

# FINTECH (XFN1-GB)

## XFN1-GB 8101 Finance Concepts and Math (1.5 Credits)

*Typically offered occasionally*

This course introduces the key concepts and analytical tools for financial analysis. Mastering these tools is important for making financial decisions and essential for understanding the material in later courses. We will develop two primary approaches to valuation—discounted cash flow valuation and no-arbitrage pricing—and apply these techniques to value fixed income securities, equities, and options. One critical component of discounted cash flow analysis is the determination of the appropriate discount rate. The search for a model of discount rates will naturally take us to a study of risk and return in the context of portfolio choice. The outcome of this journey will be an intuitive derivation of one of the most powerful and famous models in finance—the Capital Asset Pricing Model (CAPM)—and its more recent extensions. Along the way, the course will highlight the role of diversification and the associated classification of risk. The second valuation approach, no-arbitrage pricing, is the primary technique for valuing derivative securities. We'll see how the law of one price can be applied to value options in a simple binomial setting and how the intuition from this setting allows us to understand the well-known and widely used Black-Scholes option pricing formula. Finally, we will discuss the role of banks and money market funds in the provision of safe and liquid assets. Safe and liquid assets, such as deposits, provide special services that allow them to fetch a higher price than implied by CAPM. Liquid assets, however, are still exposed to interest rate risk, and banks are exposed to the risk of runs, which must be understood and managed.

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

## XFN1-GB 8102 R Programming for Data (1.5 Credits)

*Typically offered occasionally*

In this course, students will learn how to program in R and how to use R for effective data analysis and visualization. Turn raw data into understanding, insight, and knowledge (Wickham & Golemund, 2017, p. ix) using R to import, prepare, understand, and communicate your data findings. The course begins with developing a basic understanding of the R working environment. Next, students will be introduced to the necessary arithmetic and logical operators, salient functions for manipulating data and getting help using R. Next, the common data structures, variables, and data types used in R will be demonstrated and applied. Students will write R scripts and build R markdown documents to share their code with others. They will utilize the various packages available in R for visualization, reporting, data manipulation, and statistical analysis. Students import data sets, and transform and manipulate those data sets for various analytical purposes. Students will learn how to create control structures, such as loops and conditional statements, to traverse, sort, merge, and evaluate data. Finally, students create interactive business applications allowing for data querying and exploration. This course is designed for those who have no experience in R or programming. This class gives you skills in programming and R and introduces you to the following: - A new way of thinking - A new language for speaking and reading (vectors, data frames, functions, objects, etc.) - A new syntax for writing, e.g. `c()`, `print()`, `cat()`, `sort()`, `require()`, `subset()`, for data analysis and presentation.

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

## XFN1-GB 8103 Databases for Business Analytics (1.5 Credits)

*Typically offered occasionally*

Databases are ubiquitous in all businesses and hold significant information about the business. Every data analysis and report typically starts with an SQL query, as SQL is the lingua franca of all database systems. Therefore, SQL is necessary for anyone who needs to analyze data as part of their job. Many tech companies consider the knowledge of SQL a prerequisite for all their analysts and managers. This database class is designed for absolute beginners and teaches students how databases are structures and how to write SQL queries that retrieve data from a database. The hands-on class focuses on developing the necessary skills for writing SQL queries. We will cover the following topics: - Basics of Entity-Relationship model and the connection to databases - USE, DESCRIBE queries to understand the structure of a database - Selection queries: `*column,column AS, DISTINCT, ORDER BY, LIMIT` - Filtering data using `"where"`: Boolean conditions, IN, BETWEEN, LIKE - Join queries: Inner and Outer joins, self-joins, semi-joins, anti-joins - Aggregation queries: GROUP BY, SUM, AVG, MAX, MIN, etc - Subqueries - Window queries

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

## XFN1-GB 8104 Ethics in Fintech (1 Credit)

*Typically offered occasionally*

Ethics in Fintech is a theory, discussion- and reflection-based course that helps students: - Gain an understanding of the purpose, roles and impact of business in society, especially as these apply within an emerging technology that embodies both societal risks and opportunities. - Develop a positive vision of what technology driven business can achieve, and a realistic understanding of collateral effects. - Develop the intellectual capital to recognize and navigate the ambiguities, hazards, and opportunities they will face in their careers.

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8105 The Financial Services Industry (1.5 Credits)***Typically offered occasionally*

