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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH 642</td>
<td>Statistical Analysis</td>
<td>3</td>
</tr>
<tr>
<td>MTH 643</td>
<td>Statistical Analysis II with Financial Applications</td>
<td>3</td>
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<tr>
<td>MTH 645</td>
<td>Optimization Methods</td>
<td>3</td>
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<tr>
<td>MTH 647</td>
<td>Introduction to Mathematical Finance</td>
<td>3</td>
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<tr>
<td>MTH 648</td>
<td>Stochastic Calculus with Application to Finance</td>
<td>3</td>
</tr>
<tr>
<td>MTH 649</td>
<td>Computational Methods of Finance</td>
<td>3</td>
</tr>
<tr>
<td>FIN 650</td>
<td>Financial Investment</td>
<td>2</td>
</tr>
<tr>
<td>FIN 651</td>
<td>Advanced Topics in Investments</td>
<td>2</td>
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</tbody>
</table>

Electives 12

Computer Science, Engineering, and Mathematics Electives (3-9 credits)
- CSC 632: Introduction to Parallel Computing
- CSC 645: Introduction to Artificial Intelligence
- ECE 548: Machine Learning
- ECE 553: Neural Networks
- 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 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
Sample Plan of Study
3-semester MSMF

Year One

Fall
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  Advanced Topics in Investments  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  12-15

Total Credit Hours  34-37

Mission
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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.

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.