

QUANTITATIVE FINANCE (QFGB)

QFGB 8901. ACCOUNTING I. (3 Credits)

Provides a basic understanding of the preparation and analysis of corporate financial statements. Introduces generally accepted accounting principles (GAAP) and the standard-setting process. Discusses current issues in the reporting process, such as the benefits and problems of the Sarbanes-Oxley Act.

QFGB 8902. BASICS OF ECONOMICS. (1 to 3 Credits)

Covers both microeconomics and macroeconomics. Microeconomics topics include theory of demand and the nature of profit and utility-maximizing market equilibrium that constitute the economic basis of finance theory and applications. The macroeconomics segment defines the major components of the economy, outlines a simple model of long-run, real economic behavior with competitive, market clearing prices, then establishes a companion model of short-run adjustments without flexible pricing.

QFGB 8903. BASICS OF FINANCE. (1 to 3 Credits)

Provides a conceptual framework for decision-making processes in many diverse areas of finance. Concepts including time value of money, stock and bond valuation, project and firm valuations, risk and return measures, portfolio management, basic CAPM and APT, diversification and hedging are reviewed. Basic theoretical aspects of corporate finance, such as dividend policy and capital structure, are also introduced.

QFGB 8905. MATH FOR QUANTITATIVE FINANCE. (1.5 Credits)

Reviews the basics of mathematics in preparation for advanced courses in the MSQF program. Topics include: Special functions, Multivariate calculus, Optimization, Integration, Differential equations (ODE and PDEs), and Linear algebra.

QFGB 8906. PROBABILITY & STATISTICS. (1.5 Credits)

Reviews the basics of probability and statistics in preparation for advanced courses in the MSQF program. Topics include special distributions like binomial, poisson, normal, lognormal, gamma, beta, and fat-tailed distributions.

QFGB 8911. ADV FINANCIAL MODELING. (2 Credits)

Provides the foundation for developing skills in the quantitative analysis of financial decisions, primarily using Microsoft Excel. Topics include business planning, forecasting, sensitivity and scenario analyses, risk and return measures, portfolio analysis, binomial option pricing and Value-at-Risk (VAR) analysis. Emphasizes practical skills to produce computer models that are useful for a variety of decision-making purposes.

QFGB 8914. BASIC OF DERIVATIVES. (2 Credits)

Introduces deferred delivery (i.e. exchange-traded futures and OTC - traded forward) markets and option markets. The course covers the following: (1) briefly examines the institutional features of these markets; (2) discusses hedger, arbitrageur and speculator strategies; (3) provides and analytical foundation for the pricing of these contracts; (4) reviews some of the available empirical evidence concerning these markets; and (6) uses the data to perform small-scale suggestive tests of the theories and strategies.

QFGB 8915. INTRO TO STOCHASTIC CALCULUS. (2 Credits)

Focuses on the practical applications of stochastic differential equations subject to appropriate boundary conditions, solving valuation problems, and using measure-transformations as required in advanced financial engineering practice to value assets within a risk-neutral framework. Builds a theoretical foundation for continuous-time models that are essential for the pricing and hedging of financial derivatives.

QFGB 8923. MACHINE LEARN & ECONOMETRICS. (2 Credits)

Covers estimation of parametric and non-parametric techniques commonly used in finance, applying high-frequency financial databases. Discusses properties of financial data, linear time series data analysis, basic theory of statistical inference with linear models, general linear models, conditional Heteroskedasticity models, nonlinear models and Bayesian inference and estimation.

QFGB 8924. EQUITY STYLE DERIVATIVES. (2 Credits)

Designed to complement and extend the topics discussed in Basics of Derivatives (QF 8914), this course includes all types of derivatives where a commodity, equity, or currency is the underlying asset. Hull's software and a Bloomberg/Reuters terminal are used for pricing options and gathering data. The data to perform small-scale suggestive tests of theories and strategies is used.

QFGB 8925. SIMULATION APPLICATIONS. (2 Credits)

Introduces state-of-the-art computational techniques essential for implementing financial models, pricing derivatives, obtaining numerical solutions to estimation problems, and simulating stochastic systems in risk management. Provides conceptual framework for gaining experience on simulation design and implementation using METLAB. This course builds a skill set that combines financial modeling, data analysis, and computation.

Attribute: ASDM.

QFGB 8926. FINANCE THEORY. (2 Credits)

Introduces financial theory with a particular emphasis on portfolio choice and the fundamentals of asset pricing. Focuses on both the partial equilibrium theory (CAPM), and the general equilibrium theory (Arrow-Debreu Pricing Theory) with brief introductions on the arbitrage-based theories. Introduces the basics of asymmetric information and how the problems it imposes can be mitigated via security design. It also emphasizes and understanding of the theories of Discrete-Time Asset Pricing; studies the application of the theory of stock options to real options and complex corporate liabilities; and explores the basic foundation of the GMM tests of asset-pricing theories.

QFGB 8927. INTRODUCTION TO C++. (2 Credits)

This course will introduce quantitative finance students to programming in C++.

