FINANCE AND RISK ENGINEERING (FRE-GY)

FRE-GY 5000 FRE Recitation (0 Credits)
Typically offered Fall and Spring
FRE Recitation
Grading: Class does not print on the transcript
Repeatable for additional credit: Yes

FRE-GY 5010 Q-CODE: Quantitative Coding for Finance Interviews (0 Credits)
Typically offered Summer term
This summer bootcamp online experience for the rising second year MS Financial Engineering cohort prepares students for coding assessments during interviews for full-time positions.
Grading: Class does not print on the transcript
Repeatable for additional credit: No
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 5020 FRE Bootcamp II (0 Credits)
Typically offered Summer term
This summer bootcamp online experience for the incoming MS Financial Engineering cohort prepares students for coursework in Financial Engineering and for summer internship interviews.
Grading: Class does not print on the transcript
Repeatable for additional credit: No
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 5030 FRE Bootcamp III -- From Brain Teasers to Black-Scholes (0 Credits)
Typically offered Summer term
This summer bootcamp experience for the incoming MS Financial Engineering cohort prepares students for coursework in Financial Engineering and for summer internship interviews. | Prerequisite: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.
Grading: Class does not print on the transcript
Repeatable for additional credit: No
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 5040 FRE Bootcamp IV - Econometrics and Machine Learning with Python (0 Credits)
Typically offered Summer term
This summer bootcamp experience for the incoming MS Financial Engineering cohort prepares students for coursework in Financial Engineering and for summer internship interviews. | Prerequisite: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.
Grading: Class does not print on the transcript
Repeatable for additional credit: No
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 5500 Bloomberg Certification (0 Credits)
Typically offered Fall, Spring, and Summer terms
This course tracks the requirement for the self-paced, self-taught Bloomberg certification to be completed through a Bloomberg terminal. | Prerequisite: Graduate Financial Risk Engineering students only
Grading: Grad Poly Pass/Fail
Repeatable for additional credit: No

FRE-GY 5990 Capstone Assessment (0 Credits)
Typically offered occasionally
The Master of Science in Financial Engineering program offers four types of Capstone experiences to its graduate students: theses, projects, special topics, and internships. This Capstone Assessment will serve as a centralized measure for the various types of Capstone experiences to identify whether students have successfully completed this experience and garner feedback about graduating students' skills and professional readiness. Note: course should be completed during final semester of studies. | Prerequisites: FRE-GY 9973 or FRE-GY 7021 (taken two times for a total of 3 credits) or FRE-GY 7043 or two special topics courses of 1.5 credits each, with a capstone papers submitted to the faculty.
Grading: Grad Poly Pass/Fail
Repeatable for additional credit: No
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 6003 Financial Accounting and Analysis (3 Credits)
Typically offered Fall and Spring
This course provides a solid understanding of the creation and interpretation of modern financial statements. Topics include the reasons for financial statements, U.S. accounting principles and how they differ abroad, quality of financial information, financial ratios and their uses, cash-flow analysis, measurement of corporate performance. The course will also cover various methods of forecasting statements and a discussion of valuation. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6023 Financial Economics (3 Credits)
Typically offered Fall and Spring
This course provides a rigorous introduction to the principles and application of the theory of financial economics. Following a review of foundational theories of markets and competition, this course covers the following areas: certainty and perfect capital markets, the institutional setting of financial economics, risk and contingent claims theory, and capital market imperfections and the limits to arbitrage that these impose on financial systems. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6031 Money, Banking and Financial Markets (1.5 Credits)
Typically offered Fall and Spring
Studies how the interactions among money, the financial system and the economy determine interest rates and asset returns. It utilizes a consistent approach based in economics to explain the role of the financial system in matching savers and borrowers and in providing risk-sharing, liquidity and information services in efficient financial markets. Students study why and how financial markets and financial instruments evolve as a function of transactions and information costs, adverse selection and moral hazard problems, and summarize economic arguments for and against regulation. Finally, they examine the money supply process and monetary policy, in particular the link between monetary authorities and the macro-economy through a transmission mechanism involving banks and the non-financial public. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6073 Introduction to Derivative Securities (3 Credits)
