



# **FINTECH COURSES**

**AT THE UNIVERSITY OF MICHIGAN**

**2020-2021**

**COMPILED BY THE**

**UNIVERSITY OF MICHIGAN  
FINTECH COLLABORATORY**

In 2019, the University of Michigan was one of 11 universities to receive funding from Ripple's University Blockchain Research Initiative to establish the U-M FinTech Collaboratory. This interdisciplinary initiative is supported by faculty and staff from the following U-M schools and units: the College of Engineering, the Ross School of Business, the Ford School of Public Policy, the Center for Smart Infrastructure Finance, the Business Engagement Center, and the Center on Finance, Law & Policy. This list catalogs courses across the University that teach fintech core competencies or knowledge.

**03**

COLLEGE OF ENGINEERING

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**04**

FORD SCHOOL OF PUBLIC POLICY

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**05**

LAW SCHOOL

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**06**

COLLEGE OF LSA / MATH DEPT

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**07**

ROSS SCHOOL OF BUSINESS

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**If you teach a course that is not included (or know of one), please email details to Christie Baer ([cbaer@umich.edu](mailto:cbaer@umich.edu)).**

# COLLEGE OF ENGINEERING

## Engineering Economics and Finance (CEE 504)

Credits **3**

Instructor: **Peter Adriaens, Professor**, Civil & Environmental Engineering;  
Ross School of Business & School for Environment & Sustainability

Term Offered: **Fall 2020**

Engineering Economics and Finance focuses on evolving financial decision making in engineering practice. Topics like accounting, public and private investment decision making, project management and risk and uncertainty are covered and linked to practical problems that are meaningful to (smart) infrastructure systems and the students' professional futures.

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## Environmental Finance (CEE 588/ChE 590)

Credits **3**

Instructor: **Peter Adriaens, Professor**, Civil & Environmental Engineering;  
Ross School of Business & School for Environment & Sustainability

Term Offered: **Fall 2020**

This course discusses innovations in processes, investment mandates and financial basics of Environmental Finance across traditional (stocks and bonds) and alternative asset classes (real assets, private equity, hedge funds, and structured products, including FinTech). It will examine how investment structures and financial return characteristics inform capital allocations to environmental and sustainability objectives. We will explore how fractionalization and tokenization of assets is starting to disrupt the environmental finance space, and democratize financing models across institutional and retail investors.

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## Electronic Commerce (EECS 547 / SI 652)

Credits **3**

Prerequisites **EECS 281 or SI 502 or permission of instructor**

Instructor: **Michael Wellman**, Lynn A. Conway Collegiate Professor of Computer Science and Engineering

Term Offered: **Fall 2020**

Introduction to the design and analysis of automated commerce systems, from both a technological and social perspective. Infrastructure supporting search for commerce opportunities, negotiating terms of trade and executing transactions. Issues of security, privacy, incentives and strategy.

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## Entrepreneurial Business Fundamentals for Engineers & Scientists (ENGR 520)

Credits **3**

Instructor: **Peter Adriaens, Professor**, Civil & Environmental Engineering;  
Ross School of Business & School for Environment & Sustainability

Term Offered: **Winter 2021**

This course provides students with a perspective in looking to form or join startup companies and those that are looking to create corporate value via industrial research. The students are taught the entrepreneurial business development screening tools necessary to translate opportunities into businesses with focus on: strategy, finance and market positioning

# FORD SCHOOL OF PUBLIC POLICY

## **Cybersecurity for Future Leaders** (PUBPOL 750.004)

Credits 3

Instructor: **Javed Ali**, Towsley Policymaker in Residence; Co-taught with **Dr. Carl Landwehr**, Lead Research Scientist, Cyber Security Policy & Research Institute, George Washington University

Term Offered: **Fall 2020**

Future leaders will need to understand the science, technology, and human considerations behind cybersecurity well enough to make informed decisions when provided advice and options for action. Over the last decade cybersecurity issues have risen in prominence from a U.S. National security perspective, as well as from the perspective of individuals and organizations. There have been near daily reports regarding cyber operations launched by nation states, hacking groups, criminal organizations, and individuals against a variety of targets, using different tools and methods, and with different effects. Technology has accelerated the rate of cyber operations, enabling those intent on using cyber tools for a variety of malign purposes. The U.S. government has also attempted to reorganize and reorient towards this multi-dimensional threat, in addition to private industry, state and local governments, and academia—but there are still a number of gaps and vulnerabilities that deserve technical and policy attention and solutions.

