BACHELOR OF SCIENCE WITH A MAJOR IN MATHEMATICS

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/#degreeregulationtext).

Program-specific curriculum:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Required</td>
<td></td>
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<tr>
<td>MATH 1231</td>
<td>Single-Variable Calculus I (or the equivalent)</td>
<td></td>
</tr>
<tr>
<td>MATH 1232</td>
<td>Single-Variable Calculus II</td>
<td></td>
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<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>
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<tr>
<td>MATH 2971</td>
<td>Introduction to Mathematical Reasoning</td>
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</tbody>
</table>

One course (3 credits) from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<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 substituted 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

- MATH 4121 Introduction to Abstract Algebra I
- MATH 4239 Real Analysis I
- Two courses (6 credits) from the following:
  - MATH 3125 Linear Algebra II
  - MATH 3257 Introduction to Complex Variables
  - MATH 3806 Introduction to Topology
  - MATH 4122 Introduction to Abstract Algebra II
  - MATH 4240 Real Analysis II

Five additional mathematics (MATH) courses (15 credits) numbered 3000 or above. For students who complete the bachelor of science requirements for a major in astronomy and astrophysics, biology, biophysics, chemistry, economics, physics, statistics, finance, or any major in SEAS, this requirement is reduced to three additional MATH courses (9 credits) numbered 3000 or above.

Applied mathematics concentration

- MATH 3342 Ordinary Differential Equations
- MATH 3343 Partial Differential Equations
- MATH 3559 Introduction to Mathematical Modeling
- MATH 4239 Real Analysis I

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

Interdisciplinary mathematics concentration

- MATH 3342 Ordinary Differential Equations
- MATH 3553 Introduction to Numerical Analysis
MATH 3359  Introduction to Mathematical Modeling

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

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, economics, physics, statistics, finance, and all fields in the School of Engineering and Applied Science.

GENERAL EDUCATION

In addition to the University General Education Requirement (http://bulletin.gwu.edu/university-regulations/general-education/#text), undergraduate students in Columbian College must complete a further, College-specific general education curriculum—Perspective, Analysis, Communication, or G-PAC. 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.

G-PAC approved courses, Dean’s Seminars, and Sophomore Colloquia that may be available for registration are listed on the CCAS Advising website (https://advising.columbian.gwu.edu/general-education-courses/).

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

- Writing—one approved course in university writing and two approved writing in the disciplines (WID) courses.
- Humanities—one approved course in the humanities that involves critical or creative 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.

Coursework for the Columbian College general education curriculum is distributed as follows:

- Arts—one approved course in the arts 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.
- Humanities—one approved course in the humanities that involves critical thinking skills (in addition to the one course in this category required by the University General Education Requirement).
- Local or Civic Engagement—one approved course that develops the values, ethics, disciplines, and commitment to pursue responsible public action.
- Natural or Physical Science—one 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).
- Oral Communication—one course in oral communication.

Certain courses are approved to fulfill the requirement in more than one of these categories.

Courses taken in fulfillment of G-PAC also may 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.

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.