Typically offered Fall, Spring, and Summer terms
This course explains in detail various models and methods for pricing and hedging derivatives including: European, American, exotic options, swaps, and convertible bonds. Presentation is done using equity, interest rate, and volatility derivative products. A short introduction to computational methods necessary for pricing derivatives is provided. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6083 Quantitative Methods in Finance (3 Credits)
Typically offered occasionally
This course focuses on quantitative methods and financial modeling. Probability theory, stochastic processes and optimization are studied and applied to a broad variety of financial problems and their derivatives. Topics include probability spaces; conditional probability; densities; distributions; density estimators; multivariate probability; moment-generating functions; random walks; Markov processes; Poisson processes; and the Brownian-motion process. | Prerequisite: Students are expected to know calculus and elementary probability and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6091 Financial Econometrics (1.5 Credits)
Typically offered Fall and Spring
Topics include a review of probability and statistical inference and linear regression models. The focus of the course is time series analysis with special attention to the modeling of financial stock prices and returns. Volatility modeling and estimation will be also addressed through the analysis of intra-day trading data. | Prerequisite: FRE-GY 6083 and a working knowledge of statistics. Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6103 Valuation for Financial Engineering (3 Credits)
Typically offered Fall and Spring
This course introduces financial engineers to robust risk-based valuation methods in discrete and continuous time. This includes four major applications: cash flows, traded derivative contracts, nontraded and embedded derivatives, and corporate assets & liabilities. - “Cash flows” refers to risk-free and risky payments or expenditures. - “Traded derivatives” include a high level treatment of forward contracts and the most commonly traded option contracts. - “Nontraded and embedded derivatives” refer to contingent cash flows created in the normal processes of contracting and asset management - “Corporate assets” refer to claims to cash flows owned and managed by corporations - “Corporate liabilities” refers to corporate-issued securities or other payment obligations incurred by corporations. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6123 Financial Risk Management (3 Credits)
Typically offered Fall and Spring
This course introduces the techniques and problems of Financial Risk Management and Asset Pricing. It emphasizes risk finance and attitudes; Value at Risk; risk measurement principles; valuation and expected utility and their relevance in the valuation and the pricing of financial investments; insurance; management of derivatives; and risk management. Throughout, risk-management application problems are explored., The course introduces and focuses on the fundamental principles of the Arrow-Debreu state preference theory used to price derivatives and other assets in complete markets. Risk neutral-Binomial models in option pricing; essential elements of Ito calculus; and the Black-Scholes model for pricing options are introduced and applied to practical financial decision making and risk management problems. Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6131 Clearing and Settlement and Operational Risk (1.5 Credits)
Typically offered Fall and Spring
This course focuses on issues involved in processing financial transactions—from order execution to final settlement of transactions—and operational risk in general. The course examines the procedures and market conventions for processing, verifying, and confirming completed transactions; resolving conflicts; decisions involved in developing clearing operations or purchasing clearing services; the role played by clearing houses; and numerous issues associated with cross-border transactions. The course also examines the effects of transaction processing, liquidity management, organizational structure, and personnel and compliance on the nature of operational risk. Qualitative and quantitative measures of operational risk are discussed. | Prerequisite: FRE-GY 6153 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6141 Static and Dynamic Hedging (1.5 Credits)
Typically offered occasionally
The course discusses advanced topics in hedging exposures, with emphasis on adaptation of the mathematics to the real world. Examines applications in quantitative finance. Methods in the hedging of cash flows and liabilities for corporations and for option traders are covered. A synthesis is made of both theory and historical hedges traded. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6153 Foundations of Financial Technology (3 Credits)
Typically offered Fall and Spring
