

# MASTER OF SCIENCE IN FINANCIAL TECHNOLOGY

The Master of Science in Financial Technology (MS FinTech) is designed to prepare students for work in a technologically sophisticated workplace with intricate knowledge of cutting-edge developments in the space of FinTech. The MS in FinTech program includes courses from the departments of finance, analytics and management that are most relevant to understanding FinTech. Graduates of this program will supplement their education in other fields with deep knowledge of the fast-growing field of FinTech.

## Program

Code	Title	Credits
<b>Required Courses</b>		
DATA 6510	Data Warehousing and Visualization	3
DATA 6570	Artificial Intelligence Applications	3
FNCE 6991	Blockchain and Cryptocurrency	3
FNCE 6992	Decentralized Finance	3
FNCE 6993	Algorithmic Trading	3
FNCE 6994	Ethical Considerations in and Regulation of FinTech	3
MGMT 6508	Strategic Management of Technology and Innovation: The Entrepreneurial Firm	3
<b>Electives</b>		
Select 3 courses from the following (at least 1 course must be DATA):		9
DATA 5405	Python Fundamentals	
DATA 6500	Leading with Analytics	
DATA 6505	Data Munging in Python	
DATA 6530	Statistics and Forecasting	
DATA 6540	Business Intelligence and Data Storytelling	
DATA 6545	Data Science and MLOps	
FNCE 6540	Investment Analysis	
FNCE 6545	Portfolio Management	
FNCE 6560	Global Financial Markets and Institutions	
FNCE 6565	Derivative Securities	
FNCE 6580	Financial Risk Management	
<b>Total Credits</b>		<b>30</b>

## Courses

### Analytics

#### 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.

**Finance****FNCE 5400 Principles of Finance 3 Credits****Prerequisites:** ACCT 5400, DATA 5400.

This course examines the fundamental principles of modern finance that are helpful in understanding corporate finance, investments, and financial markets. More specifically, the course examines the time value of money; the functioning of capital markets; valuation of stocks, bonds, and corporate investments; risk measurement; and risk management. Students learn to use sources of financial data and spreadsheets to solve financial problems. Previously FI 0400.

**FNCE 6500 Stakeholder Value 3 Credits****Prerequisite:** FNCE 5400.

This course examines business decision-making with the aim of creating and managing value for stakeholders. Accordingly, students learn how to lead and manage a business in a competitive environment. This involves the formulation of corporate objectives and strategies, operational planning, and integration of various business functions leading to greater stakeholder value. Topics include investment and strategic financial decision-making. A business simulation facilitates the learning process. Previously FI 0500.

**FNCE 6530 Corporate Finance 3 Credits****Prerequisite:** FNCE 5400.

This course provides an exploration of theoretical and empirical literature on corporate financial policies and strategies. More specifically, the course deals with corporate investment decisions, capital budgeting under uncertainty, capital structure and the cost of capital, dividends and stock repurchases, mergers and acquisitions, equity carve-outs, spin-offs, and risk management. Previously FI 0530.

**FNCE 6540 Investment Analysis 3 Credits****Prerequisite:** FNCE 5400.

This course examines the determinants of valuation for bonds, stocks, options, and futures, stressing the function of efficient capital markets in developing the risk-return trade-offs essential to the valuation process. Previously FI 0540.

**FNCE 6545 Portfolio Management 3 Credits****Prerequisite:** FNCE 6540.

Students examine how individuals and firms allocate and finance their resources between risky and risk-free assets to maximize utility. Students use an overall model that provides the sense that the portfolio process is dynamic as well as adaptive. Topics include portfolio planning, investment analysis, and portfolio selection, evaluation, and revision. Previously FI 0545.

**FNCE 6555 International Financial Management 3 Credits****Prerequisite:** FNCE 6530.

The globalization of international financial markets presents international investors and multinational corporations with new challenges regarding opportunities and risks. This course examines the international financial environment of investments and corporate finance, evaluating the alternatives available to market participants in terms of risk and benefits. Topics include exchange rate determination, exchange rate exposure, basic financial equilibrium relationships, risk management including the use of currency options and futures, international capital budgeting and cost of capital, and short-term and international trade financing. Previously FI 0555.

**FNCE 6560 Global Financial Markets and Institutions 3 Credits**

This course examines financial markets in the context of their function in the economic system. The material deals with the complexity of the financial markets and the variety of financial institutions that have developed, stressing the dynamic nature of the financial world, which is continually evolving. Previously FI 0560.

**FNCE 6565 Derivative Securities 3 Credits**

**Prerequisite:** FNCE 6540 (concurrency allowed).

This course offers in-depth coverage of financial derivative securities, such as options futures and swaps. The course focuses on the principles that govern the pricing of these securities as well as their uses in hedging, speculation, and arbitrage activities. Previously FI 0565.

