Mathematics, BS

Banner Code: SC-BS-MATH

Academic Advising
Website: http://math.gmu.edu/advisors.php

This program provides exciting opportunities for students interested in mathematics. Students are encouraged to select an optional concentration in Actuarial Mathematics (ACTM), Applied Mathematics (AMT), or Mathematical Statistics (MTHS). Students who do not select a concentration study traditional mathematics.

Teacher Licensure
Students who wish to become teachers and plan to seek teacher licensure should consider the following options:

• Secondary Education - Mathematics (6-12) Undergraduate Certificate (http://catalog.gmu.edu/colleges-schools/education-human-development/school-education/secondary-education-mathematics-6-12-undergraduate-certificate/)
• Mathematics, BA or BS/Curriculum and Instruction, Accelerated MEd (Secondary Education Mathematics concentration)

Interested students should attend an information session early in their studies. For more information, visit the Graduate School of Education’s website (http://gse.gmu.edu/).

Admissions & Policies

Admissions
University-wide admissions policies can be found in the Undergraduate Admissions Policies (http://catalog.gmu.edu/admissions/undergraduate-policies/) section of this catalog.

To apply for this program, please complete the George Mason University Admissions Application (https://www2.gmu.edu/admissions-aid/apply-now/).

Policies
Students must fulfill all Requirements for Bachelor’s Degrees (http://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2), including the Mason Core (http://catalog.gmu.edu/mason-core/).

MATH 300 Introduction to Advanced Mathematics meets the writing intensive requirement for this major.

For policies governing all undergraduate programs, see AP.5 Undergraduate Policies (http://catalog.gmu.edu/policies/academic/undergraduate-policies/).

Graduating seniors are required to have an exit interview.

Language Proficiency Recommendation
The department recommends proficiency in French, German, or Russian.

Course Recommendations and Policies
A maximum of 6 credits of grades below 2.00 in coursework designated MATH or STAT may be applied toward the major.

Students intending to enter graduate school in mathematics are strongly advised to take MATH 315 Advanced Calculus I and MATH 321 Abstract Algebra.

Students may not receive credit for both MATH 214 Elementary Differential Equations and MATH 216 Theory of Differential Equations; both MATH 213 Analytic Geometry and Calculus III and MATH 215 Analytic Geometry and Calculus III (Honors); both MATH 351 Probability and STAT 344 Probability and Statistics for Engineers and Scientists I; and both MATH 352 Statistics and STAT 354 Probability and Statistics for Engineers and Scientists II.

After receiving a grade of ‘C’ or better in one of the courses listed below on the left, students may not receive credit for the corresponding course on the right:

<table>
<thead>
<tr>
<th>Course</th>
<th>May Not Receive Credit for</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 113 or MATH 123</td>
<td>MATH 105 or MATH 108</td>
</tr>
<tr>
<td>MATH 351 or STAT 344</td>
<td>MATH 110</td>
</tr>
<tr>
<td>MATH 441</td>
<td>MATH 111</td>
</tr>
<tr>
<td>MATH 125</td>
<td>MATH 112</td>
</tr>
</tbody>
</table>

Requirements

Degree Requirements
Total credits: minimum 120

Students should refer to the Admissions & Policies tab for specific policies related to this program.

In addition to the mathematics core, science, and computational skills requirements, students may select an optional concentration in Actuarial Mathematics (ACTM), Applied Mathematics (AMT) or Mathematical Statistics (MTHS).

Mathematics Core

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 113</td>
<td>Analytic Geometry and Calculus I (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Analytic Geometry and Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 203</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 213</td>
<td>Analytic Geometry and Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>MATH 215</td>
<td>Analytic Geometry and Calculus III (Honors)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 214</td>
<td>Elementary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 216</td>
<td>Theory of Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 300</td>
<td>Introduction to Advanced Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 322</td>
<td>Advanced Linear Algebra</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 23

1 Fulfills the writing intensive requirement.
concentration must complete the following coursework:

### Biology Sequence:
- BIOL 213 Cell Structure and Function (Mason Core) (http://catalog.gmu.edu/mason-core/)
- BIOL 300 BioDiversity
- BIOL 308 Foundations of Ecology and Evolution
- BIOL 311 General Genetics