Financial Institutions spend billions per year to exploit the latest development in information technology. This course introduces a framework with which to understand and leverage information technology. The technology components covered include telecommunications, groupware, imaging and document processing, artificial intelligence, networks, protocols, risk, and object-oriented analysis and design. the course also covers the entire technological-planning process specifically for financial institutions. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6191 Advanced Topics in Financial Technology (1.5 Credits)
Typically offered occasionally
This course complements the Foundations of Financial Technology by treating in-depth advanced topics in this rapidly changing field. Students prepare and present case studies applying the concepts covered in class. | Prerequisites: FRE-GY 6153 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 6233 Options Pricing & Stochastic Calculus (3 Credits)
Typically offered Fall and Spring
This course provides the mathematical foundations of Option Pricing models. The techniques covered include arithmetic and geometric Brownian motion, first passage time, the reflection principle, the stochastic Ito integral, Ito differential Calculus, change of probability measure, martingales, Stochastic Differential Equations and Partial Differential Equations. Some of the pricing models considered are the European, Barrier, Asian and American options. These problems are either solved analytically by the martingale approach or numerically, by applying approximation and simulation methods. Since the same techniques allow the treatment of more complex financial products, examples of credit derivatives will be also presented. This course is a requirement in the Computational Finance Track | Prerequisite: FRE-GY 6083 and matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6251 Numerical & Simulation Techniques in Finance (1.5 Credits)
Typically offered Fall and Spring
Advanced numerical techniques for the solution of ordinary, partial and stochastic differential equations are presented. These techniques are analyzed both mathematically and using computer aided software that allows for the solution and the handling of such problems. In addition, the course introduces techniques for Monte Carlo simulation techniques and their use to deal with theoretically complex financial products in a tractable and practical manner. Both self-writing of software as well as using outstanding computer programs routinely used in financial and insurance industries will be used. | Prerequisite: FRE-GY 6083 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6273 Corporate Valuation: from Startups to Giants (3 Credits)
Typically offered Fall and Spring
This course provides students with the analytical and financial modeling skills needed to value firms ranging from early-stage startups to mature giants. Students will use the material they learn to build and present a comprehensive valuation model for a mature company and will also present their valuations of a range of startups to their venture backers and management teams. There are no prerequisites other than graduate standing (the course will cover the basics of accounting and valuation), but students must be prepared to spend some time outside of class hours to interact with entrepreneurs and venture capitalists, both in-person at Tandon and in other countries over Zoom. | Prerequisites: Graduate Standing.
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6351 Econometrics and Time Series Analysis (1.5 Credits)
Typically offered Fall and Spring
Financial econometrics has matured into a necessary and essential part of financial engineering that provides opportunities to deal with real and practical problems in finance. For example, techniques such as ARCH and GARCH and their subsequent development are used to estimate the volatility of underlying financial processes; the analysis of intra-day trading data that requires particular models and techniques; memory-based and fractal stochastic processes to study complex markets behaviors and copulas applied routinely to model- and estimate-dependent risks. These financial and risk problems require the application of advanced financial-econometric techniques, which the course provides from both theoretical and empirical-applied viewpoints. Selected cases provide a real-world sense of financial engineering when it is faced with financial-market reality and complexity. | Prerequisite: FRE-GY 6083 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6361 Corporate and Financial Strategy (1.5 Credits)
Typically offered Fall and Spring
This is an introduction to financial strategy for MS Financial Engineering students. The course focuses on the role of financial engineers and financial officers in developing and sustaining competitive advantage through the use of financial engineering analyses. | Prerequisites: FRE-GY 6023 and FRE-GY 6103 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6391 Mergers & Acquisitions (1.5 Credits)
Typically offered Fall and Spring
This course examines the theories and empirical evidence related to mergers and acquisitions and other corporate transactions and reorganizations. The course looks at friendly mergers, hostile takeovers (including takeover and anti-takeover tactics), leveraged buyouts and bankruptcy. Throughout, the course examines the motives behind these transactions and reorganizations. | Prerequisites: FRE-GY 6103 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6411 Fixed Income Securities and Interest Rate Derivatives (1.5 Credits)
