

MSBA Course Descriptions¹

BA-775: Business Analytics Toolbox (4 credits)

Much of the data owned by companies resides in databases. This hands-on course introduces students to various relational databases and SQL, which is the standard language that is used to query the data. By working with a variety of datasets, students will become familiar with the fundamentals of both modern and traditional databases and the essentials of writing SQL queries, such as select, filter, sort, group, and join. Using Google Cloud Platform (GCP), students will set up their own databases in the cloud and learn how to work with real-world data. Some additional cloud components such as cloud storage and cloud computing will be covered as well. Students will learn how to set up a virtual cloud environment where they will run their analysis. Once the fundamentals of databases and cloud are furnished, students will work towards creating visualized summaries of the data in a dashboard. Students will become familiar with storytelling using data and learn the key aspects of creating meaningful business intelligence dashboards.

BA-780: Introduction to Data Analytics (3 credits)

This course will primarily focus on data and the key techniques that are necessary when working programmatically. Data is obtained from a data source; students will learn how to work with the most common data sources and how to load it into Python. Once the data is loaded and before it can be analyzed one needs to apply a series of steps known as data munging to get a tidy and workable dataset. Data munging will be the core of this course, where students will learn how to clean the data, handle missing values, perform data transformations and manipulations, and prepare it for analysis. Through learning data visualization, exploratory techniques, and summarizing methods students will become competent to perform exploratory data analysis. These techniques are typically applied before any modeling begins and can help to confirm the validity of the original business question or to refine it. They are also stepping stones in informing the development of more complex statistical models. The course will conclude with creating data reports and interactive dashboards, two major communication tools required in any data science project.

BA-810: Supervised machine learning (3 credits)

The internet has become a ubiquitous channel for reaching consumers and gathering massive amounts of business-intelligence data. This course will teach students how to perform hands-on analytics on such datasets using modern supervised machine learning techniques through lectures and in-class exercises. Students will analyze data using the R programming language, derive actionable insights from the data, and present their findings. The goal of the course is to create an understanding of modern analytics methods, and the types of problems they can be applied to. The course is open to students with or without a technical background who are interested in analytics. While no prior programming experience is required, students will learn the fundamentals of the R programming language to build and test predictive models.

BA-815: Competing with Analytics (3 credits)

The objective of this class is to provide a strategic overview of how business analytics is applied in practice across different industries and functions, how it delivers value, which skills are core to capturing this value, and which pitfalls await organizations. The course will rely extensively on seasoned industry experts sharing their direct experiences and include readings, case study discussions,

¹ Course descriptions are tentative and can change anytime; list of electives is subject to change; some electives may require faculty approval.

and hands-on team assignments. The goal is not to go deep, but rather to provide pertinent examples of application in industry (e.g. recommender systems, web analytics, personalization campaigns, pricing and revenue management, ML Ops, data storytelling, demand forecasting/sensing, inventory optimization, fraud and claims analytics, ESG modeling, etc.)

BA-820: Unsupervised and Unstructured Machine Learning (3 credits)

It has been reported that as much as eighty percent of the world's data is unstructured. This course will cover the methods being applied to both unstructured and unlabeled datasets. Through a series of lectures and hands-on exercises, students will examine the techniques to unlock insights from data that appear to lack a known outcome. The goal of this course is to compare and contrast the application of various methods being applied today and provide the foundation to develop impactful insights from these datasets.

BA-830: Business Experimentation and Causal Methods (3 credits)

This course teaches students how to measure impact in business situations and how to evaluate others' claims of impact. We will draw on a branch of statistics called causal inference that studies when data can be used to measure cause and effect. The course will begin by discussing randomized controlled trials, the most reliable way of measuring effects, and will move onto other methods that can be used when experiments are not feasible or unavailable. We will learn how to implement these methods in R. Causal inference has become especially important for digital businesses because they are often able to run experiments and to harness 'big data' to make decisions. We will illustrate the methods we learn with examples drawn from digital businesses such as Airbnb, Ebay, and Uber and through topic areas such as price targeting, balancing digital marketplaces, reputation systems, measuring influence in social networks, and algorithmic design. We will also use data from other business and social science applications.

ES-710: Teaming (1 credit)

This course introduces the challenges of leading and participating in teams and project groups. It emphasizes the roles of team members and leaders, how to motivate within a team environment, and how to create an environment in which teams and their members increase their capabilities. This course also provides support for students as they work on program projects and helps students to gain both knowledge of team dynamics and the skills to shape them.