This class will examine the broad landscape of cybersecurity from both a technical and policy perspective. It will introduce fundamental concepts of computing and cyber security, including information theory, computability, cryptography, networking fundamentals, how vulnerabilities arise, and how attacks work. In addition, it will explore foundational ideas including definitions, cyber norms, and ethics; identify existing U.S. laws, authorities and governmental constructs; and frame classic security concepts like deterrence, attribution, offense, defense, and retaliation. The course will also involve guest speakers, short writing assignments designed to capture technical or policy insights, policy papers designed to explore alternative views on different cybersecurity topics, and simulated National Security Council policy meetings where students assume different interagency roles and examine potential courses of action.

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## **FinTech Entrepreneurship** (PUBPOL 750.008)

Credits 1

Instructor: **Adrienne Harris**, Towsley Policymaker in Residence & Professor of Practice

Term Offered: **Fall 2020**

Total global fintech investment increased from \$50.8 billion in 2017 to a full \$111.8 billion in 2018, according to KPMG's The Pulse of Fintech, and there are no signs that growth in this sector will slow down. What are the latest trends in fintech and how do innovators, entrepreneurs, and other stakeholders see the space developing? Beyond the general trends, how do fintech entrepreneurs, incumbents, and investors identify and assess opportunities in fintech? And what does the lifecycle of a fintech company – from ideation, to investment, to growth and maybe acquisition – look like? This course will provide a strong foundation for those with a working level of knowledge in fintech and who are interested in starting or investing in fintech companies.

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## **Introduction to Financial Technology and the Future of Financial Services** (PUBPOL 750.009)

Credits 3

Instructor: **Adrienne Harris**, Towsley Policymaker in Residence & Professor of Practice

Term Offered: **Fall 2020**

Throughout history, financial services has played a vital role in the global economy, and similarly, technology has been an integral part of financial services. Although the combination of financial services and technology isn't new, the advent of mobile technologies along with a post-financial crisis world have led to a financial technology, or fintech, revolution. New products and services have emerged, causing financial services to look very different than it did 10, or even four, years ago. But fintech is still a relatively new industry, and many questions remain about the benefits and the risks of fintech, how it will impact incumbent institutions and systems, what it will mean for consumers, and how governments should view these developments.

How are recent technological advances different than past innovations? How is technology changing financial services today and how will it change the industry in the future? What impact does this change have on stakeholders, including consumers? What are the benefits and risks of this change? This course will examine these questions and others.

## | LAW SCHOOL

### **Data Privacy Law (LAW 503)**

Credits **2**

Instructor: **Daniel Deacon, Lecturer**

Term Offered: **Winter 2021**

This course is an introduction to data and information privacy law. It will survey the common law, statutory, and regulatory regimes governing firms that collect, process, use, and store personal information. Students will be exposed to general consumer protection laws that bear on data privacy as well as to statutes, such as the Fair Credit Reporting Act, that apply to particular industries or kinds of data. The course will also touch on privacy law in the European Union and on issues involving the international transfer of data.

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### **Blockchain and the Law (LAW 704)**

Credits **2**

Instructor: **James Blakemore and Joshua Garcia, Adjunct Professors**

Term Offered: **Winter 2021**

For true believers, the blockchain is poised to revolutionize every aspect of our increasingly digital lives. From its infancy, however, the technology has faced a legitimacy problem, plagued by an association with bad actors and illicit uses -- the Silk Road, hackers, Ponzi schemes and other fraud, market manipulation, money laundering, terrorist financing. This course will explore the law's responses to these issues, as well as the many other ways in which the law is taming the Wild West of cryptocurrency. We will begin with blockchain's beginnings: the Bitcoin whitepaper and the basics of the technology. From there we will examine the different angles from which the law has begun to domesticate the blockchain. Topics will include smart contracts, the treatment of cryptocurrencies under the federal securities, commodities, banking, and tax laws, and the ill-fitting patchwork of state money transmitter laws used to regulate many blockchain businesses. Along the way we will trace how blockchain, an innovation initially embraced by cypherpunks and cryptoanarchists, has gone mainstream. While both evangelists and skeptics are welcome, no prior knowledge of Bitcoin or blockchain is necessary

# COLLEGE OF LSA / MATH DEPT

## Mathematics of Finance & Risk Management (MATH 423)

Credits **3**Prerequisites **Math 217, Math 425, and EECS 183 or equivalent**Instructor: **Multiple sections/instructions**Term Offered: **Fall 2020**

This course is an introduction to the mathematical models used in finance and economics with particular emphasis on models for pricing derivative instruments such as options and futures. The goal is to understand how the models derive from basic principles of economics and to provide the necessary mathematical tools for their analysis. A solid background in basic probability theory is necessary.

