



# WPI

On behalf of the WPI Business School, the Committee on Graduate Studies and Research (CGSR) recommends and I move that an M.S. program in Financial Technology (FinTech) and four new courses (MIS 510, MIS 520, FIN 530, and FIN 540) be added, all as described in the materials distributed for this meeting.



# Proposed M.S. in FinTech



*The Use Of Technology Solutions To Make Financial Processes More Effective In Innovative Ways.*



**WPI**

THE BUSINESS  
SCHOOL

# MS FinTech Program

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At the intersection of:

- Finance
- Information Technology
- Computer Science
- Mathematics
- Data Science

Faculty Contacts:

- Prof. Kwamie Dunbar (Program Director)
- Prof. Rob Sarnie



# MS FinTech Program Objectives

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- **Gain knowledge** of key technologies of the FinTech industry, including artificial intelligence (AI), machine learning (ML), blockchain & smart contracts, and cryptocurrency.
- **Develop key competencies** in predictive analytics and programming applications for quantitative risk management, financial forecasting, corporate innovation, and financial modeling.
- **Understand** information and communication tools, technologies, and standards integral to consumer, merchant, and enterprise services in the payments and financial service sectors.
- **Design** solutions using these technologies for the emerging FinTech industry, for communities historically excluded from the banking and/or securities sectors, and for non-financial industries.
- **Learn** about the emerging areas for entrepreneurial opportunities in the FinTech sector.
- **Identify and evaluate** the limitations and challenges of FinTech, including equity, inclusion, ethical uses of technology, and the basic legal and regulatory frameworks of the U.S. banking and securities sectors.

# Proposed Curriculum (33 credits)

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## Core Courses (9 credits)

- MIS 510 Business Applications of Blockchain Tech
- MIS 520 AI and its Business Applications
- MIS 587 Business Applications in ML

## 2 Specialties (18 credits)

- Advanced Financial Mathematics
- Fintech Analytics
- FinTech Development

## CAPSTONE (6 credits)

- OBC 505 Teaming and Organizing for Innovation
- BUS 596 Capstone Project

### Advanced Financial Mathematics

FIN 530 Cryptocurrencies and Financial Markets  
FIN 540 Financial Analytics for Data Scientists

MA 571 Financial Mathematics I  
MA 572 Financial Mathematics II  
MA 574 Portfolio Valuation and Risk Management  
MA 573 Computational Methods of Financial Math  
MA 575 Market and Credit Risk Models and Mgt

### FinTech Analytics

FIN 530 Cryptocurrencies and Financial Markets  
FIN 540 Financial Analytics for Data Scientists

DS 502 Statistical Methods for Data Science  
MIS 502 Data Management for Analytics  
DS 503 Big Data Management  
OIE 559 Advanced Prescriptive Analytics  
MIS 571 Database Applications Development  
MKT 568 Data Mining for Business Applications

### FinTech Development

FIN 530 Cryptocurrencies and Financial Markets  
FIN 540 Financial Analytics for Data Scientists

CS 513 Computer Networks  
CS 528 Mobile and Ubiquitous Computing  
CS 541 Deep Learning  
CS 573 Data Visualization  
CS 578 Cryptography and Data Security  
CS 5084 Intro to Algorithms  
CS 5007 Intro to Prog Concepts, Data Struct and Algorithms

Note: Must select at least one of the two FIN courses for each specialty.