Choose one from the following:

- MATH 125
- MATH 315
- MATH 316

Choose one from the following:

- CHEM 211
- CHEM 213
- CHEM 212
- CHEM 214

### Chemistry Sequence:
- CHEM 211 General Chemistry I (Mason Core) (http://catalog.gmu.edu/mason-core/)
- CHEM 213 and General Chemistry Laboratory I (Mason Core) (http://catalog.gmu.edu/mason-core/)
- CHEM 212 General Chemistry II (Mason Core) (http://catalog.gmu.edu/mason-core/)
- CHEM 214 and General Chemistry Laboratory II (Mason Core) (http://catalog.gmu.edu/mason-core/)

### Geology Sequence:
- GEOL 101 Introductory Geology I (Mason Core) (http://catalog.gmu.edu/mason-core/)
- GEOL 102 Historical Geology (Mason Core) (http://catalog.gmu.edu/mason-core/)

### Physics Sequence:
- PHYS 160 University Physics I (Mason Core) (http://catalog.gmu.edu/mason-core/)
- PHYS 161 and University Physics Laboratory I (Mason Core) (http://catalog.gmu.edu/mason-core/)
- PHYS 260 University Physics II (Mason Core) (http://catalog.gmu.edu/mason-core/)
- PHYS 261 and University Physics Laboratory II (Mason Core) (http://catalog.gmu.edu/mason-core/)

### Computational Skills

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 112</td>
<td>Introduction to Computer Programming</td>
<td>4</td>
</tr>
</tbody>
</table>

### BS without Concentration

In addition to the mathematics core, science, and computational skills requirements listed above, students who are not choosing a concentration must complete the following coursework:

### Traditional Mathematics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 125</td>
<td>Discrete Mathematics I (Mason Core)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td></td>
</tr>
<tr>
<td>MATH 315</td>
<td>Advanced Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 316</td>
<td>Advanced Calculus II</td>
<td>3</td>
</tr>
</tbody>
</table>

### Additional Science

Select additional science credits from one of the following three options:

- A second sequence from the choices under "Science" above
- 6 credits from more advanced courses in biology, chemistry, geology, or physics
- The 4-credit option of PHYS 262 and PHYS 263

**Total Credits:** 28-33

### Concentration in Actuarial Mathematics (ACTM)

This concentration provides exciting opportunities for students interested in studying actuarial mathematics. Expertise in this field leads directly into a career as a practicing actuary with an insurance company, consulting firm, or in government employment.

### ACTM Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 125</td>
<td>Discrete Mathematics I (Mason Core)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td></td>
</tr>
<tr>
<td>MATH 351</td>
<td>Probability</td>
<td>3</td>
</tr>
<tr>
<td>MATH 352</td>
<td>Statistics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 551</td>
<td>Regression and Time Series</td>
<td>3</td>
</tr>
<tr>
<td>MATH 554</td>
<td>Financial Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 555</td>
<td>Actuarial Modeling I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 557</td>
<td>Financial Derivatives</td>
<td>3</td>
</tr>
<tr>
<td>ACCT 203</td>
<td>Survey of Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ECON 103</td>
<td>Contemporary Microeconomic Principles</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td></td>
</tr>
<tr>
<td>ECON 306</td>
<td>Intermediate Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>or ECON 310 Money and Banking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or FNAN 321 Financial Institutions</td>
<td></td>
</tr>
<tr>
<td>STAT 362</td>
<td>Introduction to Computer Statistical Packages</td>
<td></td>
</tr>
</tbody>
</table>

Select two from the following:

- MATH 441 Deterministic Operations Research
- MATH 442 Stochastic Operations Research
- MATH 446 Numerical Analysis
- MATH 453 Advanced Mathematical Statistics

**Total Credits:** 39
Concentration in Applied Mathematics (AMT)
This concentration provides exciting opportunities for students interested in taking additional classes on applied mathematics. The concentration prepares numerical analysts able to deal with real world applications in science and engineering.

