MASTER OF SCIENCE IN DATA SCIENCE

The integration of data science and business knowledge has created a demand for professionals who can make data-driven decisions to help their organizations succeed in today's data-intensive world. The MSDS program includes 33 credits and is full-time and in-person. The program runs over the fall, spring, and summer sessions. The students complete eight required data science courses and choose a three-course specialization (Fintech, International Business, and Global Supply Chain Management). Students may also choose a generalist track (no specialization) that tailors electives to their personal and professional needs. Applicants who do not have the prerequisites for the MSDS program, depending on their background, will be required to take specific bridge courses during the summer before the full-time program begins.

Modern day organizations need individuals who not only understand but know how to leverage and lead with applied data science to optimize both the business side, and product and services side of the organization. Our Master of Science in Data Science (MSDS) program builds on Bryant's expertise in business education to provide all students with a strong foundation in business and feature a modern, open-source-focused curriculum for students who seek the technical expertise required to become data scientist, data engineers, and analyst, and the business skills to apply this knowledge in a business domain of their interest. The program trains students to utilize the tools of data management, data visualization, machine learning, natural language processing, deep learning, AI, cloud, and distributed processing to solve real-world business problems. The program focuses on topics such as reproducible data science experiments, collaborative problem solving, communication, security, and ethical issues that arise in data science and AI.

Upon graduation, students will be proficient programmers in Python, R, SQL, Spark, and Tableau/PowerBI. They will develop a good understanding of deep learning models and their implementation via multiple platforms such as Keras and Pytorch. Additionally, they will have experience with an evolving array of cutting-edge big data management and cloud analysis tools like Microsoft Azure, Amazon Web Services, and Databricks. Students will also apply their data science skills and knowledge in capstone projects along the way and at the end of the program.

Master of Science in Data Science Program requirements:

Required Introduction Course:		
MSDS 515	Preparing for MSDS Success	0
Data Science Foundation Course Requirements:		
ISA 510	Probability and Statistics for Data Analytics	3
ISA 520	Data Visualization and Communication	3
ISA 530	Fundamentals of Machine Learning	3
ISA 540	Large Scale Data Management and Data Ethics	3
Data Science Core Required Courses:		
MSDS 610	Deep Learning	3
MSDS 620	Natural Language Processing	3
MSDS 630	Large Scale Data Analytics	3
MSDS 640	Data Science Capstone	3
Students must pick 3 courses from the list below:		
FIN 501	Programming in Finance	3
FIN 502	Fintech and Blockchain for Finance	3
FIN 503	Fintech and Digital Innovation Fund	3
GSCM 601	Corporate Social Responsibility in Global Supply Chain Management	3
GSCM 603	Advanced Supply Chain Integration	3
GSCM 604	Logistics of International Trade	3
HS 501	Introduction to Healthcare Informatics	3
HS 510	Population Health	3
HS 530	Healthcare Operations and Systems	3
HS 610	Electronic Health Records	3
HS 630	Health Analytics (R, Python, Tableau)	3
HS 640	Project Management	3
IB 601	International Business Management	3
IB 602	Global Human Resource Management	3
IB 603	International Marketing	3
MBA 520	Managing Corporate Enterprise	3
MBA 521	Leading Effective Organizations	3
MBA 522	Reporting and Controlling Resources	3
MBA 523	Managing Information Resources	3
MBA 524	Managing Financial Resources	3
MBA 525	Marketing for Competitive Advantage	3

May opt to take a direct study, co-ops, or special topics in Data Science with program director approval

A minimum of 33 credit hours is required for graduation. Introduction Course in also required.

Global Finance Courses

GFIN 601. Global Financial Management. 3 Credit Hours.
This course deals with the theories and principles of global management. It develops a framework for evaluating the opportunities, costs, and risks of operating in the global markets for goods, services, and financial assets. Topics include the rationale for hedging currency risk, treasury management of international transactions, managing transaction exposure to currency risk, managing operating exposure to currency risk, foreign market entry and country risk management, multinational capital budgeting, multinational capital structure and cost of capital, and corporate governance. Students will explore global financial management by analyzing case studies and preparing a country analysis report for market entry.

GFIN 691. Directed Independent Study in Global Finance. 3 Credit Hours.
This course is designed to allow an individual academic program to be tailored to fit the unique interests of a graduate student. At the initiation of the graduate student, the faculty member and the student will develop an academic plan that is submitted to the College of Business for final approval.

