M.S. in Quantitative Finance & Risk Analytics (QFRA)
Fall 2020 & Spring 2021
Course Descriptions

Required Professional Development & Career Workshops
- **MGMT 7770 Prof. Development Workshop 1**

The PDW sequence is designed to develop the professional skills of students in the MS Programs that are needed to be a successful contributor in a business setting. PDW I follows a framework of Leadership, Followership, and Membership in a professional community. Students will gain practical experience through exposure to experts in specific skill areas, role-play and practice sessions, and exercise completions. The fall semester concentrates on individual skills development in presentation, communication and networking. Additionally, membership in one's professional community will be emphasized through engagement in two activities specific to the student's MS Program. Building on the skills and abilities obtained earlier in your career, this PDW is geared toward a higher level of professionalism inherent in a successful business environment.

- **MGMT 7780 Prof. Development Workshop 2**

The PDW sequence is designed to develop the professional skills of students in the MS Programs that are needed to be a successful contributor in a business setting. The PDW II will continue to follow a framework of Leadership, Followership and Membership in a professional community. Students will gain practical experience through exposure to experts in specific skill areas, role-play and practice sessions, and exercise completions. The second semester emphasizes developing influence skills, understanding and shaping group dynamics, and navigating organizational politics. Additionally, membership in one's professional community will be emphasized through engagement in four hours of activities specific to the student's M.S. program.

Required QFRA Core:
Fall
- **MGMT 6020 Financial Management I***

The purpose of this course is to develop a working understanding of the major investment and financial decisions of the firm. Emphasis will be placed upon identifying and solving the problems commonly faced by financial managers. The course presents the needed theory and develops financial problem solving skills through individualized problem solving, structured case analysis, and industry and company analysis using Internet sources.

- **MGMT 6100 Foundations of Data Science**

* Pre-requisites: none

Every dataset tells a unique story, and in this course, students learn to elicit these stories from data. The course develops students' ability to ask critical questions about their data in order to better understand it. Students will run tests to identify data problems and will learn how to take corrective actions. In addition, the course covers

important parametric and non-parametric tests, and discusses their benefits and limitations in a big data world.

▪ MGMT 6520 Financial Modeling & Optimization
* Pre-requisite: MGMT 6020 or permission of instructor

This course introduces quantitative analysis for financial markets and instruments. The course covers applications of mathematical tools and optimization modeling to portfolio selection and fund management, risk analysis, hedging and valuation of financial assets, and financial planning under uncertainty. The course introduces applications of calculus, differential equations, and introduces stochastic processes within a financial markets context to address arbitrage pricing and equilibrium asset pricing models.

▪ MGMT 6560 Introduction to Machine Learning Applications

The widespread proliferation of IT-influenced economic activity leaves behind a rich trail of micro-level data, enabling organizations to use analytics and experimentation in both strategy and operations. This course provides a hands-on introduction to the concepts, methods and processes of business analytics. Students will learn how to obtain data and draw business inferences from data by asking the right questions and using the appropriate tools.

▪ MGMT 6370 Options Futures & Derivatives Markets
* Pre-requisite: MGMT 6020 or permission of instructor

The purpose of this course is to provide an introduction to second generation financial instruments including forward and future contracts, options, future options and swaps on a variety of underlying instruments including fixed income securities. The fixed income markets will be integrated with the discussion of IRDs (interest rate derivatives.)

 *MGMT 6020 can be waived and replaced with an elective course.

Spring
▪ MGMT 6410 Quantitative Asset Management
* Pre-requisite: MGMT 6020 or permission of instructor

The course begins by providing students with a theoretical and practical background in the field of investments. This includes comparison of asset classes characteristics and returns as well as discussion of relevant models, financial institutions, and behavioral issues facing investors. These principles are then quantitatively applied in areas including portfolio construction, index-linked strategies, smart beta/factor portfolios, portfolio risk management, and dynamic portfolio management.

▪ MGMT 7760 Risk Analytics & Management
*Pre-requisites: MGMT6520 or permission of the instructor.