ES-720: Management Communication (1 credit)

Effective communication skills are key to the success of any manager or executive as you persuade, inform, and lead your clients, colleagues, bosses, and subordinates. This course explores persuasive verbal and written communication in a variety of management settings, including formal meeting-style presentations as well as strategic written business documents. You will learn to assess your audience, understand the strategic choices available when communicating, and choose the correct strategy for the audience at a given time. Students will learn to construct a persuasive argument and to deconstruct arguments made by others, recognizing and avoiding reasoning flaws. Students will give planned and impromptu presentations that are organized logically and persuasively, and that reflect best practices in using visual aids. Students will also learn best practices in business writing, for example, in writing memos and substantive emails.

BA-840: Data Ethics: Analytics in Social Context (3 credits)

This class examines ethical issues of data, data science, and algorithms. We consider unintended consequences and transparency of algorithms, phenomena such as mass personalization and experimentation, and examine competing ideas about privacy and the sometimes blurry line between the private and the public spheres in the digital age. The course is intended to place analytics in a social context and equip students to anticipate and understand the ethical tradeoffs they will be making in the process of doing analytical work.

BA-860: Marketing Analytics (3 credits)

This is an introductory course on Digital Marketing emphasizing analytics that seeks to familiarize students with digital marketing tactics. At the heart of marketing lies consumers and their marketing journey through the stages of awareness, intent, conversion and finally retention. In this course, we will learn how digital has revolutionized the interactions between firms and consumers along this journey. Digital offers powerful tactics to reach consumers along the funnel: online display ads raise awareness, search listings reach consumers with intent, on-site e-commerce marketing facilitate conversion, and social media both energizes and retains customers.

BA-865: Advanced Analytics Topics I – Introduction to Neural Networks (3 credits)

This course will introduce you to the Python programming language and the ecosystem of software packages needed for Data Science and to build and train Neural Networks in Python, including: NumPy, Pandas, SKlearn, and PyTorch or Tensorflow. After reviewing key Python building blocks, the course will focus on Neural Networks and Deep learning Concepts and implementation in PyTorch/Tensorflow. This is an intensive course and the majority of it will be presented through interactive python notebooks (Google Colab).

BA-870: Financial Analytics (3 credits)

This is an introductory course on Financial Analytics providing students with knowledge about key “financial” concepts (financial accounting, financial statements, managerial accounting, corporate finance, and investments) so that they can intelligently apply their prior analytics knowledge and tools to real-world financial applications.

BA-875: Operations and Supply Chain Analytics (3 credits)

This is an introductory course on principles, methods, and techniques used in operations and supply chain analytics. Emphasis is given on the big data age where firms are continuously designing, assessing, and improving the systems that create and deliver their products and services. Students will learn visual representation techniques to enhance their understanding of complex data and models. Such visual techniques will be paired with network analysis to better identify patterns, trends and differences from datasets across categories, space, and time. The course will also draw on real-world applications to demonstrate their use in a variety of contexts.

BA-880: People Analytics (3 credits)

This course focuses on the strategies that can be used to design and implement people analytics in organizations. The course covers theory, practice, and statistical methods that are critical for addressing people-related challenges at companies, such as hiring, retaining, evaluating, rewarding performance, and tracking teams and social networks, to name a few. By drawing on the latest company practices, research, and cases studies, this course will help you develop intuition about how people analytics can

be applied in the real world, advance your business' objectives through the strategic management of people, and also your own career.

BA-885: Advanced Analytics Topics II – Neural Networks (3 credits)

In this course we will open the neural network (NN) "black box" and examine how these mathematical modeling tools evolved to become the powerful data analysis engines that many companies rely on today. We will start with simple, comprehensible, few neuron models that we can build from scratch on our devices, and *byte by byte* grow our skills to understand and manipulate the enterprise-scale networks with complex architectures that are currently used in businesses ranging from Alpha-Go to Tesla. As we explore the mathematical and computational representations of different network architectures, you will obtain a solid understanding of how to choose and customize NN models that fit best to the task at hand, aware of their strengths and challenges, and what these mean for practitioners in business analytics. We will also draw examples related to global challenges such as climate crisis.

BA-888: Capstone Project (3 credits)

The capstone project course will allow students to work on a data project in a team setting. The goal is for the students to solve a real-world problem using the knowledge, tools, and techniques acquired throughout the program and show their skills to potential employers. Students will present intermediate progress during a poster session and present their final findings to a faculty panel at the end of the year. Throughout the project student teams will be expected to work in agile sprints with regular updates to their business and faculty advisor.

IS-843: Big Data Analytics for Business (3 credits)

This programming-based analytics course will cover how to perform statistical analysis of large datasets that do not fit on a single computer. We will design a Hadoop cluster on Google Cloud Platform to analyze these datasets. Utilizing Spark, Hive, and other technologies, students will write scripts to process the data, generate reports and dashboards, and incorporate common business applications. Students will learn how to use these tools through Jupyter Notebooks and experience the power of combining live code, equations, visualizations, and narrative text. Employer interest in these skills is very high. Basic programming in python, and basic analytics are prerequisite.