Typically offered Fall, Spring, and Summer terms
This course examines the body of analytical tools and measures that constitute modern fixed-income markets. The valuation of interest-rate sensitive cash flows is the unifying theme. Major topics include theories of term structure, institutional aspects of fixed-income markets and analytical techniques for managing interest-rate risk. Bond refunding, defeasance, corporate bonds, forwards, futures, options and interest-rate swaps are discussed. The course gives an overview of the major classes of fixed-income securities and the markets in which they trade. Among the major classes of fixed-income instruments discussed are Treasury and agency securities, mortgage-backed securities (including CMOs and Strips), asset-backed securities, municipals, floating and inverse floating rate securities. | Prerequisite: FRE-GY 6023, FRE-GY 6083, FRE-GY 6103 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6491 Credit Risk & Financial Risk Management (1.5 Credits)
Typically offered Fall and Spring
This course provides a deep understanding of credit instruments from a qualitative and quantitative point of view. Students learn how to price credit derivatives and hedge credit risk. Both the structural and intensity models approaches are presented. Applications to a number of structured products are considered. | Prerequisites: FRE-GY 6411 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6671 Global Finance (1.5 Credits)
Typically offered Fall and Spring
The level of economic and financial globalization combined with the growth of the multinational firms and virtual firms with no boundaries may have altered the future of finance and its risk engineering. The purpose of this course is to focus attention on the essential elements that both large financial firms and institutions are confronting worldwide, the challenges of national and international financial investments, currencies speculations and investments, regulation as well as managing risks in a strategic and macroeconomic environment. In such an environment, financial markets are multi-polar, geographically distributed with national entities pursuing their own economic and political agenda. | Prerequisites: FRE-GY 6411 and FRE-GY 6511 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6711 Quantitative Portfolio Management (1.5 Credits)
Typically offered Fall and Spring
This course focuses on the quantitative foundations of portfolio management . It teaches the fundamental mathematical models such as the Markowitz, CAPM, and the Merton investment-consumption models, and discusses the issues related to the implementation of these models in practice to different types of portfolios. Finally, it also introduces some common portfolio construction and rebalancing techniques. | Prerequisites: FRE-GY 6083 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6713 Advanced Investment Theory and Applications (3 Credits)
Typically offered Fall and Spring
This course covers a wide range theoretical and practical issues that arise in the management of equity and fixed income portfolios, including the classical (Markowitz) foundations of mean-variance optimization, the use of constraints, risk budgeting, robust (outlier-resistant) optimization, tail risk aware optimization, the estimation of expected returns, and the measurement and monitoring of portfolio performance using ideas from statistical process control. It will also require the use of Bloomberg's PORT optimization tool to optimize, as well as to simulate the risk and return of, large portfolios. | Prerequisite: FRE-GY 6083, FRE-GY 6103 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6731 Market Risk Management and Regulation (1.5 Credits)
Typically offered Fall and Spring
This course covers quantitative methods of measurement and management of market risk as well as regulatory aspects of market risk management including both the current framework of Basel 2, 2.5, and 3 and the future methodology of FRTB. As the final project students produce a fully developed risk management system that includes risk calculations (sensitivities, VaR, Stressed VaR, Stress Analysis) on individual position and portfolio levels. | Co-requisite: FRE-GY 6711 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6803 Financial Engineering (research course) (3 Credits)
Typically offered Fall and Spring
This course is a research/case effort and can be handled in different ways at the discretion of the faculty supervisor. The course may involve a series of cases that are dissected and analyzed. It may involve teaming students with industry personnel for proprietary or non-proprietary research projects. Or it may involve thesis-type research. Generally, students work under faculty supervision, but the course is intended to be largely self-directed within guidelines established by the supervising faculty member. A significant written research component is required. Prerequisites: This course should be taken during the student's final semester. | Prerequisites vary depending on the student's track and the nature of the chosen project.