Content: Topics include risk and return theory, portfolio theory, the capital asset pricing model, the random walk model, stochastic processes, Black-Scholes Analysis, numerical methods, and interest rate models.

## Financial Mathematics I (MATH 573)

Credits **3**Prerequisites **Math 526**Instructor: **Dominykas Norgilas, Byrne Postdoctoral Fellow and Assistant Professor**Term Offered: **Fall 2020**

This is a core course for the quantitative finance and risk management Masters program and introduces students to the main concepts of Financial Mathematics. This course emphasizes the application of mathematical methods to the relevant problems of financial industry and focuses mainly on developing skills of model building. This is an introductory course in Financial Mathematics. This course starts with the basic version of Mathematical Theory of Asset Pricing and Hedging (Fundamental Theorem of Asset Pricing in discrete time and discrete space). This theory is applied to problems of Pricing and Hedging of simple Financial Derivatives. Finally, the continuous time version of the proposed methods is presented, culminating with the BlackScholes model. A part of the course is devoted to the problems of Optimal Investment in discrete time (including Markowitz Theory and CAPM) and Risk Management (VaR and its extensions). This course shows how one can formulate and solve relevant problems of financial industry via mathematical (in particular, probabilistic) methods.

## Financial Mathematics II (MATH 574)

Credits **3**Prerequisites **Math 526 and Math 573**Instructor: **TBD**Term Offered: **Winter 2021** expected

This is a core course for the quantitative finance and risk management Masters program and is a sequel to Math 573. This course emphasizes the application of mathematical methods to the relevant problems of financial industry and focuses mainly on developing skills of model building. This course discusses Mathematical Theory of Continuous-time Finance. The course starts with the general Theory of Asset Pricing and Hedging in continuous time and then proceeds to specific problems of Mathematical Modeling in Continuous-time Finance. These problems include pricing and hedging of (basic and exotic) Derivatives in Equity, Foreign Exchange, Fixed Income and Credit Risk markets. In addition, this course discusses Optimal Investment in Continuous time (Merton's problem), High frequency Trading (Optimal Execution), and Risk Management (e.g. Credit Value Adjustment).

## **Computational Finance (MATH 623)**

Credits **3**

Prerequisites **Math 316 and Math 425 or 525**

Instructor: **TBD**

Term Offered: **Winter 2021** expected

This is a course in computational methods in finance and financial modeling. Particular emphasis will be put on interest rate models and interest rate derivatives. Specific topics include Black-Scholes theory, no-arbitrage and complete markets theory, term structure models, Hull and White models, Heath-Jarrow-Morton models, the stochastic differential equations and martingale approach, multinomial tree and Monte Carlo methods, the partial differential equations approach, finite difference methods.

# | ROSS SCHOOL OF BUSINESS

## **A Brief Introduction to Computing Technologies: Crypto, AI, Quantum (ACC 651)**

Credits **0.5**

Instructor: **Venky Nagar**, KPMG Professor of Accounting and Teitelbaum Research Scholar

Term Offered: **Winter 2021** expected

Most discussions of modern tech are either vague pie-in-the-sky ballads or insanely technical. What MBAs need is a sound mathematical and intuitive understanding of modern tech, not so that they can become coders, but so that they can interact with coders and noncoders alike with confidence. The course will involve nothing more than grade school level math, for that is sufficient to deeply understand modern tech and accurately assess business opportunities. The course will last for two weeks and have four sessions, for that is all that is needed to get there.

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## **Venture Capital Finance (FIN 623)**

Credits **2.25**

Instructor: **Michael Godwin**, LEO Intermittent Lecturer

Term Offered: **Fall 2020**

This course covers venture capital market structure and institutional arrangements and the application of financial theory and methods in a venture capital finance setting. It presents and applies the fundamentals of venture capital finance, employing "live" case studies to focus on financing startup and early stage, technology-based firms.

