MATHEMATICS, BS

Banner Code: SC-BS-MATH

Academic Advising

Exploratory Hall, Room 4411
Fairfax Campus
Phone: 703-993-1482
Email: danders1@gmu.edu
Website: math.gmu.edu/degree-programs.php

Students may select an optional concentration in Actuarial Mathematics (ACTM), Applied Mathematics (AMT), Mathematics Education (MTHE) 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
- Mathematics, BA or BS/Curriculum and Instruction, Accelerated MEd (Secondary Education Mathematics concentration)

Interested students should attend an information session early in their undergraduate career. 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 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, including the Mason Core.

MATH 290 Introduction to Advanced Mathematics meets the writing intensive requirement for this major.

For policies governing all undergraduate programs, see AP.5 Undergraduate Policies.

Language Proficiency

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 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), Mathematics Education (MTHE) or Mathematical Statistics (MTHS).

Mathematics Core

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 113</td>
<td>Analytic Geometry and Calculus I (Mason Core)</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Analytic Geometry and Calculus II</td>
</tr>
<tr>
<td>MATH 203</td>
<td>Linear Algebra</td>
</tr>
<tr>
<td>MATH 213</td>
<td>Analytic Geometry and Calculus III</td>
</tr>
<tr>
<td>or MATH 215</td>
<td>Analytic Geometry and Calculus III (Honors)</td>
</tr>
<tr>
<td>MATH 214</td>
<td>Elementary Differential Equations</td>
</tr>
<tr>
<td>or MATH 216</td>
<td>Theory of Differential Equations</td>
</tr>
<tr>
<td>MATH 290</td>
<td>Introduction to Advanced Mathematics</td>
</tr>
<tr>
<td>MATH 322</td>
<td>Advanced Linear Algebra</td>
</tr>
</tbody>
</table>

Total Credits: 23

1. Fulfills the writing intensive requirement.

Science

Select a one-year sequence of a laboratory science from the following Mason Core Natural Science courses:

<table>
<thead>
<tr>
<th>Chemistry Sequence</th>
</tr>
</thead>
</table>


Mathematics, BS

CHEM 211 & CHEM 213 General Chemistry I (Mason Core) and General Chemistry Laboratory I (Mason Core)

CHEM 212 & CHEM 214 General Chemistry II (Mason Core) and General Chemistry Laboratory II (Mason Core)

Geology Sequence:
GEOL 101 Introductory Geology I (Mason Core)
GEOL 102 Introductory Geology II (Mason Core)

Physics Sequence:
PHYS 160 & PHYS 161 University Physics I (Mason Core) and University Physics I Laboratory (Mason Core)
PHYS 260 & PHYS 261 University Physics II (Mason Core) and University Physics II Laboratory (Mason Core)

Total Credits 8

Computational Skills
CS 112 Introduction to Computer Programming (Mason Core)
Total Credits 4

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
MATH 125 Discrete Mathematics I (Mason Core) 3
MATH 315 Advanced Calculus I 3
MATH 316 Advanced Calculus II 3
MATH 321 Abstract Algebra 3
or MATH 431 Topology
Select 12 additional credits of MATH courses numbered above 300 1

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 chemistry, geology, or physics 2
The 4-credit option of PHYS 262 and PHYS 263

Total Credits 28-32

1 Excluding MATH 400 History of Math (Topic Varies) (Mason Core)
2 But only 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 Actuarial Mathematics (ACTM)

ACTM Courses
MATH 351 Probability 3

Concentration in Applied Mathematics (AMT)

AMT Courses
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 1

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 chemistry, geology, or physics 2
The 4-credit option of PHYS 262 and PHYS 263

Total Credits 28-32

1 Excluding MATH 400 History of Math (Topic Varies) (Mason Core)
2 But only 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)

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 two from the following: 6
  STAT 455 Experimental Design
  STAT 463 Introduction to Exploratory Data Analysis
  STAT 474 Introduction to Survey Sampling

Additional Science Courses
Select additional science credits from one of the following options: 4-8
  A second sequence from the choices under "Science" above
  6 credits from more advanced courses in chemistry, geology, or physics
  The 4-credit option of PHYS 262 and PHYS 263

Total Credits 31-35

1 But only 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 Mathematics Education (MTHE)
The following coursework is required for this concentration. A grade of 'C' or better is required for all licensure coursework.

MTHE Courses
MATH 125 Discrete Mathematics I (Mason Core) 3
MATH 302 Foundations of Geometry 3
MATH 315 Advanced Calculus I 3
MATH 321 Abstract Algebra 3
MATH 351 Probability 3
EDCI 372 Teaching Mathematics in the Secondary School 3
EDCI 472 Advanced Methods for Teaching Mathematics in the Secondary School 3
EDCI 490 Student Teaching in Education (Mason Core) 6
EDRD 419 Literacy in the Content Areas 3
EDUC 372 Human Development, Learning, and Teaching (Mason Core) 3
EDUC 422 Foundations of Secondary Education 3
Select one 3-credit MATH course numbered above 300 1 3

Additional Science Courses
Select additional science credits from one of the following three options: 4-8
  A second sequence from the choices under "Science" above
  6 credits from more advanced courses in chemistry, geology, or physics
  The 4-credit option of PHYS 262 and PHYS 263

Total Credits 43-47

1 Excluding MATH 400 History of Math (Topic Varies) (Mason Core)
2 But only 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

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 requirements (outlined below), Requirements for Bachelor's Degrees, and elective courses. Students are strongly encouraged to consult with their advisors to ensure that they fulfill all requirements.