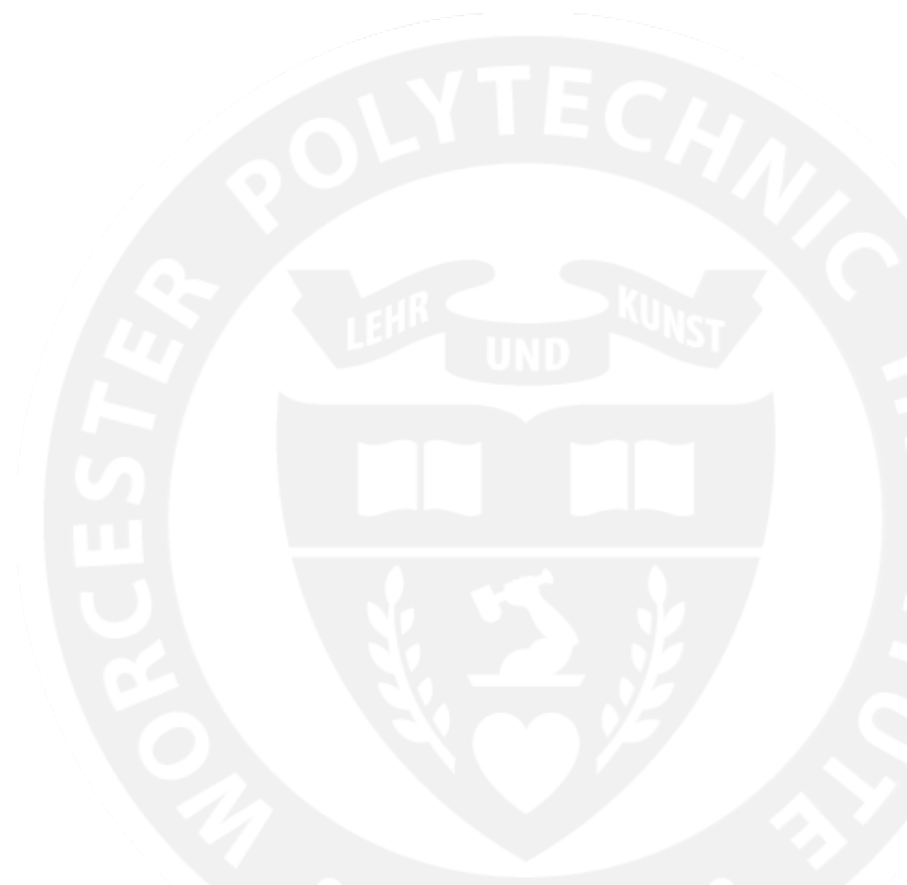


# WPI

## Discussion

Questions, Comments, Suggestions...





# Existing UG and GR FinTech Programs in the U.S.

Outside of the United States, a variety of programs are available in Hong Kong, the United Kingdom, and France. However, in the United States, only a few institutions offer full Graduate Programs focused specifically on Fintech

Schools offering FinTech Programs				
University	Program			
	Certificate	Concentration	Major	MS
Northeastern University		X		
University of Rhode Island		X		
Jacksonville University			X	X
University of Georgia	X			
New Jersey Institute of Technology			X	X
Seton Hall University			X	
Virginia Commonwealth University			X	
Creighton University			X	
Brandeis University				X
University of Connecticut				X
New York University				X
Duke				X
University of Central Florida				X
Kennesaw State				X
University of Texas - Dallas				X
Carnegie Mellon University	X			
Columbia University	X			
Cornell	X			
MIT	X			
Oakland University	X			
University of California Berkley	X			



# New Courses

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## **MIS 510 - BUSINESS APPLICATION OF BLOCKCHAIN TECH (3 credits)**

This course examines the foundations of blockchain technology from multiple perspectives, including engineering, law, and economics. The course will cover blockchain technologies, distributed ledger technology, cryptocurrencies (e.g., Bitcoin), and their applications, implementation, and security concerns. Students will learn how these systems work, analyze the security and regulation issues relating to blockchain technologies and understand the impact of blockchain technologies on financial services and other industries. The student will get a detailed picture of blockchain business networks' components and structures, such as ledgers, smart contracts, consensus, certificate authorities, security, roles, transaction processes, participants, and fabrics. This course also examines the BTC ecosystem, XRP, ETH, tokens and ICOs, and CBDC. Students will also explore the history, current environment, and near-term outlook of financial innovation (FinTech), focusing on applications of Blockchain technology. Students will learn to formulate an accurate image and a deep practical understanding of the capabilities and limitations of various blockchain techniques. Students will also gain hands-on experience creating a simple Blockchain contract and will be able to converse on a practical basis about what Blockchain can and cannot do.