MKG-852: Data Driven Marketing Decisions (3 credits)

This course will focus on developing marketing strategies driven by marketing analytics. Topics covered include market segmentation, targeting, and positioning, and new product development. The course will draw on and extend students' understanding of issues related to quantitative analysis and principles of marketing. The course will use a combination of cases, lectures, and a hands-on project to develop these skills.

MKG-856: Consumer Insights (3 credits)

Marketing, in particular, begins and ends with the consumer -- from determining consumer needs to ensuring customer satisfaction. In this course, we will explore the most recent scientific research in marketing, psychology, and behavioral economics related to consumer behavior. We will develop your ability to understand and influence what people want, how people decide what and when to buy, and whether people will be satisfied or dissatisfied with their decisions. These psychological insights are particularly useful for marketing strategy, brand positioning, and marketing communication decisions, but also yield insight into common biases in judgment and decision making, beyond marketing, to which you would otherwise fall prey. Why people are willing to drive across town to save \$5 on a tank of gasoline, for example, when they would not drive a minute to save \$5 on a refrigerator. We will discuss

some of these applications in class. In addition, we will examine the methodology of market research (specific to consumer behavior) to build the tools you will need to interpret and base decisions on it. Readings will include primary empirical research articles (e.g., Journal of Consumer Research articles), business journal articles, and research reviews (e.g., Harvard Business Review articles). The course includes lecture, discussion, an exam, and a team term project.

MKG-864: Pricing Strategy and Tactics (3 credits)

This course focuses on the practical needs of the marketing manager making pricing decisions. Students learn the techniques of strategic analysis necessary to price more profitably by evaluating the price sensitivity of buyers, determining relevant costs, anticipating and influencing competitors' pricing and formulating an appropriate pricing strategy.

BS-803: Statistical Programming for Biostatisticians (2 credits)

This course will focus on skills required for advanced computing applications in biostatistics. Students will learn statistical programming and methods such as loops, functions, macros as well as data visualization techniques in SAS and R. Furthermore, the course will provide an introduction to Linux and basic statistical programming in Python. Lab sessions will also provide students with basic computing skills to enroll in more advanced statistical classes such as BS830 and BS857.

BS-806: Multivariable Analysis for Biostatisticians (4 credits)

This course will focus on skills required for effective conduct of data analysis. This course will focus on multiple regression modeling and multivariate analysis to cover multi-way Anova, multiple linear regression, classification and regression trees, automated model search, model fit and diagnostic, experimental design and multivariate analysis (PCA and cluster analysis) with particular emphasis on applications in medicine and public health.

HM-817: Advances in Digital Health (3 credits)

Digital technologies are fundamentally transforming the health sector. Health information technology now permeates every segment of the health value chain, starting with the search for health information, to improving patient outcomes, to improving health. In this course students explore the evolving digital health landscape through a mix of case studies, practitioner talks, individual papers and team projects. Students will enhance their digital health requirements and systems selection toolbox. They will develop competence in current digital health technology standards, gain a deeper understanding of the strategic drivers of digital health through the eyes of the healthcare CIO and CMIO, the operational challenges from the perspective of the end user and the healthcare providers, and challenges of incorporating digital health technologies into existing workflows.

PM-804: Digital Disruption in Health (2 Credits)

This course is designed to introduce students to health information technologies (HIT) and how they are changing delivery of care in the US--- including effects on efficiency, equity, effectiveness and patient satisfaction. Students explore issues related to electronic medical records, standards for meaningful use, personal health records, public health information systems, interoperability of HIT, and mHealth. Students examine the impact of federal government intervention to increase HIT adoption, and compare the use of HIT in the US with other industrialized countries. Students apply their knowledge by working through an in-depth case study of an implementation of HIT in a health care delivery organization or public health department. Readings introduce theoretical frameworks related to HIT, including the Technology Acceptance Model. Assignments include a policy memo, an individual case analysis, and in-class quizzes.

BA890: Analytics Practicum

The analytics practicum allows students to gain individual, practical experience related to business analytics. Students will complete a report based on one of the following:

- **Reflection paper related to an internship experience:** Students should describe work accomplished and knowledge gained from working on a part-time or full-time internship in an area directly related to Business Analytics (e.g. data engineering, data analysis, data modeling, machine learning, data visualization). The paper should demonstrate the student's knowledge of Business Analytics concepts acquired through the internship experience.

- **Research Project:** Students should select a topic related to Business Analytics which has not been covered in existing coursework or significantly extends concepts taught in the MSBA curriculum. The research topic can be novel or can be an extension of work completed during the capstone project. It should be substantive enough in terms of technical, quantitative, data management, or programming aspects and contain appropriate references. Students should not merely compile work of others, but also display genuine critical thinking.