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 6811 Financial Software Laboratory (1.5 Credits)
Typically offered Fall, Spring, and Summer terms
This course teaches students to use financial software tools commonly employed in industry. Examples include: @Risk, Yieldbook, Excel, R, and C ++. | Prerequisites: Graduate Standing
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Any NYU Graduate/Doc Standing.

FRE-GY 6831 Computational Finance Laboratory (1.5 Credits)
Typically offered Fall and Spring
The course introduces programming applications in financial modelling. Topics include variables, data types, input/output, plotting, selection statements, loop statements, functions, and classes, and implementation for Black-Scholes option pricing partial differential equation, Monte Carlo simulation, numerical methods for solving partial differential equations, and option pricing by Fourier transform. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6871 R in Finance (1.5 Credits)
Typically offered Fall, Spring, and Summer terms
This course introduces the free programming language R and its many applications to finance including risk management, portfolio construction, strategy development and testing, and trading and execution. Topics covered include financial time series analysis, advanced risk tools, applied econometrics, portfolio management, and derivatives valuation. Students will be required to write some code in R every week. | Prerequisites: FRE-GY 6123, FRE-GY 6083 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6883 Financial Computing (3 Credits)
Typically offered Fall, Spring, and Summer terms
This course covers programming applications to financial engineering, including C++ and Java and the various common development environments for them. Topics include structured and object-oriented programming in C++ with applications to binomial options pricing, multi-threaded programming in Java with applets and graphical interfaces with applications to risk measurement tools, data-based manipulation and programming in SQL and standard database access libraries with applications to historical financial data series retrieval and management, and other advanced programming concepts important for financial engineering such as numerical techniques, trading systems, and large-scale software design. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 6901 Selected Topics in Financial Engineering (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include infrastructure and projects finance, international and global finance, economics and finance in developing countries, global finance in a global world, international investment strategies, finance and taxes, among others. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 6921 Selected Topics in Financial Engineering (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include infrastructure and projects finance, international and global finance, economics and finance in developing countries, global finance in a global world, international investment strategies, finance and taxes, among others. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 6931 Selected Topics in Financial Engineering (1.5 Credits)
Typically offered occasionally
Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 6951 Selected Topics in Financial Engineering (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include infrastructure and projects finance, international and global finance, economics and finance in developing countries, global finance in a global world, international investment strategies, finance and taxes, among others. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 6971 Sel Topics in Financial Engr (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics will be emphasized and provide focus for further study. Examples might include urban finance engineering, environmental finance, infrastructure and projects finance, real estate finance, insurance finance and derivatives, macro hedge funds management, among others. Prerequisites: advanced standing and instructor's permission and Graduate Standing
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 6981 Sel Topics in Financial Engr (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics will be emphasized and provide focus for further study. Examples might include urban finance engineering, environmental finance, infrastructure and projects finance, real estate finance, insurance finance and derivatives, macro hedge funds management, among others. Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 6991 Sel Tpcs in Financial Engineering (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include infrastructure and projects finance, international and global finance, economics and finance in developing countries, global finance in a global world, international investment strategies, finance and taxes, among others. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 7003 Financial Accounting and Analysis (3 Credits)
Typically offered Fall
This course provides a solid understanding of the creation and interpretation of modern financial statements. Topics include the reasons for financial statements, U.S. accounting principles and how they differ abroad, quality of financial information, financial ratios and their uses, cash-flow analysis, measurement of corporate performance. The course will also cover various methods of forecasting statements and a discussion of valuation. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7021 Financial Engineering Capstone: Internship (1.5 Credits)
Typically offered Fall, Spring, and Summer terms
In this course, the Career Development Office helps the student secure an internship. Students work under faculty supervision. However, the course is intended to be largely self-directed within the guidelines established by the supervising faculty member. A paper based on the internship work is required. | Prerequisites: This course should be taken after the student has successfully completed two Semesters and earned at least 18 credits. Prerequisites vary depending on the student's track, the nature of the internship and Graduate Standing.