The financial services industry touches all of our lives and has been going through a continuous transformation since the deregulation that began in the early 1970's. That evolution has accelerated in recent years as more and more pressure has been brought to bear by various stakeholders in the industry who have divergent goals and agendas. Those invested stakeholders include clients, investors, employees, regulators/politicians and the public at large. Overlaying all of this change has been rapid technological advancement that has had a direct impact on how the industry delivers its services, meets expected equity returns and manages the risk inherent in that delivery. This Course is an Advanced Finance Elective where THINKING not MEMORIZING is what it is all about. This course is a survey course. It provides a broad overview of the financial services industry and of the forces that are continuing to change it worldwide. That change/evolution has resulted in a confederation of sometimes integrated products and services within a multi-product firm. It has also resulted in individual stand-alone businesses within those same integrated financial firms, or in boutique, stand-alone, limited product firms. The course focuses on four big questions: (1) Why and what kind of services are provided by participants in the industry? (2) Who develops, provides and regulates those services? (3) How are they likely to be executed or modified in the future? (4) What skills (both technical and "soft") are required for an individual to succeed in the industry? Our approach will be to examine each of the principal businesses in which various financial service firms have been involved, including: raising capital; financial advisory; broker/dealer positions; sales and trading; proprietary investing; managing the assets of others (both institutions and individuals) and risk management. Throughout, there are a number of overarching themes. Among these are: the interplay of politics, regulation, globalization, and technology; the emergence of shadow banking including private equity and hedge funds as both critical clients and potential competitors for the major investment banks; the search for new, high-margin products and whether that process has reached its limits; and the changing relationships among the different groups within a financial service firm. By the end of this course each student should be well versed in the functioning of the industry, be able to understand the financial press and associated economic commentary, be aware of the types of skills necessary to thrive in this industry and have a new perspective on the global financial system.

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No**XFN1-GB 8106 Statistical Foundations of Machine Learning (2 Credits)***Typically offered occasionally*

This course will introduce students to the fundamental concepts of Machine Learning. These include (i) the type of data that can be used, the data structure needed to build predictive models, feature engineering (ii) the principles of training and testing predictive models and the idea of cross-validation (iii) bias (iv) interpretability of models (v) evaluation metrics of models (vi) an introduction to unsupervised learning As data collected over time is key to many Fintech applications, we will also discuss some of the key ideas of time series analysis and the challenges inherent in that.

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No**XFN1-GB 8107 Big Data & Dealing with Data in Finance (1 Credit)***Typically offered occasionally*

This course will help you learn how to program so that they can effectively retrieve, store, manipulate, and visualize data. You will develop practical programming and data manipulation skills using Python. Python is a beginner-friendly programming language that is widely used in industry. In recent years, it has also become the de facto standard in data science. The courses focuses on practical tasks when dealing with data using Numpy and Pandas; obtaining data from online sources via APIs and web scraping; plotting using Matplotlib, and writing and reading data to/from files (CSV and Excel files). The course teaches you how to manipulate and analyze financial data in Python using professional tools. While no prior programming/Python experience is assumed, it does involve coding.

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No**XFN1-GB 8108 Platform Strategy in Fintech (1.5 Credits)***Typically offered occasionally*

Fintech platforms are everywhere. New business models are being leveraged by emerging organizations and traditional entities alike, complementary to well-established models or as potential replacements of their core businesses. The economic disruption has been revolutionary. In a few short years, the ranking of most valuable companies by market capitalization has totally shifted to being dominated by one business model. In this course, we will equip ourselves with the fundamental economic, strategic and governance concepts to navigate the 21st century world of fintech platforms. We will understand what platforms are and how they differ from traditional organizations, the economics of network effects that drive their growth and success, how to launch a platform, global expansion, platform strategies for the traditional finance company, key governance principles, and the emerging world of generative AI platforms. Cases from China, India and Kenya, coupled with expertise from industry leaders and a look into the future of fintech in the APAC region will bring these ideas to life, and student teams will translate their learning into proposing their own new fintech platforms.

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No

**XFN1-GB 8109 Strategy, Change, and Analytics (1.5 Credits)***Typically offered occasionally*

It's no secret that technology is revolutionizing the financial services industry, and the disruptive possibilities seem endless. But with possibility and disruption comes risk, and risk brings various impediments to change that make capitalizing on new disruptive possibilities a non-trivial strategic problem. Large and established incumbents in financial services often face severe tradeoffs in incorporating new technological possibilities into their standard routines and operating businesses. One need only look at the recent missteps of Goldman in implementing their new Marcus initiative to admit that even well-capitalized and prestigious incumbents often find navigating new business possibilities tricky. The difficulties that established incumbents face in adapting to the new technological landscape have opened up opportunities for savvy entrepreneurs to create new businesses that are more agile and more focused, upending old business models with alternative and disruptive models that change the rules of the game. But the failure rate of start-ups in any industry is high, and some experts say it is even higher in the fintech space. Being small, technologically savvy, and nimble is no guarantee of success. Entrepreneurs face impediments and tradeoffs of their own. This course is about understanding the dynamics of industry disruption and the technological competition and substitution that it often entails, both in a general sense as well as focused on fintech. The course has several goals: 1. Explore the general landscape of fintech. Some of you are already quite knowledgeable about this domain, but our pre-module reading/case Cutting Through The Fog: Finding a Future with Fintech will ensure a basic familiarity for the class as a whole. This reading also sets up the dual perspectives that we will take in the course: the perspective of an incumbent financial firm facing opportunities and threats in the fintech space and attempting to fashion a response, and the perspective of a start-up firm attempting to enter into this space with disruptive intentions. 2. Review the concept of "competitive advantage" and apply it as a benchmark strategic objective when evaluating opportunities and threats in the fintech space. The premodule reading Competitive Advantage provides an accessible and interactive tutorial precisely defining competitive advantage, how to measure it, and how to achieve it. We will use this reading to develop the dual strategic problems of competition and substitution. 3. Develop a systematic understanding of the general dynamics of industry competition and disruption and how to manage these dual pressures simultaneously. We'll use the Back Bay Battery Simulation and associated material to help us articulate possible strategies for managing these dual pressures simultaneously. 4. Enact and expand our accumulated understanding of 1-3 above by discussing two cases together in class. The Eastern Bank case recounts the experience of an established incumbent bank attempting to respond to new technological possibilities via an internal venturing initiative designed to articulate innovative strategic options. The Cuvva case outlines the early years and strategic decisions of a UK start-up with aspirations to disrupt the domestic auto insurance industry with short-term and easily arranged personal liability coverage. 5. Sharpen our sensitivity to the individual, social, and organizational impediments to transformation and change. Often, even the best ideas never get traction because of inertia, resistance, politics, and competing interests. John Kotter's famous article Leading Change: Why Transformation Efforts Fail, together with a short in-class exercise at the end of our module, will be our guide for building a proactive approach to managing the forms of resistance to new possibilities and the transformations they bring with them. We'll ground our analysis and discussions in what has become known as the "value-based view" of strategy. The value-based view provides a "lingua franca" for strategic management, a common set of concepts that can be used to understand a wide range of situations involving business value creation and capture. The value-based view provides a precise definition of what it means to have a competitive advantage in one or both of these. It also provides a very clear framework for understanding disruptive technological substitution