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## **Big Data Manipulation and Visualization (TO 404)**

Credits **1.5**



Credits: **1.5**

Term Offered: **Sanjeev Kumar, LEO Lecturer I of Technology and Operations**

We live in the age of Big Data - large, complex data that cannot be processed using traditional tools. Companies are using recent abundance of Big Data to help make better decisions, build novel solutions to difficult problems and gain competitive advantage. However, companies are faced with scarcity of Data Analyst talent that can understand and work with Big Data. There is growing demand for professionals with skills in managing and manipulating Big Data and building Visualizations that can help explain and communicate the data and its analysis. To help students succeed in this growing field, these courses teach Big Data Manipulation using data analytics environment R, and Big Data Visualization using Tableau and R graphics packages including Ggplot2.

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## **Introduction to Coding with Python (TO 420)**

Credits **1.5**

Instructor: **Hila Etzion, Assistant Professor of Technology and Operations**

Term Offered: **Winter 2021** expected

The business world clearly has an increasing need for tech -savvy managers who could speak the language of coders and technicians. In addition, the number of popular BBA electives that require students to code has grown significantly in recent years (e.g. TO 412, TO 414, and FIN 342). This course is intended for BBAs with no prior programming experience. This course will help such students to get a fast grasp of what coding is all about, while learning the basics of programming in Python. It will prepare students for advance business courses which require programming but do not focus on the teaching of coding. Students will learn python data structures, conditional execution, iterations, working with files and more.

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## **FinTech Innovations (TO 428/FIN 638)**

Credits **3 (undergraduate), 3 (graduate)**

Instructor: **Robert Dittmar, Professor of Finance**  
**Andrew Wu, Assistant Professor of Technology and Operations and Finance**

Term Offered: **Winter 2021** expected

New technological innovations are poised to fundamentally transform the financial industry in the coming decades, resulting in abundant career opportunities for FinTech professionals who are well-versed in the dual languages of tech and finance. This course introduces students to the most cutting edge topics including blockchain, cryptofinance and smart contracts, mobile payments, P2P lending, and robo-advising. Topics on big data and technology commercialization will be interwoven throughout the course. Students will (1) obtain in-depth technical knowledge of core Fin Tech concepts, (2) connect this technical know-how to current financial theories and market practices, and (3) decipher concepts beyond just the buzz words to provide critical judgments on new Fin Tech ventures. This knowledge will enable students to be the go-to FinTech expert in a wide variety of industries, and give them an important advantage in career advancement over peers who might just know the "buzz words".

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## **Global Business Field Projects in FinTech (TO 429/FIN 639) LONDON, UK**

Credits **3 (Note: Winter semester course with fieldwork abroad over spring break)**

Instructor: **Robert Dittmar, Professor of Finance**  
**Andrew Wu, Assistant Professor of Technology and Operations and Finance**

Term Offered: **Winter 2021 (Note: Winter semester course with fieldwork abroad over spring break)**



Technological innovation has been transforming the economy across all industries, and the current race to develop technologies which open new sectors is taking over the conventional approach to business. Cryptofinance, blockchain, ICOs, crowdfunding, mobile payments, smart contracts, and many other concepts are growing in popularity among companies and require a new set of skills outside of traditional finance expertise. The expanding intersection of finance and technology offers valuable opportunities for those who have in-depth knowledge on both topics and can utilize these concepts to form analyses on viable developments. This course, taught by Professor Robert Dittmar and Professor Andy Wu, provides the unique opportunity for students to develop their knowledge of FinTech through action-based project work with innovative tech companies around the world.

Students will engage in a FinTech project with employees at stakeholder companies. This interdisciplinary group project work will allow students to grow their global network, develop real-world skills and experience, and gain a career edge in the rapidly advancing intersection of finance and technology.

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### **Multi-disciplinary Action Program (MAP) courses** for MBAs focused on a Fintech company's challenge.

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#### **Big Data Management: Tools and Techniques (TO 640)**

Credits **2.25**

Instructor: **Mehmet Begen, Associate Professor of Technology and Operations**  
**John Silberholtz, Assistant Professor of Technology and Operations**

Term Offered: **Fall 2020**

This course teaches the basic tools in acquisition, management, and visualization of large data sets. Students will learn how to: store, manage, and query databases via SQL; quickly construct insightful visualizations of multi-attribute data using Tableau; use the Python programming language to manage data as well as connect to APIs to efficiently acquire public data. After taking this course, students will be able to efficiently construct large data sets that source underlying data from multiple sources, and form initial hypotheses based on visualization. This class will include a lab: after learning new material in a lecture, students will work with their teams on an assigned list of tasks to learn hands-on the tools taught. A final project will enable students to integratively apply all the covered tools to a real-world context. This material is a pre-cursor to advanced statistical analysis, which is taught in other classes.