QFGB 8928. AUTO TRADING SYSTEMS - INTRO. (3 Credits)

This course discusses key issues involved in the design of an Auto (Algorithmic) Trading Systems, and provides hands-on experience. The end product is a prototype Auto Trading System designed by students that successfully trades in the real market (stock, futures, option) using live data feeds from exchanges. Issues covered include: typical structures of trading systems; efficient processing of live information; minimizing trade slippages; handling large number of securities; asynchronous information processing; GUI interfaces; etc. Industry experts are invited to discuss new developments. Key programming techniques will be reviewed at the beginning, very briefly. The course is suitable for students in MSGF, MSQF, and other master level students with programming skills equivalent to one formal course (e.g, R, Matlab, VBA, etc). Students with less programming skill may take the course if approved by instructor.

QFGB 8931. FIXED INCOME SECURITIES. (2 Credits)

Introduces fixed-income securities, basic fixed-income concepts, the different sectors of the fixed-income market, and basic bond mathematics. Studies quantitative fixed-income analysis and its use in valuing bonds and quantifying risk-return characteristics. Involves extensive training in the mathematical formulation of bond valuation problems and in the use of the existing models and software to solve these problems.

QFGB 8933. FINANCIAL ECONOMETRICS II. (2 Credits)

Introduces modern financial econometric techniques with a special focus on applications to finance. Both the theoretical framework for making statistical inference and exemplary applications using data in modern finance are emphasized. The course involves extensive use of commercial software packages as well as implementing new financial econometric techniques using high-level programming language, such as MATLAB.

QFGB 8934. INTEREST RATE DERIVATIVES. (2 Credits)

Studies continuous time no-arbitrage models of yield curves and pricing of fixed-income securities and derivatives. In particular, treasury bonds as well as more complicated instruments, such as options on bonds, interest rate swaps, option on interest rate swaps, caps, floors, and Mortgage Backed Securities are priced and analyzed.

QFGB 8935. RISK MANAGEMENT. (2 Credits)

Builds strong understanding of the risks of individual products and methods of hedging and/or replication those products. Also examines firm-wide risk issues from a financial perspective which requires aggregation of multiple positions and consideration of interrelationships among asset price fluctuations. Regulatory and other non-market risk issues are considered and simulation techniques for modeling risk are practiced.

Attribute: ASDM.

QFGB 8942. ADVANCED FINANCE THEORY. (2 Credits)

This course build upon Financial Theory I (QF 8922) and examines cross-sectional and time series properties of asset returns. Offers an in-depth statistical review of several theoretical models of inter-temporal asset pricing. Microstructure effects on short-term asset returns as well as tests of returns predictability are covered.

QFGB 8943. LARGE-SCALE DATA MODELING. (2 Credits)

Explores financial modeling topics using large data sets and various econometric techniques applied in a variety of financial problems. Topics include modeling the yield curve in the US and other countries, application of pattern recognition techniques in developing stock-rating systems, factor models in portfolio construction, and portfolio performance evaluation. Emphasis on project analysis using SAS to process large data sets and develop appropriate models for solving real problems in equity and fixed-income research.

QFGB 8944. CREDIT RISK MGMT. (2 to 3 Credits)

Introduces modern credit risk models with particular focus on credit derivative instruments. Focuses on derivative market methods, rather than accounting analyses of business risks. Exposes students to institutional practices and commonly used data. Students will be expected to thoroughly understand professional software output, along with the risks and rewards of credit product strategies.

QFGB 8946. C++ FOR FINANCE. (3 Credits)

This course uses C++ to solve Finance problems. Two types of students will take this course. One type is the student with a strong computer programming background (perhaps an engineering undergraduate), but who has not taken C++ or applied it to finance problems. The other type may have been a finance undergraduate student who has little computer programming experience before entering the MSQF program. The latter student must take the spring introduction to C++ course offered by the computer science department as a prerequisite to taking this course in their second fall term.

QFGB 8947. ADVANCED DERIVATIVE PRICING. (2 Credits)

This course covers advanced option pricing.

QFGB 8948. QUANTITATIVE METHODS FOR PORTFOLIO MANAGEMENT. (2 Credits)

Introduces the scope of the quantitative concepts used in asset management, with focus on practical application, challenges and limitations in constructing optimal portfolios, evaluating performance and portfolio risk. Involves extensive discussions of case studies and group project. * *Subject to NY Approval.

QFGB 8949. ADVANCED FINANCIAL ECONOMETRIC. (2 Credits)

This course takes up Bayesian estimation of small-scale financial sector and macro-econometric models. Counter-factual simulations will also be used, as well as monte-carlo methods for evaluating confidence intervals. In addition to Bayesian estimation, the course will make use of extensive data sets to investigate topics such as contagion effects across countries in financial markets, and neural networks for predictive accuracy. * *Subject to NY Approval.

