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.
The Use Of Technology Solutions To Make Financial Processes More Effective In Innovative Ways.
MS FinTech Program

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

- **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)

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.
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.

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<thead>
<tr>
<th>University</th>
<th>Program</th>
<th>Certificate</th>
<th>Concentration</th>
<th>Major</th>
<th>MS</th>
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<td>Northeastern University</td>
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<td>Seton Hall University</td>
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<td>Kennesaw State</td>
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<td>University of Texas - Dallas</td>
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<td>Carnegie Mellon University</td>
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New Courses

**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

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

• 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

<table>
<thead>
<tr>
<th>UNIVERSITY REQUIREMENTS (12/3 Units)</th>
<th>BUSINESS FOUNDATION CURRICULUM (4/3 Units)</th>
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<tbody>
<tr>
<td><strong>HUMANITIES AND ARTS (6/3 Units):</strong> 6 courses including Inquiry Seminar/Practicum</td>
<td>2 courses from financial competency and 2 from organizational, legal, and ethical competency</td>
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<tr>
<td><strong>SOCIAL SCIENCE (2/3 Units):</strong> Satisfied by ECON 1110, ECON 1120</td>
<td>1. BUS 2020 The Legal Environment of Business Decisions</td>
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<tr>
<td><strong>PHYSICAL EDUCATION (1/3 Units)</strong></td>
<td>2. ACC 2060 Financial Statements for Decision Making</td>
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<tr>
<td><strong>INTERACTIVE QUALIFYING PROJECT (3/3 Unit)-3rd Year</strong></td>
<td>3. FIN 2070 Risk Analysis for Decision Making</td>
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<tr>
<th>MATHEMATICS AND SCIENCE REQUIREMENTS (8/3 Units)</th>
<th>FINTECH FOUNDATION (3/3 Units)</th>
</tr>
</thead>
</table>
| **BASIC SCIENCE (2/3 Units)**  
Any Course with prefix: BB, CH, GE, PH | 1. FIN 3300 Finance, Risk Analytics and Technology |
| **MATHEMATICS (5/3 Units)**  
Calculus - MA 1021; MA 1022; Statistics - MA 2611; MA 2612;  
Matrices and Linear Algebra - MA 2071 or MA 2072 or MA 2073 | 2. FIN 3310 Financial Markets and Digital Currencies |
| **COMPUTER SCIENCE (1/3 Units):**  
CS 1004 (recommended) or CS 1101 or CS 1102 | 3. FIN 3330 Financial Analytics |

<table>
<thead>
<tr>
<th>TECHNICAL AND ANALYTICS COURSES (6/3 Units)</th>
<th>FINTECH CONCENTRATION (6/3 Units)</th>
</tr>
</thead>
</table>
| **Technical Courses (3/3 units)**  
1. MIS 2300 Business Applications of Blockchain  
2. MIS 3787 Business Applications of Machine Learning, or CS 4342 Machine Learning  
3. FIN 3730 Artificial Intelligence with Business Applications | **Choose any 2 from:** ETR 1100; OBC 1010 or OBC 4367; BUS 3010 + Select 4 courses from a concentration below |
| **Analytics Courses (3/3 units)**  
1. BUS 2080 Data Analysis for Decision Making, or OIE 2081 Introduction to Prescriptive Analytics  
2. OIE 3510 Stochastic Models, or OIE 3460 Simulation modeling and Analysis, or OIE 4430 Advanced Prescriptive Analysis: From Data to Impact  
3. MIS 4084 Business Intelligence | |

| MAJOR QUALIFYING PROJECT (3/3 Unit)  
MQP must have a business focus related to FINTECH | • Financial Technologies  
• Financial Analytics  
• Financial Mathematics |
| FREE ELECTIVES (3/3 Unit) | 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. |
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.

<table>
<thead>
<tr>
<th>Financial Technologies</th>
<th>Financial Analytics</th>
<th>Financial Mathematics</th>
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<tr>
<td>1. Choose any 2 of the following: ETR 1100; OBC 1010 or OBC 4367; BUS 3010</td>
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<td>1. Choose any 2 of the following: ETR 1100; OBC 1010 or OBC 4367; BUS 3010</td>
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</table>
| 2. Chose any 4 of the following: CS 2022/MA 2201 Discrete Mathematics | 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 | 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 |

Worcester Polytechnic Institute