Code | Title | Credits
--- | --- | ---
MATH 125 | Discrete Mathematics I (Mason Core) | 3
MATH 315 | Advanced Calculus I | 3
MATH 351 | Probability | 3
MATH 413 | Modern Applied Mathematics I | 3
MATH 414 | Modern Applied Mathematics II | 3
MATH 446 | Numerical Analysis I | 3
Select 6 credits of MATH courses numbered above 300 | | 6

Additional Science Courses
Select additional science credits from one of the following three options:

- A second sequence from the choices under "Science" above
- 6 credits from more advanced courses in biology, chemistry, geology, or physics
- The 4 credit option of PHYS 262 and PHYS 263

Total Credits | 28-33

1 Excluding MATH 400 History of Math (Topic Varies) (Mason Core).
2 Only refers to courses acceptable for credit toward a natural science major. Suggested courses include: CHEM 313 Organic Chemistry I through CHEM 332 Physical Chemistry II; CHEM 463 General Biochemistry I; GEOL 302 Mineralogy through GEOL 364 Marine Geology; and PHYS 266 Introduction to Thermodynamics.

Concentration in Mathematical Statistics (MTHS)
This concentration provides exciting opportunities for students interested in taking additional classes on statistics and data analysis. The concentration prepares data analysts able to deal with real world applications in science and engineering.

Code | Title | Credits
--- | --- | ---
MTHS Courses
MATH 125 | Discrete Mathematics I (Mason Core) | 3
MATH 315 | Advanced Calculus I | 3
MATH 351 | Probability | 3
MATH 352 | Statistics | 3
MATH 453 | Advanced Mathematical Statistics | 3
MATH 551 | Regression and Time Series | 3
STAT 362 | Introduction to Computer Statistical Packages | 3
Select one from: | | 3

STAT 260 | Introduction to Statistical Practice I | 3
STAT 350 | Introductory Statistics II | 3
STAT 360 | Introduction to Statistical Practice II | 3
Select two from the following: | 6
STAT 455 | Experimental Design | 3
STAT 460 | Introduction to Biostatistics | 3
STAT 462 | Applied Multivariate Statistics | 3
STAT 463 | Introduction to Exploratory Data Analysis | 3
STAT 465 | Nonparametric Statistics and Categorical Data Analysis | 3
STAT 472 | Introduction to Statistical Learning | 3
STAT 474 | Introduction to Survey Sampling | 3

Additional Science Courses
Select additional science credits from one of the following options: | 3-4
Choose 3 credits from more advanced courses in biology, chemistry, geology, or physics
Choose the 4 credit option of PHYS 262 and PHYS 263

Total Credits | 33-34

1 Only refers to courses acceptable for credit toward a natural science major. Suggested courses include: CHEM 313 Organic Chemistry I through CHEM 332 Physical Chemistry II; GEOL 302 Mineralogy through GEOL 364 Marine Geology; and PHYS 266 Introduction to Thermodynamics.

Mason Core and Elective Credits
In order to meet a minimum of 120 credits, this degree requires additional credits (specific credit counts by concentration are shown below), which may be applied toward any remaining Mason Core (http://catalog.gmu.edu/mason-core/) requirements (outlined below), Requirements for Bachelor’s Degrees (http://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2), and elective courses. Students are strongly encouraged to consult with their advisors to ensure that they fulfill all requirements.

- Without concentration: 51-57 credits
- ACTM concentration: 45-46 credits
- AMT concentration: 51-57 credits
- MTHS concentration: 50-52 credits

Mason Core
Some Mason Core (http://catalog.gmu.edu/mason-core/) requirements may already be fulfilled by the major requirements listed above. Students are strongly encouraged to consult their advisors to ensure they fulfill all remaining Mason Core (http://catalog.gmu.edu/mason-core/) requirements.

