Mathematics

- Master of Science in Applied Mathematics (p. 1)
- Master of Financial Mathematics (p. 2)
- Master of Mathematics Education (p. 2)
- Certificate, Computational Finance (p. 3)
- Certificate, Financial Risk Management (p. 3)
- Certificate, Statistical Finance (p. 3)

Wiebke Diestelkamp, Department Chairperson
Paul Eloe, Master of Science in Applied Mathematics and Master of Financial Mathematics Program Director
Rebecca J. Krakowski, Mathematics Education Program Director

The Department of Mathematics offers three masters degrees, the Master of Science in Applied Mathematics (MAS), (p. 1) the Master of Financial Mathematics (MFM) (p. 2) and the Master of Mathematics Education (MME). (p. 2)

Master of Science in Applied Mathematics (MAS)

The MAS program is interdisciplinary in nature. The program has a thirty three minimum credit hour requirement. There are two required courses, and a required three credit hour course in Mathematics Clinic that represents the research component for the master’s program. There is a required area of concentration which consists of four courses. A student will then choose an additional four elective courses. Approved elective courses are listed below. Other elective courses can be approved with the agreement of the student’s academic and research advisors.

It is expected that the research component, Mathematics Clinic, complement the student’s area of concentration, thus, strengthening the plan of study. Areas of concentration can include courses outside the Department of Mathematics; such courses are approved to satisfy the area of concentration with the agreement of the student’s academic and research advisors.

MTH 521 Real Analysis and Applications 3
MTH 541 Mathematics Clinic 3
MTH 565 Linear Algebra 3

Concentrations, choose one 1

Dynamical Systems, choose four:
MTH 531 Advanced Differential Equations
MTH 532 Difference Equations & Applications
MTH 535 Partial Differential Equations
MTH 551 Methods of Mathematical Physics
MTH 552 Methods of Applied Mathematics

Applied Statistics:
MTH 411 Probability & Statistics I 3
& MTH 412 and Probability & Statistics II
Choose two:
MTH 543 Linear Models
MTH 544 Time Series
MTH 547 Statistics for Experimenters

Computational Mathematics, choose four:
MTH 535 Partial Differential Equations
MTH 543 Linear Models

Total Hours 33

1 Students, in consultation with the academic advisor, can construct other areas of concentration. These areas of concentration can be carefully constructed to include four-course concentrations in computer science, engineering or business for students with appropriate backgrounds.

2 At most 6 hours of approved 400-level courses may be part of a student's program.

3 MTH 558 serves as an approved elective for a master’s candidate in only two cases: the candidate has selected the discrete mathematics concentration, or the candidate completes the sequence, MTH 558 – MTH 559. To satisfy the requirement of an area of concentration, a student will be required to take 12 semester hours of 500-level coursework in the selected area of concentration. Examples of areas of concentration include (but are not limited to):

Differential Systems

MTH 531 Advanced Differential Equations 3
MTH 535 Partial Differential Equations 3

Six additional hours of mathematics courses approved by the committee

Total Hours 12

Engineering Systems

EGM 503 Introduction to Continuum Mechanics 3
EGM 533 Theory of Elasticity 3
Six additional hours of computer science courses approved by the committee 6

Total Hours 12

Computational Systems

MTH 555 Numerical Analysis I 3
MTH 556 Numerical Analysis II 3
Six additional hours of computer science courses approved by the committee 6

Total Hours 12

Master of Financial Mathematics (MFM)

The Master of Financial Mathematics (MFM) is a certified Professional Science Master’s program in quantitative methods in financial risk management with the purpose to support a growing local and regional market in financial services. It is offered in cooperation with the Department of Economics and Finance. The program integrates statistics, computation and modeling with training in the professional domain and graduates will find employment opportunities in the banking, insurance and financial trading industries. The program has a thirty-three minimum credit hour requirement. A plan of study includes an introductory required finance course, seven more required courses that include coursework in the MBA program, and two elective courses, selected, in consultation with a faculty advisor, from a set of electives from Computer Science, Mathematics and MBA. An eleventh three credit hour course, Mathematics Clinic, represents the master’s level research for the program.

The introductory finance course can be waived for students with appropriate background in finance and replaced with an appropriate elective.

As with the MAS program, the MFM program requires the capstone research experience of a Mathematics Clinic project. Individual students or teams of students will report to a faculty member and work on a project that is posed by the financial industry.

Introductory course

MBA 620 Principles of Finance 3

Required courses

MTH 544 Time Series 3
MTH 556 Numerical Analysis II 3
MTH 558 Financial Mathematics I-Discrete Model 3
MTH 559 Financial Mathematics II-Continuous Model 3
MTH 560 Advanced Topics in Financial Mathematics 3
MTH 563 Computational Finance 3
MBA 627 Financial Derivatives & Risk Management 3

Research

MTH 541 Mathematics Clinic 3

Choose two of the following electives: 6

CPS 542 Database Management Systems
CPS 562 Database Management Systems II
MBA 625 Investments
MBA 628 Fixed Income Analysis
MTH 521 Real Analysis and Applications
MTH 535 Partial Differential Equations
MTH 543 Linear Models

Total Hours

Master of Mathematics Education (MME)

The MME program was developed primarily to meet the professional needs of high school mathematics teachers. Although Ohio Department of Education licensure guidelines no longer require all K-12 grade teachers complete a master’s degree program in their content area or general education, the MME completed in entirety or in part will certainly satisfy ongoing professional development requirements for license renewal, and has been designed by the Department of Mathematics to address issues that are especially important to high school mathematics educators. The MME may also be of interest to upper grades middle school mathematics teachers, provided they have the AYA 7-12 license in mathematics. (Note: The MME is NOT an initial licensure program.)