Global Supply Chain Management Courses

GSCM 601. Corporate Social Responsibility in Global Supply Chain Management. 3 Credit Hours.
This course will focus on the strategic impact of corporate social responsibility on the global supply chain. The goals of this course are to provide students with an in-depth knowledge of the various types of supply chain events that are connected to corporate social responsibility and the strategic best practices to mitigate these events. Lectures will provide a theoretical basis and illustrate the practical application of concepts. Cases, articles from academic journals, short videos, assignments, and one exam will be utilized to reinforce the subject matter and provide a variety of learning modes.

GSCM 603. Advanced Supply Chain Integration. 3 Credit Hours.
A key challenge to successful supply chain management is coordination of activities across the supply chain. This course will provide strategies for supply chain design by identifying the appropriate level of integration and coordination to improve the long-term performance of the individual companies and the supply chain as a whole. Topics include demand forecasting, integrated business management (sales and operations planning), demand management and CPFR, demand planning, and relationship management. Hands-on learning will take place within a global supply chain management simulation.

GSCM 604. Logistics of International Trade. 3 Credit Hours.
This course provides basic preparation in transportation economics and management as well as international transport and logistics. This course provides basic knowledge of import and export requirements for making contracts, payments, insurance, managing risk, arranging transportation, dealing with customs, and international trade law and theory. The course is taught in two modules: International Transport and Logistics, and Logistics Analysis. Attention is given to how transportation pricing and tradeoffs work, shipper and carrier strategies, and logistics processes for moving goods and people internationally. Students will quantitatively develop and assess strategies for transportation and network planning, inventory decision making, facility location planning, and vehicle routing. The course objectives are based on a partial list of the exam requirements for the Certification in Transportation and Logistics (CTL) professional credential offered by America's oldest logistics profession organization, The American Society of Transportation and Logistics (AST&L).
Prerequisites: MBA526.

GSCM 691. Directed Independent Study in Global Supply Chain Management. 3 Credit Hours.
The course is designed to allow an individual academic program to be tailored to fit the unique interests of a graduate student. At the initiation of the graduate studies, the faculty member and student will develop an academic plan that is submitted to the director of the College of Busines for final approval.

Information Syst. Analytics Courses

ISA 510. Probability and Statistics for Data Analytics. 3 Credit Hours.
Probability and statistics are at the foundation of data science and artificial intelligence. The objective of this course is to provide students with an understanding of how to analyze and understand data through statistics and probability. As such, this course provides an overview of more foundational probability and statistics topics, before delving into more advanced topics through projects. Students will work with data in Python Notebooks to demonstrate their analytical skills.
Session Cycle: Fall
Yearly Cycle: Annual.

ISA 520. Data Visualization and Communication. 3 Credit Hours.
This course examines the art and science of data visualization. It teaches how to visually explore data and how to criticize, design, and implement data visualizations. It teaches the fundamentals of human perception and data visualization, exploratory data analysis and the importance of interaction in exploration, techniques for data visualization of specific data sets (networks, temporal data, geographic data, business data, etc..), and storytelling. The course will enable students to describe a visualization problem, to explore the data using visualizations, to discuss and design appropriate visualization concepts, and to implement and critically reflect on them. We will learn multiple popular data visualization tools such as Power BI, Tableau, and Python to implement our data visualization projects throughout the course.
Session Cycle: Fall
Yearly Cycle: Annual.

ISA 530. Fundamentals of Machine Learning. 3 Credit Hours.
This is a fundamental machine learning course requiring background knowledge including probability theory, linear algebra, calculus as well as good programming skills. The programming environment used in the lecture examples, assignments, and projects will be using the following tools including Python/Pytorch/Keras. The course will cover many of the most important mathematical foundations and computational tools of modern machine learning as well as advanced methods and frameworks used in modern machine learning. We will examine specific models from the literature and examine how they can be used for modeling particular types of data. This course treats both the art of designing efficient machine learning algorithms as well as the science of analyzing and evaluating the properties and computation efficiency of algorithms. This course will help students to select and potentially develop appropriate methods and approaches to problems in real applications.
Session Cycle: Fall
Yearly Cycle: Annual.