Code | Title | Credits
--- | --- | ---
Foundation Requirements
Written Communication (ENGH 101) | 3
Oral Communication | 3
Quantitative Reasoning | 3
Information Technology and Computing | 3

1 For mathematics majors, the Department of Economics has agreed to waive the ECON 104 Contemporary Macroeconomic Principles (Mason Core) (http://catalog.gmu.edu/mason-core/) prerequisite.
### Honors

#### Honors in the Major

##### Eligibility
Mathematics majors who have maintained a GPA of at least 3.50 in mathematics courses and a GPA of 3.50 in all courses taken at George Mason University may apply to the departmental honors program upon completion of two MATH courses at the 300+ level (excluding MATH 400 History of Math (Topic Varies) (Mason Core) (http://catalog.gmu.edu/mason-core/)) at least one of which has MATH 300 Introduction to Advanced Mathematics as a prerequisite. Admission to the program will be monitored by the undergraduate committee.

##### Requirements
To graduate with honors in mathematics, a student is required to maintain a minimum GPA of 3.50 in mathematics courses and successfully complete MATH 405 Honors Thesis in Mathematics I and MATH 406 RS: Honors Thesis in Mathematics II with an average GPA of at least 3.50 in these two courses.

#### Accelerated Master's

##### Mathematics, BA or BS/Curriculum and Instruction, Accelerated MEd, (Secondary Education Mathematics concentration)

#### Overview
Highly-qualified undergraduates may be admitted to the bachelor’s/accelerated master’s program and obtain a BA (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/mathematics-ba/) or BS in Mathematics and an MEd in Curriculum and Instruction (http://catalog.gmu.edu/colleges-schools/education-human-development/school-education/curriculum-instruction-med/) (concentration in secondary education mathematics) in an accelerated time-frame after satisfactory completion of 149 credits. See AP6.7 Bachelor's/Accelerated Master's Degree (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) for policies related to this program.

This accelerated option is offered jointly by the Department of Mathematical Sciences (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/) and the Graduate School of Education (http://catalog.gmu.edu/colleges-schools/education-human-development/school-education/).

Students in an accelerated degree program must fulfill all university requirements for the master’s degree. For policies governing all graduate degrees, see AP6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/#text).

### Integration Requirements

| Written Communications (ENGH 302) (http://catalog.gmu.edu/mason-core/#written) | 3 |
| Writing-Intensive (http://catalog.gmu.edu/mason-core/#wi) | 3 |
| Synthesis/Capstone (http://catalog.gmu.edu/mason-core/#synthesis-capstone) | 3 |

Total Credits 40

1. Most programs include the writing-intensive course designated for the major as part of the major requirements; this course is therefore not counted towards the total required for Mason Core.
2. Minimum 3 credits required.

### Application Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies (http://catalog.gmu.edu/admissions/graduate-policies/). For information specific to this accelerated master’s program, see Application Requirements and Deadlines (https://cehd.gmu.edu/bachelors-accelerated-masters-program/).

### Accelerated Option Requirements

Students complete the following courses in their senior year:

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Credits</th>
<th>Spring Semester</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEED 572</td>
<td>3</td>
<td>EDRD 619</td>
<td>3</td>
</tr>
<tr>
<td>SEED 540</td>
<td>3</td>
<td>SEED 672</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 12

Alternative course options are available for students who begin their program in the spring. Students should contact the coordinator for the Bachelor’s/Accelerated Master’s Degree program in the College of Education and Human Development.

While undergraduate students, accelerated master’s students are able to apply two of the courses listed above to both the bachelor’s and master’s degrees. These courses are considered advanced standing for the MEd. A minimum grade of B must be earned to be eligible to count as advanced standing. The other two courses are taken as reserve graduate credit and do not apply to the undergraduate degree. Early in their final undergraduate semester, students must submit the Bachelor’s/Accelerated Master’s Transition Form to the CEHD Admissions Office and specify which of the four courses are to be designated as advanced standing and reserve graduate credit.