## **FIN 520 - ARTIFICIAL INTELLIGENCE AND ITS BUSINESS APPLICATIONS (3 credits)**

This course aims to provide the students with a comprehensive introduction to the recent developments in AI through the coverage of fundamental AI concepts and practical applications of these concepts in business. The course will allow students to understand AI's basic concepts and methods and apply AI-based techniques to solving practical business problems. Students will also experience how AI can transform businesses and gain an understanding of where AI technologies are heading within the next few years.

# New Courses

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## **FIN 530 - CRYPTOCURRENCIES AND FINANCIAL MARKETS (3 credits)**

This course covers digital currencies and related topics in the FinTech area. The course begins with studying the nature of money, legacy payment, and banking systems. The course then examines the emergence of stateless, cloud-based digital currency systems since 2009. Students will also gain insight into the functioning of decentralized assets in today's financial markets and the role of fintech assets such as cryptos in financial intermediation. Students will learn about central bank digital currencies and how they will help to improve banking by reducing the under-banked and un-banked population.

## **FIN 540 - FINANCIAL ANALYTICS (3 credits)**

The course introduces advanced methodological tools required for conducting finance and investment analysis research. The course aims to equip students with a working knowledge of important econometric techniques used in financial economics, such as event study, advanced time series analysis, and survival analysis. Substantial emphasis will be placed on developing programming skills in computer programs. The course emphasizes understanding and learning how to apply practitioners' econometric tools in these areas. Students will also cover the basic theory of statistical inference with linear models, general linear models, Heteroskedasticity models, time series models, analysis of variance, discriminate analysis, factor analysis, and non-parametric tests.

# Program Description

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- Designed for Grad students interested in pursuing a career in the FinTech industry:
  - alternative lending, cryptocurrency management, and trading, blockchain technologies, open banking, Insur-tech, Robo-advisement, machine learning, data mining applications and cybersecurity.
- interdisciplinary field: finance, business analytics, quantitative modeling, financial analysis, MIS, business intelligence, mathematics, statistics, and computer science.
- Covered by the accreditation of WBS by the Association to Advance Collegiate Schools of Business (AACSB-International).
- Seek to gain Certified Financial Analyst (CFA) recognition for the program. Our proposed courses are benchmarked to the CFA's "Candidate Body of Knowledge," which guides what is covered in each course
- Interested students with an interest may later sit for the CFA certification exam

# NEW BS FINANCIAL TECHNOLOGY (FINTECH)

## OVERVIEW OF DEGREE REQUIREMENTS

<b>UNIVERSITY REQUIREMENTS (12/3 Units)</b>	<b>BUSINESS FOUNDATION CURRICULUM (4/3 Units)</b> 2 courses from financial competency and 2 from organizational, legal, and ethical competency	
<b>HUMANITIES AND ARTS (6/3 Units):</b> 6 courses including Inquiry Seminar/Practicum	<ol style="list-style-type: none"> <li>1. BUS 2020 The Legal Environment of Business Decisions</li> <li>2. ACC 2060 Financial Statements for Decision Making</li> <li>3. FIN 2070 Risk Analysis for Decision Making</li> <li>4. OBC 3354 Organizational Behavior and Change, or OBC 1010 Leadership Practice, or OBC 4367 Leadership, Ethics, and Social Responsibility.</li> </ol>	
<b>SOCIAL SCIENCE (2/3 Units):</b> Satisfied by <b>ECON 1110, ECON 1120</b>		
<b>PHYSICAL EDUCATION (1/3 Units)</b>		
<b>INTERACTIVE QUALIFYING PROJECT (3/3 Unit)-3<sup>rd</sup> Year</b>	<b>FINTECH FOUNDATION (3/3 Units)</b>	
<b>MATHEMATICS AND SCIENCE REQUIREMENTS (8/3 Units)</b>	<b>TECHNICAL AND ANALYTICS COURSES (6/3 Units)</b>	
<b>BASIC SCIENCE (2/3 Units)</b> Any Course with prefix: BB, CH, GE, PH  <b>MATHEMATICS (5/3 Units)</b> Calculus - MA 1021; MA 1022; Statistics - MA 2611; MA 2612; Matrices and Linear Algebra - MA 2071 or MA 2072 or MA 2073  <b>COMPUTER SCIENCE (1/3 Units):</b> CS 1004 (recommended) or CS 1101 or CS 1102	<b>Technical Courses (3/3 units)</b> <ol style="list-style-type: none"> <li>1. MIS 2300 Business Applications of Blockchain</li> <li>2. MIS 3787 Business Applications of Machine Learning, or CS 4342 Machine Learning</li> <li>3. FIN 3730 Artificial Intelligence with Business Applications</li> </ol>	<b>Analytics Courses (3/3 units)</b> <ol style="list-style-type: none"> <li>1. BUS 2080 Data Analysis for Decision Making, or OIE 2081 Introduction to Prescriptive Analytics</li> <li>2. OIE 3510 Stochastic Models, or OIE 3460 Simulation modeling and Analysis, or OIE 4430 Advanced Prescriptive Analysis: From Data to Impact</li> <li>3. MIS 4084 Business Intelligence</li> </ol>
<b>MAJOR QUALIFYING PROJECT (3/3 Unit)</b> <b>MQP must have a business focus related to FINTECH</b>	<b>FINTECH CONCENTRATION (6/3 Units)</b> Choose any 2 from: <b>ETR 1100; OBC 1010 or OBC 4367; BUS 3010 +</b> Select 4 courses from a concentration below	
<b>FREE ELECTIVES (3/3 Unit)</b>	<ul style="list-style-type: none"> <li>•Financial Technologies</li> <li>•Financial Analytics</li> <li>•Financial Mathematics</li> </ul> <p>Note: If no concentration is chosen, the student will choose the remaining 4 courses from at least two of the available concentrations. This will be indicated as General on the transcript.</p>	