ISA 540. Large Scale Data Management and Data Ethics. 3 Credit Hours.
This course introduces data preparation and data management with a focus on applications in large-scale analytics projects utilizing relational, document, and graph database systems. Students learn about the relational model, the normalization process, and structured query language. They learn about data cleaning and integration, and database programming for extract, transform and load operations. Students work with unstructured data, indexing and scoring documents for effective and relevant responses to user queries. They learn to load, store and process big data in a cloud environment. In addition, they explore the social and ethical dimensions of data science and critically evaluate all stages of the data lifecycle from data collection and storage to data analysis and use.
Session Cycle: Fall
Yearly Cycle: Annual.

ISA 691. Directed Independent Study. 3 Credit Hours.
Students interested in exploring an idea, contributing to research, or developing a project may do so under the guidance of an affiliated faculty member in the Data Science/Business Analytics program. At the initiation of the graduate student, the faculty member and the student will develop an academic plan that is submitted to the Chair of the ISA department for approval.

ISA 692. Data Science/Business Analytics Internship. 3 Credit Hours.
ISA internships give students the opportunity for supervised employment in an area where they can apply the Data Science and/or Business Analytics skills they have studied through our curriculum. Interns work at least ten hours per week, meet periodically with a supervising faculty member, and prepare a substantive report on their work experience.
Prerequisites: ISA 510, ISA 520, ISA 530, and ISA 540.

Master of Science Data Science Courses

MSDS 515. Preparing for MSDS Success. 0 Credit Hours.
This course is designed to provide entering MSDS students with the skills necessary to be successful in a graduate data science program. Students will garner an understanding of the use of the critical expectations of a graduate level program.

MSDS 610. Deep Learning. 3 Credit Hours.
This is an advanced course requiring background knowledge including probability theory, linear algebra, calculus, understanding of machine learning methods as well as good programming skills. The course will cover many of the most important mathematical foundations and computational tools of deep learning as well as advanced methods, frameworks, and programming tools used in modern deep learning and artificial intelligence. We will examine popular deep learning models from the literature and examine how they can be used for modeling a variety of types of data. This course treats both the art of designing efficient deep learning and artificial intelligence models as well as the science of analyzing and evaluating the properties and computation efficiency of such models. This course will help students to select and potentially design appropriate models to solve real problems. There will be a heavy emphasis on implementation using Python, Keras (for deep learning), and Pytorch (for deep).
Prerequisites: ISA 510 and ISA 530
Session Cycle: Spring
Yearly Cycle: Yearly.

MSDS 620. Natural Language Processing. 3 Credit Hours.
There are many business and artificial intelligence applications that need to process unstructured text data. This course teaches students how to overcome the unique challenges of working with unstructured text in machine learning and deep learning models. Students learn about how to create text representations, embeddings, and features for modeling purposes. Natural language processing applications include sentiment classification, topic modeling, text generation, and named entity recognition. Students in this course will implement these artificial intelligence models in Python, gaining experience with libraries such as NLTK and Hugging Face.
Prerequisites: ISA 530
Session Cycle: Spring
Yearly Cycle: Yearly.

MSDS 630. Large Scale Data Analytics. 3 Credit Hours.
The course focus on manipulating, storing, analyzing, and visualizing big data. The emphasis of the course will be on mastering Spark which emerged as the most important big data processing framework. We will examine Spark SQL, Spark Machine Learning, Spark Graph Analytics, Spark Natural Language Processing, Spark Deep Learning, and Spark Streaming which allows the analysis of data in near real-time. Students will implement machine learning algorithms and execute them on real cloud systems like Amazon AWS and Databricks.
Prerequisites: ISA 530, ISA 540
Session Cycle: Summer Term 1
Yearly Cycle: Yearly.

MSDS 640. Data Science Capstone. 3 Credit Hours.
Students will execute a full data science project, developing their skills as data scientists with a focus on real-world applications and situations. The final project provides an opportunity to integrate all of the core skills and concepts learned throughout the program and prepares students for long-term professional success in the field. It provides experience in formulating and carrying out a sustained, coherent, and influential course of work resulting in a tangible data science project using real-world data. This capstone project will test student skills in data pre-processing, data preparation, data transformation, feature engineering, machine learning/deep learning, data visualization, data communication, and presentation. Projects will be drawn from real-world problems and will be conducted with industry, government, and academic partners. Emphasis will be placed on problem-solving via state-of-the-art data science pipelines and practices and on the ability to “tell a story” using verbal, analytical, written, and visualization skills.
Prerequisites: MSDS 610, MSDS 630
Session Cycle: Summer Term II
Yearly Cycle: Yearly.