BACHELOR OF SCIENCE WITH A MAJOR IN MATHEMATICS

GW's Department of Mathematics is committed to high-quality teaching and research, providing a curriculum that is designed to give students a solid background in the theory and practice of modern mathematics through three academic tracks: pure, applied, and computational. As a mathematics major, students have a wealth of intellectual challenges and opportunities in Washington, DC, the city with the highest concentration of mathematicians in non-academic positions. Students not only have internship options, they also have diverse potential career options as analysts, consultants, actuaries, stockbrokers, physicians, attorneys, and educators.

Visit the program website (https://math.columbian.gwu.edu/) for additional information.

ADMISSIONS

For more information on the admission process, please visit the Office of Undergraduate Admissions website (https://undergraduate.admissions.gwu.edu/). Applications may be submitted via the Common Application (https://go.gwu.edu/commonapp/).

Supporting documents not submitted online should be mailed to:
Office of Undergraduate Admissions
The George Washington University
800 21st Street NW, Suite 100
Washington DC 20052
Contact for questions: gwadm@gwu.edu or 202-994-6040

REQUIREMENTS

The following requirements must be fulfilled:

The general requirements stated under Columbian College of Arts and Sciences, Undergraduate Programs (http://bulletin.gwu.edu/arts-sciences/#degreeregulationstext).

Program-specific curriculum:

The following requirements must be fulfilled:

The general requirements stated under Columbian College of Arts and Sciences, Undergraduate Programs (http://bulletin.gwu.edu/arts-sciences/#degreeregulationstext).

Program-specific curriculum:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1232</td>
<td>Single-Variable Calculus II</td>
<td></td>
</tr>
<tr>
<td>MATH 2185</td>
<td>Linear Algebra I for Math Majors *</td>
<td></td>
</tr>
<tr>
<td>or MATH 2184 &amp; MATH 3125</td>
<td>Linear Algebra I and Linear Algebra II</td>
<td></td>
</tr>
<tr>
<td>MATH 2233</td>
<td>Multivariable Calculus</td>
<td></td>
</tr>
<tr>
<td>MATH 2971</td>
<td>Introduction to Mathematical Reasoning</td>
<td></td>
</tr>
<tr>
<td>or MATH 2971W</td>
<td>Introduction to Mathematical Reasoning</td>
<td></td>
</tr>
<tr>
<td>One course (3 credits) selected from the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCI 1011</td>
<td>Introduction to Programming with Java</td>
<td></td>
</tr>
<tr>
<td>CSCI 1012</td>
<td>Introduction to Programming with Python</td>
<td></td>
</tr>
<tr>
<td>CSCI 1041</td>
<td>Introduction to FORTRAN Programming</td>
<td></td>
</tr>
<tr>
<td>CSCI 1111</td>
<td>Introduction to Software Development</td>
<td></td>
</tr>
<tr>
<td>CSCI 1121</td>
<td>Introduction to C Programming</td>
<td></td>
</tr>
<tr>
<td>CSCI 1131</td>
<td>Introduction to Programming with C</td>
<td></td>
</tr>
</tbody>
</table>

For students in the pure mathematics concentration, an alternative course may substitute for the CSCI course with the approval of the department.

*Of the two options for linear algebra, MATH 2185 is preferred.

Concentration requirement

All students must complete requirements for one of the following three concentrations:

Pure mathematics concentration

<table>
<thead>
<tr>
<th>Code</th>
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</tr>
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<tbody>
<tr>
<td>MATH 4121</td>
<td>Introduction to Abstract Algebra I</td>
<td></td>
</tr>
<tr>
<td>MATH 4239</td>
<td>Real Analysis I</td>
<td></td>
</tr>
<tr>
<td>or MATH 4239W</td>
<td>Real Analysis I</td>
<td></td>
</tr>
<tr>
<td>Two courses (6 credits) from the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 3125</td>
<td>Linear Algebra II</td>
<td></td>
</tr>
<tr>
<td>MATH 3257</td>
<td>Introduction to Complex Variables</td>
<td></td>
</tr>
<tr>
<td>MATH 3806</td>
<td>Introduction to Topology</td>
<td></td>
</tr>
<tr>
<td>MATH 4122</td>
<td>Introduction to Abstract Algebra II</td>
<td></td>
</tr>
<tr>
<td>MATH 4240</td>
<td>Real Analysis II</td>
<td></td>
</tr>
</tbody>
</table>
Five additional mathematics (MATH) courses (15 credits) numbered in the 3000 and 4000 ranges. For students who complete the major requirements for a bachelor of science in astronomy and astrophysics, biology, biophysics, chemistry, data science, economics, physics, statistics, finance, information systems, or any major in SEAS, this requirement is reduced to three additional MATH courses (9 credits) numbered in the 3000 and 4000 ranges.