**XFN1-GB 8110 Financial Markets Processes and Technology (1 Credit)***Typically offered occasionally*

In the fast-paced world of finance, understanding and using technology is critical. Financial institutions, at the forefront of innovation, have embraced information technology as a vital tool to navigate the complexities of the markets. Likewise, technology has become the lifeblood of investors, empowering them with real-time price updates and invaluable market insights. The era of open-outcry trading floors has given way to automated trade matching, ensuring fast execution of transactions. The days of error-prone paper-based settlement processing are also long gone, with straight-thru-processing (STP) having become the norm, resulting in streamlined and faster settlement cycles. However, even as the use of technology has superseded manual trading, the essence of markets, trading, and risk management remains mostly unchanged. Common processes and technology architectures serve as the foundation of financial markets. Hence, to understand the financial markets, students must understand purpose, structure, and mechanisms used to implement it. The course begins by examining the role and challenge of institutional investors and goes on to explore how various market participants help address their needs. Concepts related to exchanges, the function of financial market intermediaries, clearing and settlement, and risk management are covered. Additionally, considerations related to market malpractice and trade surveillance are discussed. This course will build on concepts taught in Overview of the Financial Industry and Finance Concepts and Math.

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No**XFN1-GB 8111 Regulation in Fintech (1 Credit)***Typically offered occasionally*

Regulation in Fintech examines the impact of financial regulation and other regulations on Fintech. It helps students understand the drivers for and tenants of financial regulation and how it affects firms globally. It explores how regulation shapes business and technology decisions related to lending, payments, and digital assets. Regulation of Fintech reviews how regulatory sandboxes have been used by Fintech firms and financial institutions to test ideas and garner regulatory support. Additionally, the course compares the different countries' regulatory approaches and looks at future trends in Fintech regulation. Real-world case studies are used bring to key concepts to life and relate them to practical business concerns. This course will build on concepts taught in Overview of the Financial Industry and Financial Markets Processes and Technology.

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No**XFN1-GB 8112 Data Visualization for Fintech (1 Credit)***Typically offered occasionally*

Data Visualization for Fintech

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No**XFN1-GB 8113 Behavioral Finance (1.5 Credits)***Typically offered occasionally*

Behavioral Finance

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No**XFN1-GB 8114 Blockchain and Cryptocurrencies (1.5 Credits)***Typically offered occasionally*

Blockchain and Cryptocurrencies

**Grading:** Grad Stern Graded**Repeatable for additional credit:** No

**XFN1-GB 8115 Decision Models (1.5 Credits)**

*Typically offered occasionally*

Decision Models

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8116 Venture Capital in Fintech (1 Credit)**

*Typically offered occasionally*

Venture Capital in Fintech

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8117 Valuation and Unicorns in Fintech (1 Credit)**

*Typically offered occasionally*

Valuation and Unicorns in Fintech

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8118 Entrepreneurial Finance (2 Credits)**

*Typically offered occasionally*

Entrepreneurial Finance

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8119 Cyber Risk Management (1 Credit)**

*Typically offered occasionally*

Cyber Risk Management

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8120 Artificial Intelligence and Machine Learning in Risk Management (1 Credit)**

*Typically offered occasionally*

Artificial Intelligence and Machine Learning in Risk Management

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8121 Leadership in Fintech (1 Credit)**

*Typically offered occasionally*

Leadership in Fintech

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8201 Fintech Startup Case Studies (2.5 Credits)**

*Typically offered occasionally*

Fintech Startup Case Studies

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No

**XFN1-GB 8501 Capstone (5 Credits)**

*Typically offered occasionally*

Capstone

**Grading:** Grad Stern Graded

**Repeatable for additional credit:** No