to provide a "real world" consulting experience through a project-centric experiential approach, in addition to case studies of analytics consulting and business problem solving using descriptive, predictive and prescriptive analytics. When possible, class projects will be client-driven using community partners. Students work in teams using analytics to answer the client's current and important business questions using data. The students will approach these as business analytics consultants by using effective project management to gathering requirements, using continuous client engagement to deepen understanding of the problem, suggesting ways in which to explore the question and its possible solutions through data, running different data models to approach the solution, working with clients to come up with effective analytics strategies, making business presentations based on findings, incorporating the inevitable changes that come with real world projects, and recommending strategic solutions based on their findings. Previously IS 0520.

DATA 6530 Statistics and Forecasting   **3 Credits**
Prerequisite: DATA 5400 or placement exam.
This course introduces analytical techniques used for decision-making under uncertainty. Topics include time series and other forecasting techniques, such as Monte Carlo simulation, to assess the risk associated with managerial decisions. Specifically, we will cover data collection methods, time dependent models and analysis, advanced solver, time series techniques, exponential smoothing, moving averages, and Box-Jenkins (ARIMA) models. Application examples include financial models - stock prices, risk management - bond ratings, behavior models - customer attrition, customer likes/dislikes, buying patterns - propensity to buy, politics - identify swing voters, and sales. Previously QA 0500, BUAN 6530.

DATA 6540 Business Intelligence and Data Storytelling   **3 Credits**
Prerequisite: DATA 6510.
Modernly, business intelligence has become far more interactive. This course provides an advanced application and overview of the new techniques for building interactive dashboards and tools now prevalent in this profession. Additionally, with data overload happening on every level, the importance of good data storytelling has soared. Using programming languages and environments such as Tableau and R, this course introduces students to the business intelligence profession and teaches the skills necessary to develop and deploy cloud-based interactive apps to assist in data and analytical storytelling, including insights into user interface design (UI) and user experience design (UX). The course concludes with a comprehensive project. Previously BA 0540, BUAN 6540.

DATA 6545 Data Science and MLOps   **3 Credits**
Prerequisite: DATA 6505.
This course provides an advanced understanding of the practices of machine learning techniques and operations (MLOps), with a special focus on business applications. To assure practical relevance, the emphasis of this course is on the applications of techniques and tools realizing machine learning in terms of business analytics. The course is organized following the Cross-Industry Standard Process for Data Mining (CRISP-DM) and all learned techniques are applied in a couple of semester-wide projects. Python is introduced and illustrated through a series of tutorials and case studies, and Automatic Machine Learning (AutoML) is introduced as well. Students are expected to actively participate in the course deliverables through independent assignments, lab work, and group projects. The course culminates with a final project in predictive analytics, as well as individual exercises in modeling and interpretation intending to be a component of an analytics capstone experience. Previously BA 0545, BUAN 6545.

DATA 6550 Big Data Management and Data Ops   **3 Credits**
Prerequisites: DATA 6505 and DATA 6510.
This course introduces the fundamentals of Big Data management and its implementation in the public cloud. Topics include classic theories of data architecture, dimensional database design, data pipelines, and data governance, supplemented with the latest developments in the emerging field of DataOps. The theory is grounded with hands-on experience building databases and data pipelines with the Modern Data Stack. Previously IS 0550.

DATA 6560 Sports Analytics   **3 Credits**
Sports analytics is transforming the way teams, leagues, players, coaches, referees, and fans perceive and appreciate their favorite pastimes and games, including major team sports such as baseball, basketball, football, soccer, cricket, and rugby, more individualized sports like tennis and golf, and brand-new innovations such as e-sports. In this course, students will gain experience in framing analytical questions in sports, discover and evaluate cutting-edge research and findings in sports analytics, develop hands-on skills in using and implementing sports analytics solutions, and learn how to communicate findings to a non-analytical audience in an impactful and actionable way. This course culminates in a scholarly sports analytics research paper.

DATA 6570 Artificial Intelligence Applications   **3 Credits**
Artificial intelligence is becoming far more prevalent in the business and analytics worlds, yet many analytics professionals are excluded from participating in this new wave because they lack the strong coding foundations that are typically needed to implement this new technology from scratch. However, recent advances in AI/ML have coincided with desktop and cloud tools that can be deployed far more easily to generate new models without complicated coding requirements. This course will teach students how to discover, use, and daisy-chain such tools to solve real-world business problems in ways that would otherwise be impossible.

DATA 6575 Deep Learning and Artificial Intelligence   **3 Credits**
Prerequisite: DATA 6545.
This course introduces students to the latest development of machine learning, namely deep learning, as well as its applications to a variety of domains. Fundamental knowledge, such as the architectures of the deep neural networks, extraction of high-level features representing unstructured data, backpropagation, and stochastic gradient descent. Additionally, students get hands-on experience building deep neural network models with Python. Topics covered in this class include model building and optimization, image classification, natural language processing, generative models, and so forth. These topics cover the foundations and the latest developments in the field of deep learning.

DATA 6900 Contemporary Topics Seminar   **3 Credits**
This course draws from current literature and practice on information systems and/or operations management. The topics change from semester to semester, depending on student and faculty interest and may include: project management, e-business, management of science with spreadsheets, e-procurement, executive information systems, and other socioeconomic factors in the use of information technology. Previously IS 0585, ISOM 6900.

DATA 6990 Independent Study   **3 Credits**
This course provides an opportunity for students to complete a project or perform research under the direction of an Information Systems and Operations Management (ISOM) faculty member who has expertise in the topic being investigated. Students are expected to complete a significant project or research paper as the primary requirement of this course. Enrollment by permission of the ISOM Department Chair only. Previously IS 0598, ISOM 6990.

DATA 6999 Capstone: Business Analytics Applications   3 Credits
Prerequisites: DATA 6530, DATA 6540, DATA 6545.
This capstone course for the MS Business Analytics program is to be taken in the last term before graduation. The purpose is to apply and integrate knowledge and skills learned in the program (statistics, modeling, data management, data mining, etc.) to a live data analytics project. The course is project-based, with students collaborating on their work under the guidance of faculty members. Application areas and format of the projects may vary, depending on faculty, dataset, and budget availability. However, the work should be rich enough to demonstrate mastery of business modeling and technology, with each student making a unique, demonstrable contribution to completion of the work. Previously BA 0590, BUAN 6999.

Career Development

The Dolan Career Development Center provides professional development services that enrich graduate students' academic experiences and inspire tomorrow's business leaders. For more information, reference the Career Development section of this catalog.