M.S. IN MATHEMATICAL FINANCE

Overview

https://www.msmf.miami.edu/

The Master of Science in Mathematical Finance program is dedicated to producing technically trained professionals with an understanding of how to analyze and value complex investments, and assess the associated risks. Over the course of three semesters of study, the students receive rigorous training in mathematics, especially in the area of probability and stochastic calculus, in statistical analysis, and in computation, together with an overview of the common financial instruments and the institutional operation of markets and exchanges.

The financial landscape is constantly changing, and we design the MSMF curriculum to equip students with skills and knowledge that will provide the foundation for their future success. Our program seeks the proper balance between the mathematical and statistical theory, programming practice and financial applications.

Admission Requirements

Here is a list of the course based admissions requirements. For more information about admission, please visit our website (http://www.msmf.miami.edu/admissions/admission-requirements/).

- 1 semester of Linear Algebra
- 1 semester of Differential Equations
- 1 semester of calculus-based Probability and Statistics

Curriculum Requirements

MS in Mathematical Finance

Code	Title	Credit Hours
Core Courses		
MTH 642	Statistical Analysis	3
MTH 643	Statistical Analysis II with Financial Applications	3
MTH 645	Optimization Methods	3
MTH 647	Introduction to Mathematical Finance	3
MTH 648	Stochastic Calculus with Application to Finance	3
MTH 649	Computational Methods of Finance	3
FIN 650	Financial Investment	2
FIN 651	Quantitative Stock Portfolio Management	2
Electives		**12**
Computer Science, Engineering, and Mathematics Electives (3-9 credits)		
CSC 632	Introduction to Parallel Computing	
CSC 645	Introduction to Artificial Intelligence	
CSC 646	Introduction to Machine Learning with Applications	
CSC 746	Neural Networks and Deep Learning	
MTH 613	Partial Differential Equations I	
MTH 614	Partial Differential Equations II	
MTH 620	Numerical Linear Algebra	
MTH 646	Quantitative Risk Analysis	
MTH 650	Machine Learning in Quantitative Finance	
MTH 721	Mathematical Probability	
Finance Electives (2-6 credits)		
FIN 602	Fundamentals of Finance	
FIN 643	Quantitative Finance and Market Microstructure	
FIN 653	Alternative Investments	
FIN 660	International Finance	
FIN 670	Corporate Finance	
FIN 681	Financial Institutions	
FIN 683	Financial Modeling	

Other Business Electives (0-3 credits)		
ACC 602	Financial Reporting and Control in the Healthcare Industry	
ECO 694	Game Theory and Economic Strategy	
FIN 631	International Financial Management	
FIN 641	Valuation and Financial Decision Making	
FIN 652	Fixed Income Securities	
Total Credit Hours		**34**

MSMF with a concentration in Digital Currency

Code	Title	Credit Hours
Core Courses		
MTH 647	Introduction to Mathematical Finance	3
MTH 648	Stochastic Calculus with Application to Finance	3
MTH 642	Statistical Analysis	3
MTH 643	Statistical Analysis II with Financial Applications	3
MTH 645	Optimization Methods	3
FIN 650	Financial Investment	2
MTH 682	Blockchain and Cryptocurrency Platforms	3
MTH 683	Algorithmic and High-Frequency Trading	3
Electives		**11**
MTH or CSC Electives (at least 6 credits must be from this list):		
MTH 686	Topics in Mathematical Finance	
MTH 687	Topics in Mathematical Finance	
MTH 650	Machine Learning in Quantitative Finance	
MTH 613	Partial Differential Equations I	
MTH 614	Partial Differential Equations II	
MTH 620	Numerical Linear Algebra	
MTH 721	Mathematical Probability	
CSC 645	Introduction to Artificial Intelligence	
CSC 646	Introduction to Machine Learning with Applications	
CSC 746	Neural Networks and Deep Learning	
CSC 609	Data Security and Cryptography	
FIN electives (2 to 6 credits):		
FIN 660	International Finance	
FIN 670	Corporate Finance	
FIN 681	Financial Institutions	
FIN 683	Financial Modeling	
Total Credit Hours		**34**

Sample Plan of Study

3-semester MSMF

Year One		
Fall		**Credit Hours**
MTH 642	Statistical Analysis	3
MTH 647	Introduction to Mathematical Finance	3
FIN 650	Financial Investment	2
Elective [1]		3
	Credit Hours	**11**
Spring		
MTH 643	Statistical Analysis II with Financial Applications	3
MTH 648	Stochastic Calculus with Application to Finance	3
FIN 651	Quantitative Stock Portfolio Management	2

Elective [1]		3
	Credit Hours	**11**
Summer		
Summer Internship or Project (Optional)		
	Credit Hours	**0**
Year Two		
Fall		
MTH 645	Optimization Methods	3
MTH 649	Computational Methods of Finance	3
FIN Electives		3-6
Additional Elective (If Needed) [1]		3
	Credit Hours	**12**
	Total Credit Hours	**34**

3-semester MSMF w/concentration in Digital Currency

Year One		
Fall		**Credit Hours**
MTH 642	Statistical Analysis	3
MTH 647	Introduction to Mathematical Finance	3
FIN 650	Financial Investment	2
MTH 682	Blockchain and Cryptocurrency Platforms	3
	Credit Hours	**11**
Spring		
MTH 643	Statistical Analysis II with Financial Applications	3
MTH 648	Stochastic Calculus with Application to Finance	3
FIN 651	Quantitative Stock Portfolio Management	2
MTH 683	Algorithmic and High-Frequency Trading	3
	Credit Hours	**11**
Summer		
Summer Internship or Project (Optional)		
	Credit Hours	**0**
Year Two		
Fall		
MTH 645	Optimization Methods	3
MTH 649	Computational Methods of Finance	3
CSC/MTH Electives		3-6
FIN Elective [1]		2
	Credit Hours	**12**
	Total Credit Hours	**34**

Mission

The Master of Science in Mathematical Finance program is dedicated to producing technically trained professionals with an understanding of how to analyze and value complex investments, and assess the associated risks. Over the course of three semesters of study, the students receive a rigorous training in mathematics, especially in the area of probability and stochastic calculus, in statistical analysis, and in computation, together with an overview of the common financial instruments and the institutional operation of markets and exchanges.

The financial landscape is constantly changing, and we design the MSMF curriculum to equip students with skills and knowledge that will provide the foundation for their future success. Our program seeks the proper balance between the mathematical and statistical theory, programming practice and financial applications.

Goals

- Provide future finance professionals with the advanced quantitative skills required to understand, evaluate and price modern financial instruments. Such skills include both analytic techniques of mathematical finance, and computer-based simulation techniques.
- Expose participants to the key statistical methods, and specifics of applying these methods to working with financial data.
- Impart the necessary hands-on software and programming skills to solve various optimization and simulation problems arising in financial setting.

Concentration in Digital Currency

- Provide participants with the quantitative and programming tools used in the implementation and trading of cryptocurrencies and digital currency financial instruments.

Student Learning Outcomes

- Students will demonstrate advanced knowledge of risk-neutral approach to pricing financial instruments, discrete and continuous-time frameworks of modern mathematical finance, and common financial derivatives.
- Students will master the tools of statistical analysis and statistical software packages and be able to apply them to various financial datasets.
- Students will demonstrate working knowledge of software and programming tools to use optimization and simulation techniques in financial setting master the common models of portfolio analysis, as well as the quantitative approach to risk models.

Concentration in Digital Currency

- Students will master the mathematical foundations of cryptocurrency algorithms and the tools of algorithmic trading used in electronic markets for digital currency and other financial instruments.