Overview of risk management, concepts and measurement of risk; types of risks (market, credit, liquidity, operational, business, strategic). Clustering, classification and optimization tools applied to risk management. Frameworks and instruments available for risk management. Specific issues related with managing specific risk types — credit, liquidity and operational risk, with emphasis on current challenges. Securitization, asset-liability management, and role of insurance for risk management.

- ### MGMT 6510 Financial Computation & Simulation
* Pre-requisite: MGMT 6520 or permission of instructor
The primary objective of this course is to provide the first or second semester financial engineering student with basic quantitative and analytical tools necessary for sound financial decision making, particularly in quantitative finance and risk analytics contexts. The course emphasizes financial computation techniques, whereby students learn standard methodologies to obtain numerical solutions to financial problems. Topics include solving linear and nonlinear systems of equations, optimization, lattices, Monte Carlo simulation, and finite difference methods as applied to common financial problems. R is the primary computing language used in this course.

- ### MGMT 6420 Student Managed Investment Fund
* Pre-requisite: MGMT 6240 or permission of instructor
The Student Managed Fund course will actively invest real capital using financial market principles. The goal of the fund is to produce excess returns consistent with the performance of long/short hedge funds through use of fundamental, technical and quantitative strategies driven by economic analysis. The goal of the course is to directly apply the analytical financial skills developed within other Lally courses and provide students with both instructor and peer real-time feedback for their work.

Elective Course:
Students may choose one course (or two courses if they waive out of MGMT6020, Financial Management) listed below as approved by the M.S. QFRA adviser in order to best meet their academic goals.

- ### MGMT 6240 Financial Trading and Investing
* Pre-requisite: MGMT 6020 or permission of instructor
This course introduces interactive trading in financial instruments. Students learn the principles of asset price discovery and trading methods in a variety of markets, including equities, bonds, options, and other derivatives. Investing topics addressed include the application of quantitative methods in asset valuation, portfolio design, alternative investments, and risk management. Students work in teams of two in programming assignments involving foreign exchange markets, equities trading, and portfolio construction.

- ### MGMT 6400 Financial Econometrics Modeling
This course addresses financial modeling as an empirical activity. Several key issues and assumptions of finance are addressed through empirical modeling. Topics may include asset pricing, event studies, exchange rate movements, term structure of interest rates, and international linkages among financial markets. Computers are used extensively both in and out of class.

- **MGMT 6570 Advanced Data Resource Management**

The primary objective of this course is to introduce the multifaceted role of data as a resource of the organization, in three ways. First, it examines the role of data at the operational, tactical, and strategic levels of the organization. Second, it provides students with knowledge and hands on training of technologies that manipulate data, including structured query language (SQL), extraction transformation and loading tools (ETL), data warehousing (DW), online analytical processing (OLAP), and data mining (DM). The course exposes students to big data management techniques. Finally, the course provides students the theory and hands on training to understand the transformation of data to information.

- **MGMT 6140 Managing Digitization and Transformation**

Understanding technology-enabled changes in contemporary business environments, and how insightful executives leverage IT, is key to creating value and winning competitive advantage. This course develops an understanding of cutting-edge technological trends and their potential business impact. The course also explores the business drivers of technology-related decisions in firms and stimulates thought on new applications of technology for commerce, including new products, processes, and business models. Topics covered include: how different business models necessitate different kinds of IT investments; how IT coupled with big data analytics impacts different industries; whether and how IT hastens and aids the growth of disruptive innovations; and how organizations should adapt to the digital economy.

- **MGMT 6250 Fixed Income Securities**

This course develops the concepts and tools that will provide students with an understanding of the forces driving the valuation, risk and return of fixed income securities. These include instruments such as futures, options, callable bonds, credit default swaps and mortgage-backed securities. The size of these markets makes their pricing, hedging, and risk management invaluable to traders, risk managers, regulators or anyone interested in the functioning of the modern financial system.

- **MGMT 6962 Advanced AI and Machine Learning for Finance**

The primary objective of this course is to provide the first or second semester financial engineering or business analytics student with applied quantitative skills in the areas of artificial intelligence and machine learning for finance applications. The course material will involve hands on use of real data and focus on various AI/ML algorithms common in the finance industry. The course will cover supervised learning and unsupervised algorithms and applications including natural language processing. R will be the primary computing language used in this course.