Grading: Grad Poly Pass/Fail
Repeatable for additional credit: Yes
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 7023 Financial Engineering Capstone: Internship (1.5 Credits)
In this course, the Career Development Office helps the student secure an internship. Students work under faculty supervision. However, the course is intended to be largely self-directed within the guidelines established by the supervising faculty member. A paper based on the internship work is required. | Prerequisites: This course should be taken after the student has successfully completed two Semesters and earned at least 18 credits. Prerequisites vary depending on the student's track, the nature of the internship and Graduate Standing.
Grading: Grad Poly Pass/Fail
Repeatable for additional credit: Yes
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 7043 Financial Engineering Capstone: Project (3 Credits)
Typically offered Fall, Spring, and Summer terms
In this project course, students work with faculty on proprietary or non-proprietary research projects. Generally, students work under faculty supervision. However, the course is intended to be largely self-directed within the guidelines established by the supervising faculty member. A significant written research component is required. | Prerequisites: This course should be taken after the student has successfully completed two Semesters and has earned at least 18 credits. Prerequisites vary depending on the student's track, the nature of the project to be undertaken, and Graduate Standing.
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 7121 Statistical Arbitrage (1.5 Credits)
Typically offered Fall and Spring
Statistical arbitrage refers to strategies that combine many relatively independent positive expected value trades so that profit, while not guaranteed, becomes very likely. This course prepares students to research and practice in this area by providing the tools and techniques to generate and evaluate individual trading strategies, combine them into a coherent portfolio, manage the resulting risks, and monitor for excess deviations from expected performance. It introduces theoretical concepts such as cointegration, risk capital allocation, proper backtesting, and factor analysis, as well as practical considerations such as data mining, automated systems, and trade execution. Programming languages such as R, Python, or C++ will be used to present applications to data at low, intermediate and high frequency. | Prerequisites: FRE-GY 6123, FRE-GY 6083 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7211 Forensic Financial Technology and Regulatory Systems (1.5 Credits)
Typically offered Fall and Spring
The goal of this course is to understand the technology behind financial forensics and regulatory systems. These include innovative database techniques ("dataveillance"), artificial intelligence, data mining, and non-parametric outlier methods used by the Secuities Exchange Commission (SEC), the Financial Industry Regulatory Authority (FINRA), as well as the FBI, and other federal and state agencies. Student teams will prepare and present projects or case studies applying the concepts covered in class. | Prerequisite: FRE-GY 6153 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7241 Algorithmic Portfolio Management (1.5 Credits)
Typically offered Fall, Spring, and Summer terms
This course focuses on portfolio construction and rebalancing strategies such as momentum, value, and size strategies, among others. The course emphasizes backtesting and risk factor analysis as well as optimization to reduce tracking error. It will also address how a quantitative investment approach can help both individual and institutional investors make sound long-term investment decisions. | Prerequisite: FRE-GY 6123 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7251 Algorithmic Trading & High-Frequency Finance (1.5 Credits)
Typically offered Fall and Spring
Algorithmic trading refers to the utilization of special computer programs in an order management system that restructure an order into a sequence of sub-orders based on the dimensions of submission time, price, size, and side. The goal of this course is to survey several algorithmic strategies used by financial institutions and to understand their implementation in the context of order management systems and standard financial protocols (such as FIX and FIXatdl). Student teams will prepare and present projects or case studies applying the concepts covered in class. | Prerequisites: FRE-GY 6153 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7261 News Analytics & Strategies (1.5 Credits)
Typically offered Spring
The fast-growing field of news analytics requires large databases, fast computation, and robust statistics. This course introduces the tools and techniques of analyzing news, how to quantify textual items based on, for example, positive or negative sentiment, relevance to each stock, and the amount of novelty in the content. Applications to trading strategies are discussed, including both absolute and relative return strategies, and risk management strategies. Students will be exposed to leading software in this cutting-edge space. | Prerequisites: FRE-GY 6153 and FRE-GY 7221 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7301 Foreign Exchange (FX) Market: Fundamentals & Trading (1.5 Credits)