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#### **Mobile Innovation Development (TO 626)**

Credits **3**

Instructor: **Sanjeev Kumar, LEO Lecturer I of Technology and Operations**

Term Offered: **TBD**

Mobile platforms have emerged as the preferred vehicle for delivering business innovation to consumers. MBA students, specifically those with interests in entrepreneurship, need to understand the unique requirements of mobile business to successfully design, develop, deploy and manage business innovations. This course is designed to help students conceptualizing, designing, developing, delivering and managing technology solutions by taking them through the application (app) development process covering the full spectrum from identifying customer needs to prototyping/simulating a mobile innovation solution. Students will learn business issues related to mobile businesses including business and revenue models, customer engagement through gamification and personalization, security and privacy challenges, role of big data and mobile analytics, and integration of emerging technology directions such as wearables, smart devices IoT, location based features and Social Media Integration. The course will seek to organize students in project groups with a combination of business, design and technology

expertise. Project groups will then conceptualize, design and prototype/simulate a mobile business innovation throughout the course. Prior computer programming experience (including MS-Excel VBA programming) is preferred but not required.

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## **Mobile Innovation Development (TO 626)**

Credits **2.25**

Instructor: **M.S. Krishnan, Associate Dean for Executive Programs and  
Accenture Professor of Computer Information System**

Term Offered: **Fall 2020**

Mobile platforms have emerged as the preferred vehicle for delivering business innovation to consumers. MBA students, specifically those with interests in entrepreneurship, need to understand the unique requirements of mobile business to successfully design, develop, deploy and manage business innovations. This course is designed to help students conceptualizing, designing, developing, delivering and managing technology solutions by taking them through the application (app) development process covering the full spectrum from identifying customer needs to prototyping/simulating a mobile innovation solution. Students will learn business issues related to mobile businesses including business and revenue models, customer engagement through gamification and personalization, security and privacy challenges, role of big data and mobile analytics, and integration of emerging technology directions such as wearables, smart devices IoT, location based features and Social Media Integration. The course will seek to organize students in project groups with a combination of business, design and technology expertise. Project groups will then conceptualize, design and prototype/simulate a mobile business innovation throughout the course. Prior computer programming experience (including MS-Excel VBA programming) is preferred but not required.

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## **Mobile Innovation Development (TO 630)**

Credits **2.25**

Instructor: **M.S. Krishnan, Associate Dean for Executive Programs and  
Accenture Professor of Computer Information System**

Term Offered: **Fall 2020**

This course introduces students to the emerging nature of competition and the critical capabilities that firms need to build to thrive in this environment. Based on the contents in a book co-authored by professors C.K. Prahalad and M.S. Krishnan, the course presents a different perspective on business innovation focusing on co-creating customer experience and global resource leverage with the social and technical architecture in the firm as the two key enablers. The specific implications for various business functions in this new approach to compete will be discussed. Students interested in functional roles or consulting will find this course useful.

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## **Artificial Intelligence for Business (TO 633)**

Credits **2.25**

Instructor: **Sanjeev Kumar, LEO Lecturer I of Technology & Operations**

Term Offered: **Winter 2021** expected

We are living in fast changing world. The amount of information we generate, receive and process is increasing at an exponential rate. This information explosion is empowering a wave of smart, automated functionalities broadly called Artificial Intelligence ("AI"). AI allows computers and machines to automate the business logic - to work and react like humans.

AI comes with a great promise for individuals, organizations and societies but at the same time there are considerable risks, significant societal

implications and ethical dilemmas. This course aims to provide students with a conceptual introduction of AI, a broad understanding of AI's basic techniques, how AI is applied to problems, future applications, of AI, and an awareness of the challenges, risks and ethical considerations of use of AI in business. The course does not require a technical background. Students will be able to connect the conceptual nature of this course with the more technical coverage of AI related material in other TO courses - but they are not expected to be familiar with the technical details of AI as pre-requisites.