# NEW FINANCIAL TECHNOLOGY (FINTECH) OVERVIEW OF DEGREE REQUIREMENTS

## FINTECH CONCENTRATION COURSES (6/3 Units)

Note: If no concentration chosen, Students will choose any 2 of the following: ETR 1100; OBC 1010 or OBC 4367; BUS 3010; then the student will choose the remaining 4 courses from at least two of the available concentrations. This will be indicated as General on the transcript.

### Financial Technologies

1. Choose any 2 of the following: ETR 1100; OBC 1010 or OBC 4367; BUS 3010
2. Chose any 4 of the following: CS 2022/MA 2201 Discrete Mathematics  
CS 2119 or CS 2102 Object-Oriented Design Concepts  
CS 2223 Algorithms  
CS 3516 Computer Networks  
CS 4120 Analysis of Algorithms  
CS 4341 Intro to Artificial Intelligence  
CS 4404 Tools and techniques in Computer Network Security  
CS 4516 Advanced Computer Networks  
CS 4518 Mobile Computing  
CS 4801 Introduction to Cryptography and Communication Security

### Financial Analytics

1. Choose any 2 of the following: ETR 1100; OBC 1010 or OBC 4367; BUS 3010
2. Chose any 4 of the following:  
DS 1010 Introduction to Data Science  
DS 2010 Modeling and Data Analysis  
OIE 2600 Scripting for Process and Productivity Improvement  
DS 3010 Computational Data Intelligence  
CS 3431 Database Systems I  
MIS 3720 Business Data Management  
OIE 4430 Advanced Prescriptive Analysis: From Data to Impact  
CS 4432 Database Systems II  
DS 4433 Big Data Management and Analytics  
CS 4445 Data Mining and Knowledge Discovery in Databases  
OIE 3510 Stochastic Models  
OIE 3460 Simulation modeling and Analysis

### Financial Mathematics

1. Choose any 2 of the following: ETR 1100; OBC 1010 or OBC 4367; BUS 3010
2. Chose any 4 of the following:  
MA 2210 Mathematical Methods in Decision Making  
MA 2211 Theory of Interest I  
MA 2212 Theory of Interest II  
MA 2621 Probability for Applications  
MA 3231 Linear Programming  
MA 3233 Discrete Optimization  
MA 4235 Mathematical Optimization  
MA 4237 Probabilistic Methods in Operations Research  
MA 4635 Data Analytics and Statistical Learning  
MA 464X Introduction to time series analysis