### Mathematics, BA or BS/Mathematics, Accelerated MS

#### Overview
This degree program allows academically strong Mathematics, BA (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/mathematics-ba/) and Mathematics, BS students to obtain
their bachelor’s and a Mathematics, MS (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/mathematics-ms/) by successfully completing 144 credits. Well-prepared students may be admitted to this program after the completion of 90 undergraduate credits. Upon completion and conferment of the bachelor’s degree and with satisfactory graduate-level performance (3.00 GPA) in graduate courses, students are given advanced standing in the Mathematics, MS (http://catalog.gmu.edu/colleges-schools/science/mathematical-sciences/mathematics-ms/) program and complete an additional 24 credits to receive the master’s degree.

For more detailed information, see AP.6.7 Bachelor’s/Accelerated Master’s Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

**Application Requirements**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admission Policies (http://catalog.gmu.edu/admissions/graduate-policies/). Application information for this accelerated master’s program can be found on the Department of Mathematical Sciences website (http://math.gmu.edu/).

Successful applicants will have an overall undergraduate GPA of at least 3.00. Additionally, they will have completed the following courses with a GPA of 3.00 or higher: MATH 315 Advanced Calculus I, MATH 321 Abstract Algebra, and MATH 322 Advanced Linear Algebra.

**Accelerated Option Requirements**

At the beginning of the student’s final undergraduate semester, students must submit a bachelor’s/accelerated master’s transition form (available from the Office of the University Registrar) to the College of Science’s Office of Academic and Student Affairs (https://cos.gmu.edu/about/contact-us/). Students must begin their master’s program in the semester immediately following conferment of the bachelor’s degree.

Students must maintain an overall GPA of 3.00 or higher in graduate coursework.

**Reserve Graduate Credit**

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree. See AP.1.4.4 Graduate Course Enrollment by Undergraduates (http://catalog.gmu.edu/policies/academic/registration-attendance/#ap-1-4-4).

**BS (selected)/Statistical Science, Accelerated MS**

**Overview**

Highly-qualified students in BS programs have the option of applying to the accelerated Statistical Science, MS (http://catalog.gmu.edu/colleges-schools/engineering/statistics/statistical-science-ms/) program.

For more detailed information, see AP.6.7 Bachelor’s/Accelerated Master’s Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

**Admission Requirements**

No specific undergraduate BS degree is required. Students enrolled in any BS degree may apply to the accelerated Statistical Science, MS (http://catalog.gmu.edu/colleges-schools/engineering/statistics/statistical-science-ms/) program if such an accelerated Statistical Science, MS pathway is allowable from the student’s BS program, which will be determined by the academic advisors of both the BS and MS programs; and if they have earned 90 undergraduate credits with an overall GPA of 3.00. Students must have successfully completed the following Mason courses each with a grade of C or better prior to admission to the accelerated program:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 213</td>
<td>Analytic Geometry and Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>MATH 203</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 321</td>
<td>Abstract Algebra</td>
<td></td>
</tr>
<tr>
<td>STAT 250</td>
<td>Introductory Statistics I (Mason Core)</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 344</td>
<td>Probability and Statistics for Engineers and Scientists I</td>
<td></td>
</tr>
<tr>
<td>STAT 346</td>
<td>Probability for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 351</td>
<td>Probability</td>
<td></td>
</tr>
<tr>
<td>STAT 362</td>
<td>Introduction to Computer Statistical Packages</td>
<td>3</td>
</tr>
</tbody>
</table>

**Accelerated Option Requirements**

Students must complete all credits satisfying degree requirements for the BS and MS programs, with 6 credits overlap chosen from the following courses: STAT 515 Applied Statistics and Visualization for Analytics, STAT 544 Applied Probability, STAT 545 Applied Statistics I, STAT 560 Biostatistical Methods, and STAT 574 Survey Sampling I. (Credit may not be received for both STAT 474 and STAT 574; nor for both STAT 460 and STAT 560.) The graduate courses selected for overlap must be approved by the academic advisors of both the BS and MS programs. All graduate course prerequisites must be completed prior to enrollment. Each graduate course must be completed with a grade of B or better to apply toward the MS degree.

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

**Degree Conferral**

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form that is submitted to the Office of the University Registrar and Graduate Recruitment and Enrollment Services. At the completion of MS requirements, a master’s degree is conferred.