Key features of the MME include: curriculum that focuses on pedagogical content knowledge - the special knowledge that distinguishes the mathematics knowledge of teachers from that of mathematicians; student development of a stronger mathematics content knowledge, as well as the ability and opportunity to apply this knowledge to the 9-12 grade curriculum; introduction to major research issues and both quantitative and qualitative methods in mathematics education; continued growth as leaders in education; an emphasis on the latest technological advances - both computer-based and using hand-held graphing utilities; consistent experience of "best practices" modeled by program faculty whose area of expertise is mathematics education.

This is primarily a summer program that offers a solid base in the teaching of secondary school mathematics. The curriculum includes both mathematics and education coursework consisting of 10 classes, three graduate semester hours each, that may be completed over the course of three summers, with minimal requirements during the regular school year.

As is the case with other graduate programs within the Department of Mathematics, the MME program requires a capstone experience of a Mathematics Clinic project. Each student will work with a faculty member to design and implement an action research project in mathematics education. A "journal ready" report will be required, as well as a presentation of findings in one of our departmental colloquia.

| MTH 500 Models of Teaching | 3 |
| MTH 502 Philosophical Studies in Education | 3 |
| MTH 660 Introduction to Educational Research | 3 |
| MTH 512 Geometry for Secondary Teachers | 3 |
| MTH 513 Algebra for Secondary Teachers | 3 |
| MTH 514 Advanced Mathematics for Secondary Teachers | 3 |
| MTH 515 Applications of Graph Theory & Combinatorics in Modern Mathematics | 3 |
| MTH 516 Applications of Linear & Abstract Algebra in Modern Education | 3 |
| MTH 517 Trends & Issues in Mathematics Education | 3 |
| MTH 541 Mathematics Clinic | 3 |

Total Hours 30
Certificate Programs

Certificate programs appeal to students who do not want to commit to the full MFM program. Upon successful completion of five courses focused on a specific set of concepts, a student will earn a post-baccalaureate certificate in that area. The certificate programs and the associated five courses are:

Certificate in Computational Finance (CFN)
Certificate Requirements:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MTH 556</td>
<td>Numerical Analysis II</td>
<td>3</td>
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<tr>
<td>MTH 563</td>
<td>Computational Finance</td>
<td>3</td>
</tr>
<tr>
<td>MTH 558</td>
<td>Financial Mathematics I-Discrete Model</td>
<td>3</td>
</tr>
<tr>
<td>MTH 559</td>
<td>Financial Mathematics II-Continuous Model</td>
<td>3</td>
</tr>
<tr>
<td>MBA 627</td>
<td>Financial Derivatives &amp; Risk Management</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
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<td><strong>15</strong></td>
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Certificate in Statistical Finance (STF)
Certificate Requirements:

<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MTH 543</td>
<td>Linear Models</td>
<td>3</td>
</tr>
<tr>
<td>or ENM 501</td>
<td>Applied Engineering Statistics</td>
<td></td>
</tr>
<tr>
<td>MTH 544</td>
<td>Time Series</td>
<td>3</td>
</tr>
<tr>
<td>or ENM 530</td>
<td>Engineering Economy</td>
<td></td>
</tr>
<tr>
<td>MTH 563</td>
<td>Computational Finance</td>
<td>3</td>
</tr>
<tr>
<td>MTH 558</td>
<td>Financial Mathematics I-Discrete Model</td>
<td>3</td>
</tr>
<tr>
<td>MTH 559</td>
<td>Financial Mathematics II-Continuous Model</td>
<td>3</td>
</tr>
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<td><strong>Total Hours</strong></td>
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</tbody>
</table>

Certificate in Financial Risk Management (FRM)
Certificate Requirements:

<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBA 627</td>
<td>Financial Derivatives &amp; Risk Management</td>
<td>3</td>
</tr>
<tr>
<td>MBA 628</td>
<td>Fixed Income Analysis</td>
<td>3</td>
</tr>
<tr>
<td>MTH 558</td>
<td>Financial Mathematics I-Discrete Model</td>
<td>3</td>
</tr>
<tr>
<td>MTH 559</td>
<td>Financial Mathematics II-Continuous Model</td>
<td>3</td>
</tr>
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<td>MTH 563</td>
<td>Computational Finance</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

The certificate programs are designed as mini-programs in focus areas. Thus, each includes the capstone applied research experience of Mathematics Clinic.

Entrance, performance, and exit standards

Students seeking admission to the Certificate Programs will satisfy the entrance requirements to the MFM program. These are:

- Completion of a graduate application for admission to a certificate program at the University of Dayton
- Bachelor’s degree in a science or technical area such as mathematics, physics, computer science, engineering, economics or finance, and at least a 3.0 GPA on a 4.0 scale
- Prerequisite mathematics coursework in calculus, differential equations, linear algebra, elementary probability and statistics
- Programming skills

Students applying for a Certificate must be enrolled in the Certificate program and must have completed the requirement of five courses with a minimum G.P.A. of 3.0.

Students cannot simultaneously be admitted to the Master of Financial Mathematics and one of the certificate programs. Students can be simultaneously enrolled in any other post-baccalaureate program at the University of Dayton and a certificate program. Students must meet the entrance standards of the Master of Financial Mathematics to gain admission to a certificate program. To learn more about the application process for admission to a certificate program, please contact the Department of Mathematics.

Assistantships

Financial assistance is available to qualified students through graduate teaching assistantships. A graduate assistant receives a stipend, tuition remission and health benefits. Most graduate assistants require two years to complete the requirements for a master’s degree. Internships in the MFM program are recommended and the Department facilitates finding internship opportunities.

Facilities

Departmental PCs and the MATHSCI Computer Learning Environment are available for student use in conjunction with projects or coursework.