### Applied mathematics concentration

<table>
<thead>
<tr>
<th>Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MATH 3342</td>
<td>Ordinary Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 3343</td>
<td>Partial Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 3553</td>
<td>Introduction to Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td>MATH 3359</td>
<td>Introduction to Mathematical Modeling</td>
<td></td>
</tr>
<tr>
<td>MATH 4239</td>
<td>Real Analysis I</td>
<td></td>
</tr>
<tr>
<td>or MATH 4239W</td>
<td>Real Analysis I</td>
<td></td>
</tr>
</tbody>
</table>

Four additional mathematics (MATH) courses (12 credits) numbered in the 3000 and 4000 ranges. For students who complete the major requirements for a bachelor of science in astronomy and astrophysics, biology, biophysics, chemistry, data science, economics, physics, statistics, finance, information systems, or any major in SEAS, this requirement is reduced to two additional MATH courses (6 credits) numbered in the 3000 and 4000 ranges.

### Interdisciplinary mathematics concentration

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<td>MATH 3342</td>
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<td></td>
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<tr>
<td>MATH 3553</td>
<td>Introduction to Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td>MATH 3359</td>
<td>Introduction to Mathematical Modeling</td>
<td></td>
</tr>
</tbody>
</table>

Six additional mathematics (MATH) courses (18 credits) numbered in the 3000 and 4000 ranges. For students who complete the major requirements for a bachelor of science in astronomy and astrophysics, biology, biophysics, chemistry, data science, economics, physics, statistics, finance, information systems, or any major in SEAS, this requirement is reduced to four additional MATH courses (12 credits) numbered in the 3000 and 4000 ranges.

Minor or second major requirement—Students in the interdisciplinary concentration must complete an approved minor or second major in a field in which mathematics is applied. The pre-approved fields are astronomy and astrophysics, biology, bioinformatics, biophysics, chemistry, data science, economics, physics, statistics, finance, information systems, or any major in SEAS.

### GENERAL EDUCATION

In addition to the University General Education Requirement (http://bulletin.gwu.edu/university-regulations/general-education/), undergraduate students in Columbian College must complete a further, College-specific general education curriculum—Perspective, Analysis, Communication (G-PAC) (http://bulletin.gwu.edu/arts-sciences/gpac/) as well as CCAS 1001. Together with the University General Education Requirement, G-PAC engages students in active intellectual inquiry across the liberal arts. Students achieve a set of learning outcomes that enhance their analytical skills, develop their communication competencies, and invite them to participate as responsible citizens who are attentive to issues of culture, diversity, and privilege.

**Coursework for the University General Education Requirement is distributed as follows:**

- **Writing**—4 credits in UW 1020 University Writing and 6 credits distributed over at least two writing in the discipline (WID) courses taken in separate semesters. WID courses are designated by a “W” appended to the course number.
- **Humanities**—one approved humanities course that involves critical thinking skills.
- **Mathematics or statistics**—one approved course in either mathematics or statistics.
- **Natural or physical science**—one approved laboratory course that employs the process of scientific inquiry.
- **Social Sciences**—two approved courses in the social sciences that employ critical thinking, quantitative reasoning, or scientific reasoning.

**Coursework for the CCAS G-PAC requirement is distributed as follows:**

- **Arts**—one approved arts course that involves the study or creation of artwork based on an understanding or interpretation of artistic traditions or knowledge of art in a contemporary context.
- **Global or cross-cultural perspective**—one approved course that analyzes the ways in which institutions, practices, and problems transcend national and regional boundaries.
- **Local or civic engagement**—one approved course that develops the values, ethics, disciplines, and commitment to pursue responsible public action.
- **Oral communication**—one approved course in oral communication.
• Natural or physical science—one additional approved laboratory course that employs the process of scientific inquiry (in addition to the one course in this category required by the University General Education Requirement).
• Humanities—one additional approved humanities course that involves critical thinking skills (in addition to the one course in this category required by the University General Education Requirement).
• CCAS 1001 First-Year Experience

**Certain courses are approved to fulfill GPAC requirements in more than one category.**

Courses taken in fulfillment of G-PAC requirements may also be counted toward majors or minors. Transfer courses taken prior to, but not after, admission to George Washington University may count toward the University General Education Requirement and G-PAC, if those transfer courses are equivalent to GW courses that have been approved by the University and the College.

Lists of approved courses in the above categories are included on each undergraduate major’s (http://bulletin.gwu.edu/arts-sciences/#majorstext) page in this Bulletin.

**SPECIAL HONORS**

To graduate with Special Honors, a student must meet the general requirements stated under University Regulations; maintain a grade-point average of at least 3.5 in courses in the major; complete 3 credits of MATH 4995 Reading and Research in addition to the other required courses in the major; and present an oral defense of a senior thesis prepared for MATH 4995 Reading and Research.