Typically offered Fall and Spring
Fundamental and advanced knowledge of the FX market and FX trading. Its conventions and the factors that drive its fluctuations. Forward Contracts, Cross-Currency Swaps, and FX Options. Practical applications using these instruments to effectively manage and hedge FX risks. Assessing and interpreting the influence of diverse economic factors on FX rates. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7401 Long-Term Financial Products: Mortgages, Life Insurance and Pensions (1.5 Credits)
Typically offered Spring
Long-term financial assets" addresses the challenges of applying traditional finance and financial engineering principles to long-term assets. For example, complex short-term derivatives receive a lot of attention in the finance curriculum. Issues like stability and the predictability of long-term returns and risk make longer-term valuation and risk assessments difficult and frustrating. These issues affect individuals' rent/buy decisions, mortgage selection and financing behavior, life insurance choices, retirement plans and pensions, and even social welfare and health care (social security and Medicare/Medicaid). In this class, we address the challenges and proposed solutions for measuring and addressing long-term risks and financial decisions. This includes thoughtful analysis of risk and returns, taxes and institutional considerations. Students who take this class will be better able to articulate the problems in designing and deploying long-term assets, and help them evaluate the solutions. They will also be better prepared to enter careers in wealth management and insurance. | Prerequisites: FRE-GY 6103 and Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: FRE-GY 6103 and Master or higher standing.

FRE-GY 7703 Data Science for Financial Engineering (3 Credits)
Typically offered Fall and Spring
This is an on-line quantitative course especially geared toward Master of Science in Financial Engineering students. The course covers the statistical tools needed to model and estimate the joint dynamics of markets. Included are: - topics in multivariate statistics that are relevant for risk management and portfolio management - machine learning models as generalizations of linear factor models, omnipresent across finance - the connection between the estimation/calibration of machine learning models and classical and Bayesian econometrics - backtesting and model/estimation risk in the context of decision theory - distributional stress-testing for risk management and portfolio/business construction for portfolio management. The final exam may be administered on-line or in-person. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7773 Machine Learning in Financial Engineering (3 Credits)
Typically offered Fall and Spring
This course covers the theory of Machine Learning and its fundamental applications in the field of Financial Engineering. Supervised, unsupervised, and reinforcement learning paradigms are discussed. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Graduate Standing.

FRE-GY 7801 Topics in Finance and Financial Markets I (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include Financial Economics, Macroeconomics and Finance, the Bond market, the securities markets, Derivatives markets, Contract Theory, Credit and Counterparty Risks, Banking Finance and others. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 7811 Topics in Finance and Financial Markets 2 (1.5 Credits)
Typically offered occasionally
The course analyzes and discusses current topics of particular importance in finance and risk engineering. Selected topics are emphasized and provide focus for further study. Examples can include Behavioral Finance, Personal Finance, Investment Theories and Alternative Finance, Corporate and Financial Responsibility, Financial Ethics, Hedge Funds Investment Strategies and their Management and macro hedge funds management, among others. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 7821 Topics in Risk Finance I (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in Actuarial Science are analyzed and discussed. Course topics may include for example: Pension Funds management, Actuarial Science and Social Security, Life Insurance, Insurance and Financial Products design and management. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 7831 Topics in Financial and Risk Engineering I (1.5 Credits)
Typically offered occasionally
Current and selected topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics are emphasized and provide a focus for further study. Topics include Credit Risk and Credit Derivatives, Quantitative Methods in Rare Events, Energy, Oil and Water Finance as well as advanced topics in financial econometrics and computational finance. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 7841 Topics in Risk Finance II (1.5 Credits)