**FNCE 6570 Fixed Income Securities 3 Credits**

**Prerequisite:** FNCE 6540.

This course deals extensively with the analysis and management of fixed income securities, which constitute almost two-thirds of the market value of all outstanding securities. The course provides an analysis of treasury and agency securities, corporate bonds, international bonds, mortgage-backed securities, and related derivatives. More specifically, this course provides an in-depth analysis of fixed income investment characteristics, modern valuation, and portfolio strategies. Previously FI 0570.

**FNCE 6575 Capital Budgeting 3 Credits**

**Prerequisite:** FNCE 6530.

This course examines the decision methods employed in long-term asset investment and capital budgeting policy. The course includes a study of quantitative methods used in the capital budgeting process: simulation, mixed integer programming, and goal programming. Students use these techniques and supporting computer software to address questions raised in case studies. Previously FI 0575.

**FNCE 6580 Financial Risk Management 3 Credits**

**Prerequisite:** FNCE 6540.

This course focuses on the evaluation and management of corporate and portfolio risk. More specifically, this course examines the methods of evaluating and managing risk with the objective of contributing to value maximization. Risk assessment methodologies such as value-at-risk (VaR) and cash-flow-at-risk (CaR) are analyzed and used extensively. Previously FI 0580.

**FNCE 6595 Research Methods in Finance 3 Credits**

**Prerequisite:** FNCE 6540.

This course, open to MS in Finance students only, deals extensively with applied research methods in finance, a highly empirical discipline with practical relevance in the models and theories used. The central role of risk distinguishes research methodology in finance from the methodology used in other social sciences, necessitating the creation of new methods of investigation that are adopted by the finance industry at an astonishingly fast rate. For example, methods of assessing stationarity and long-run equilibrium, as well as methods measuring uncertainty, found a home in the finance area. This course covers traditional and new research methods that are directly, and in most instances, solely applicable to finance problems. Previously FI 0595.

**FNCE 6900 Contemporary Topics Seminar 3 Credits**

**Prerequisites:** FNCE 6530, FNCE 6540.

This course presents recent practitioner and academic literature in various areas of finance, including guest speakers where appropriate. Topics vary each semester to fit the interests of the seminar participants. Previously FI 0585.

**FNCE 6990 Independent Research Seminar 3 Credits**

**Prerequisite:** FNCE 6595.

This course, open to MS in Finance students only, provides participants with the opportunity to explore a financial topic of interest in depth, immersing students in detailed investigations requiring substantial research and analysis. Previously FI 0597.

**FNCE 6991 Blockchain and Cryptocurrency 3 Credits**

The sudden rise in the value of Bitcoin and other cryptocurrencies and its volatility focused the world's attention on cryptocurrencies as a means of payment. Blockchain technology powers Bitcoin and has been hyped as the next new, transformative technology. This class will first discuss the technical underpinnings of blockchain and review key concepts such as decentralization and consensus algorithms. The class will then discuss practical applications of blockchain technology. It will then then examine blockchain as an asset and review the dynamics of the cryptocurrency markets. It will conclude with the discussion of the future of blockchain.

**FNCE 6992 Decentralized Finance 3 Credits**

Decentralized finance (DeFi) allows parties to trade in a peer-to-peer, decentralized manner by replacing financial institutions and other intermediaries with blockchain-based smart contracts and by replacing traditional, physical currencies (e.g. U.S. dollars) with cryptocurrency (e.g. stable-coins pegged to a physical currency). This course will examine how FinTech companies are disrupting the traditional financial services industry and assess the pros and cons of these new technologies. Students in this course will also survey relevant aspects of banking and securities law, with a focus on current regulatory issues pertaining to DeFi and considerations of the future regulatory landscape.

**FNCE 6993 Algorithmic Trading 3 Credits**

This class introduces the necessary background knowledge and processes to design and implement algorithmic trading models including an introduction to financial markets, mechanics, participants, order types and execution, microstructure, and more. The course walks students through the process of generating trading strategies, quantifying the trading process, risk-based modeling concepts, back-testing and optimization techniques, technology and infrastructure, regulatory compliance, and key metrics of algorithmic trading model performance evaluation.

**FNCE 6994 Ethical Considerations in and Regulation of FinTech 3 Credits**

While FinTech provides the world of finance with exciting new opportunities and innovations, they come with a new set of ethical considerations and potential new regulations. Ethical issues include potential breach of privacy of the data obtained through social media and other means. Artificial intelligence and machine learning and the use of large datasets of proprietary data could unintentionally lead to discrimination and adverse effects on diversity and inclusion efforts. Since much of the FinTech applications are linked to the internet, avoiding cyberattacks poses a large risk to successful implementation of any models. Successful leaders in the field of FinTech must understand ethical considerations associated with FinTech. It is also crucial for the manager to understand current regulation of FinTech and anticipate possible new regulation. This course will consider these and other ethical and legal considerations associated with FinTech.

## 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.