- Without concentration: 53-57 credits
- ACTM concentration: 49 credits
- AMT concentration: 53-57 credits
- MTHS concentration: 50-54 credits
- MTHE concentration: 38-42 credits

Mason Core
Note: Some 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 requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foundation Requirements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Written Communication</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Quantitative Reasoning</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Information Technology</td>
<td>3-7</td>
</tr>
<tr>
<td></td>
<td>Core Requirements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Global Understanding</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Literature</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Natural Science</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Social and Behavioral Sciences</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Western Civilization/World History</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Synthesis/Capstone Requirement</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Synthesis/Capstone</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 40

1 minimum 3 credits

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)), at least one of which has MATH 290 Introduction to Advanced Mathematics as a prerequisite.
Admission to the program will be monitored by the undergraduate committee.

**Honors 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 or BS in Mathematics and an MEd in Curriculum and Instruction (concentration in secondary education mathematics) in an accelerated time-frame after satisfactory completion of 149 credits. See AP 6.7 Bachelor's/Accelerated Master's Degree for policies related to this program.

This accelerated option is offered jointly by the Department of Mathematical Sciences and the Graduate School of Education.

Students in an accelerated degree program must fulfill all university requirements for the master's degree. For policies governing all graduate degrees, see AP.6 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. 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**
Students complete the following courses in their senior year:

<table>
<thead>
<tr>
<th>Senior</th>
<th>Fall Semester</th>
<th>Credits</th>
<th>Spring Semester</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 572</td>
<td>3</td>
<td>EDCI 672</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDUC 672</td>
<td>3</td>
<td>EDRD 619</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6</strong></td>
<td><strong>6</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 given advanced standing and reserve graduate credit.

To maintain a minimum GPA of 3.50 in mathematics courses 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 and Mathematics, BS students to obtain their bachelor's and a 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 conferral 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 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. For policies governing all graduate degrees, see AP.6 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. 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 (http://registrar.gmu.edu)) 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 conferral 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.

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

**Overview**
Highly-qualified students in selected BS programs (see below) have the option of obtaining an accelerated Statistical Science, MS. Students in an
accelerated degree program must fulfill all university requirements for the master’s degree.

For more detailed information, see AP.6.7 Bachelor’s/Accelerated Master’s Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements
Students enrolled in a BS degree in any one of the Volgenau School major areas, in the Mathematics, BS program from the College of Science, or in the Economics, BS program from the College of Humanities and Social Sciences may apply to this option if they have earned 90 undergraduate credits with an overall GPA of 3.00. Criteria for admission are identical to criteria for admission to the Statistical Science, MS program, which include successful completion of the following Mason courses each with a grade of C or better:

<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)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Analytic Geometry and Calculus II</td>
<td>4</td>
</tr>
<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>
</tbody>
</table>

Accelerated Option Requirements
Students must complete all credits that satisfy requirements for the BS and MS programs, with six credits overlapping with grades of B or better in two 500-level STAT courses selected from STAT 544 Applied Probability, STAT 554 Applied Statistics I, and STAT 574 Survey Sampling I.

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.

BS (selected)/Data Analytics Engineering, Accelerated MS
Overview
Qualified undergraduate students have the option of obtaining an accelerated Data Analytics Engineering, MS with a concentration in predictive analytics.

For more detailed information, see AP.6.7 Bachelor’s/Accelerated Master’s Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements
While no specific undergraduate degree is required, Mason undergraduate students majoring in systems engineering or any other engineering, business, computer science, statistics, mathematics, or information technology may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30.

For the predictive analytics concentration, students must submit evidence of:

- Satisfactory completion of courses in calculus, applied probability and statistics, and a scientific programming language.
- Familiarity with analytical modeling software, such as spreadsheets or math packages.

Accelerated Option Requirements
Students must complete all credits that satisfy requirements for the BS and MS programs, with six credits overlap chosen from the courses in the following table. For BS candidates, these graduate courses replace the corresponding undergraduate courses listed. The undergraduate version of these courses may not be applied toward the MS degree.

<table>
<thead>
<tr>
<th>Undergraduate</th>
<th>Graduate</th>
<th>Credit may not be received for both courses.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 473</td>
<td>SYST 573</td>
<td></td>
</tr>
<tr>
<td>OR 441</td>
<td>OR 541</td>
<td></td>
</tr>
</tbody>
</table>

For the predictive analytics concentration, any other 500-level course may be applied to both the undergraduate and graduate degrees with approval of the advisor and SEOR department chair.

OR 541 Operations Research: Deterministic Models will substitute for the OR 531 Analytics and Decision Analysis core requirement in the MS DAE program.

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 the VSE Graduate Admissions Office. At the completion of MS requirements, a master’s degree is conferred.