Typically offered occasionally
Current and selected topics of particular importance in Actuarial Science and in the insurance- finance convergence are analyzed and discussed. Course topics may include Risk Engineering and the Insurance Business, Principles of Insurance Management in a Dynamic and Global Setting, Finance-insurance convergence. | Prerequisite: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 7851 Topics in Financial and Risk Engineering 2 (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in finance and risk engineering are analyzed and discussed. Selected topics are emphasized and provide a focus for further study. Examples can include urban finance engineering, environmental finance, infrastructure and projects finance, real-estate finance, insurance finance and derivatives, and macro hedge funds management. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 7871 Topics in Financial Information Services and Technology (1.5 Credits)
Typically offered occasionally
Current topics of particular importance in financial information services and technology are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include, natural language processing, sentiment analysis, alternative data, advanced deep learning techniques, and others. |Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 9053 Information Geometry and Its Applications in Machine Learning and Beyond (3 Credits)
Typically offered Spring
This course offers an advanced, research-oriented exploration of Information Geometry and its significant applications across Machine Learning, Statistics, and various real-world domains. Information Geometry provides a mathematical framework to understand the underlying geometry of probability distributions and how it impacts learning algorithms, statistical models, and other advanced topics in computational fields. The course aims to equip students with both theoretical knowledge and practical tools to investigate cutting-edge research questions. | Prerequisites: Matriculation as a PhD student or permission of the FRE Department
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Matriculation as a PhD student or permission of the FRE Department.

FRE-GY 9073 Stochastic Systems and Modern Machine Learning Theory (3 Credits)
Typically offered Fall
This course provides a comprehensive introduction to the mathematical foundations of stochastic systems and stochastic controls in discrete time. The course also explores the applications of stochastic controls in the theoretical developments of modern machine learning, including reinforcement learning, generative diffusion models, deep neural network training, and fine-tuning large language models. | Prerequisites: PhD standing or Permission from FRE Department. Co-requisites: (Recommended but not required): ECE-GY 6253 or ECE-GY 6233 (or similar).
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: PhD standing or Permission from FRE Department.
Corequisites: (Recommended but not required): ECE-GY 6253 or ECE-GY 6233 (or similar).

FRE-GY 9713 Special Topcs in Asset Pricing (3 Credits)
Typically offered occasionally
Current topics of particular importance in asset pricing are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include, financial modeling, financial statement analysis, portfolio optimization with dynamic programming, market microstructure, and others. |Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 9733 Spec Topcs in Fin Engr (3 Credits)
Typically offered occasionally
Current topics of particular importance in financial engineering are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include machine learning with big data, fixed income securities, quantitative investing strategies, and others. |Prerequisites: Graduate Standing and instructor's permission.
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.

FRE-GY 9743 Spec Topcs in Risk Management (3 Credits)
Current topics of particular importance in risk management are analyzed and discussed. Selected topics are emphasized and provide focus for further study. Examples might include climate change risk, event driven finance, mathematics of machine learning, Markov chains, and others. | Prerequisites: Matriculation into a master or doctoral program
Grading: Grad Poly Graded
Repeatable for additional credit: Yes
Prerequisites: Graduate Standing.

FRE-GY 9973 MS Thesis in Finance & Risk Engineering (3 Credits)
Typically offered Fall and Spring
In this research course, students undertake proprietary or non-proprietary research and write a thesis-type research paper. Generally, students work under faculty supervision. However, the course is intended to be largely self-directed within guidelines established by the supervising faculty member. | Prerequisites: Graduate Standing. This course should be taken during the student's final semester. Prerequisites vary depending on the student's track and the nature of the thesis project.
Grading: Grad Poly Graded
Repeatable for additional credit: No
Prerequisites: Matriculation into a graduate program sponsored by the Department of Finance & Risk Engineering, or permission of the department.