QFGB 8950. ALTERNATIVE INVESTMENTS. (2 Credits)

The course is an introduction to the rapidly evolving universe of alternative investments. Delivered in modules, the course covers a broad array of alternative strategy classes (Quantitative/Systematic, Fundamental Long/Short, Global Macro, Private Equity) ranging across all major asset classes (Equities, Fixed Income, Currencies, Commodities, Derivatives). * *Subject to NY Approval.

QFGB 8951. INTERNSHIP AND PROJECT REPORT. (2 to 4 Credits)

A professional project report and presentation are the final outputs of this course. Students complete these projects under the supervision of a faculty member. Both individual and group-projects are possible.

QFGB 8952. BUSINESS COMM FOR QUANTS A. (1 Credit)

Covers the basics of professional speaking and writing. Develops oral and written presentation skills essential for successful careers. Coordinated with summer term internship to give students the opportunity to apply their new communication skills in a business setting.

QFGB 8953. RESEARCH SEMINAR 1. (1.5 Credits)

This fall course features a series of lecturers from the finance industry. They discuss research projects that their companies are working on.

QFGB 8954. RESEARCH SEMINAR 2. (1.5 to 3 Credits)

This spring course features a series of lecturers from the finance industry. They discuss research projects that their companies are working on.

QFGB 8955. COMPUTATIONAL FINANCE. (2 Credits)**QFGB 8957. Financial Industry and New Regulations. (3 Credits)**

This course will explore how the market structure has fundamentally changed after the 2008 liquidity and credit crisis, and how this crisis has impacted on liquidity, balance sheets, risk taking and returns across the entire financial services industry. The new reality is that regulation has changed the landscape of Wall Street and the dynamic of how the sell-side and buy-side will interact in the foreseeable future.

QFGB 8958. LECTURES IN APPLIED PORT MGT. (3 Credits)

This advanced Portfolio Management course quickly reviews Modern Portfolio Theory (MPT) conceptual underpinnings and builds on MPT 1.0. It delves into contemporary liability driven asset allocation, MPT 2.0 and portfolio management industry practices, issues and concerns. Lectures, problem solving, and self-study along with extensive hands-on tools using Microsoft Excel based models will be used to provide a practitioner's perspective. We will review and demo contemporary asset allocation optimization and forecasting techniques, new asset class pricing and valuation, performance and risk attribution, tail risk measurement and management tools etc. using real time vendor based (third party) solutions. As prerequisites - the student should have class exposure to investment and portfolio analysis, Excel, stats, and basic regressions.

QFGB 8959. MACHINE LEARNING FOR FINANCE. (2 Credits)

This course explores the world of Machine Learning and financial applications. We will investigate how it uses large amounts of structured or unstructured data to discover patterns and hidden topics, transforming raw data into knowledge for decision making. We will investigate real and practical examples from finance, tracing parallels between data science, statistics, and data analytics.

QFGB 8960. ADVANCED C++ FOR FINANCE. (2 Credits)

Advanced C++ for finance.

QFGB 8961. BUSINESS COMM FOR QUANTS B. (1 Credit)

Covers the basics of professional speaking and writing. Develops oral and written presentation skills essential for successful careers.

QFGB 8962. DYNAMICS OF BANKING&FIN MKTS. (3 Credits)

This course is designed to provide students a well-rounded and hands-on perspective on the practical functioning and decisions in financial markets and banking.

QFGB 8963. STRESS TESTS & CAP ADEQUACY. (3 Credits)

The financial crisis of 2007 -08 taught us all a lesson: that preparedness is everything. How resilient and prepared will we be, and how fast will we be able to recover? This is the key focus of this course: how to plan for moments of distress so that firms such as yours have capital of a sufficient quality to survive potential storms. We will demonstrate how to create a robust capital plan and test it for moments of hypothetical stress. We will investigate exactly how a bank holding company and an insurance company should conduct their capital plan, highlighting the significant differences between the two industries. By the end of the course, you will be able to create a capital plan for your business on your own.

QFGB 8964. ARPM BOOTCAMP-INTENSIVE QUANT. (3 Credits)

Consolidates portfolio and risk manager's expertise into a structured and rigorous quantitative framework. Empowers avid learners with background in hard sciences to gain the deep technical knowledge necessary to operate across the complex world of quantitative trading, asset management, and risk management. Topics include data science and machine learning; classical / Bayesian multivariate statistics, and econometrics; financial analytics; market, credit & liquidity risk management; estimation error and model risk; and much more. ARPM Lab online (theory, case studies, Python & MATLAB code, slides, exercises). Obtain ARPM Certificate of Attendance & 40 GARP CPD.

QFGB 8965. Trading - Market Making & Algorithms. (1.5 Credits)

This course will introduce students to basic market microstructure, algorithmic trading, and quantitative investment strategies. Mathematical and statistical techniques along with their computational implementation in R or Python will be used throughout the course.

Prerequisites: QFGB 8911 and QFGB 8923 and QFGB 8926.

QFGB 8999. INDEPENDENT STUDY. (2 or 3 Credits)