The ESGS doctoral program is based upon the integration of the scientific disciplines in geosystems, geography, geosciences, and geoinformatics. Students receive broad-based training in systematic geosciences and geography, as well as technical courses in computation and geoinformation sciences. The ESGS doctoral program represents a gateway to an academic career for some students; for others, it facilitates career advancement in the public sector or private industry. Graduates are equipped to participate in interdisciplinary research, which is the norm in today's research arena.

**Admissions & Policies**

**Admissions**

University-wide admissions policies can be found in Graduate Admissions Policies.

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

**Eligibility**

This program is intended for graduates who hold a MS or MA degree in atmospheric science, climatology, meteorology, Earth science, geology, environmental science, remote sensing, hydrology, oceanography, geography, or a related field. Highly-qualified students with a BS or BA in applicable fields are also encouraged to apply. Knowledge of mathematics through calculus is preferred. Interested applicants should contact the program degree coordinator or the GGS director of academic programs for more specific advice.

**Application Requirements**

To apply, prospective students should complete the George Mason University Admissions Application (https://www2.gmu.edu/admissions-aid/apply-now). Official transcripts from each college and graduate institution attended, a current résumé, and an expanded goals statement will be required.

Applicants will also need three letters of recommendation and an official report of scores obtained on the GRE-GEN. The GRE requirement for admission to the doctoral program may be waived if the student holds a master's degree from a regionally accredited institution. TOEFL scores are required of all international applicants. GRE-GEN scores are required of students wishing to be considered for the Office of the Provost's Presidential Scholarship. A minimum combined math and verbal GRE score of 270/340 are needed to qualify for the Presidential Scholarship.

**Policies**

For policies governing all graduate programs, see AP.6 Graduate Policies.

**Reduction of Credits**

For students entering the doctoral program with a master's degree in a related field from a regionally accredited institution, the number of required credits may be reduced up to 30 credits, subject to approval of the program faculty and the associate dean for student affairs. See AP.6.5.2 Reduction of Credits for more information.

**Secondary Program Options**

Students enrolled in this doctoral program have the option of adding a secondary graduate certificate or master's program. Depending upon the secondary program chosen, many courses may be applicable to both programs. Before adding a secondary program, students are advised to carefully review AP.6.8 Requirements for Graduate Certificates or AP.6.9 Requirements for Master's Degrees and AP.6.10 Requirements for Doctoral Degrees. Faculty advisors should be contacted for further guidance and for secondary program suggestions.

**Requirements**

**Degree Requirements**

Total credits: 72

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

**Core Courses**

Students are required to take 24 credits of courses selected from the six core areas below. Of the cores, students must complete at least one course in five of the cores and two courses in at least three of those five cores.

The six core areas from which to choose these 24 credits are:

<table>
<thead>
<tr>
<th>Core Area</th>
<th>Courses</th>
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</thead>
<tbody>
<tr>
<td><strong>Quantitative Core:</strong></td>
<td></td>
</tr>
<tr>
<td>GGS 560</td>
<td>Quantitative Methods</td>
</tr>
<tr>
<td>GGS 754</td>
<td>Earth Science Data and Advanced Data Analysis</td>
</tr>
<tr>
<td>GGS 791</td>
<td>Advanced Spatial Statistics</td>
</tr>
<tr>
<td><strong>Geoinformatics Core:</strong></td>
<td></td>
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<tr>
<td>GGS 650</td>
<td>Introduction to GIS Algorithms and Programming</td>
</tr>
<tr>
<td>GGS 664</td>
<td>Spatial Data Structures</td>
</tr>
<tr>
<td>GGS 675</td>
<td>Location Science</td>
</tr>
<tr>
<td>GGS 692</td>
<td>Web-based Geographic Information Systems</td>
</tr>
<tr>
<td>GGS 787</td>
<td>Scientific Data Mining for Geoinformatics</td>
</tr>
<tr>
<td><strong>Geosciences and Physical Geography Core:</strong></td>
<td></td>
</tr>
<tr>
<td>GGS 656</td>
<td>The Hydrosphere</td>
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<tr>
<td>GGS 657</td>
<td>The Lithosphere</td>
</tr>
<tr>
<td>GGS 670</td>
<td>Introduction to Atmosphere and Weather</td>
</tr>
<tr>
<td>GGS 721</td>
<td>Biogeography</td>
</tr>
<tr>
<td>PHYS 575</td>
<td>Atmospheric Physics I</td>
</tr>
</tbody>
</table>
Human Geography Core:
- GGS 505 Transportation Geography
- GGS 533 Issues in Regional Geography
- GGS 540 Health Geography
- GGS 704 Spatial Demography

Geographic Information Science Core:
- GGS 553 Geographic Information Systems
- GGS 563 Advanced Geographic Information Systems
- GGS 671 Algorithms and Modeling in GIS

Remote Sensing Core:
- GGS 579 Remote Sensing
- GGS 680 Earth Image Processing
- GGS 756 Physical Principles of Remote Sensing
- GGS 760 Advanced Topics in Remote Sensing
- GGS 777 Remote Sensing Natural Hazards

Total Credits 24

Research Synthesis and Colloquium

Research Synthesis
Select one from the following:
- GGS 684 Selected Topics in Geospatial Intelligence
- GGS 689 Seminar in Geographic Thought and Methodology
- GGS 795 Seminar in Regional Analysis

Colloquium
- GGS 900 Geography and Geoinformation Science Colloquium (complete twice)

Total Credits 5

Electives
In consultation with the advisor, students select credits necessary to reach 72 total credits

\[1 \leq \text{Half of elective credits} \leq 31\]

Dissertation Research
Students take 12-24 credits, with at least 6 credits in GGS 999 Dissertation. After reaching candidacy, students must stay continuously enrolled GGS 999 Dissertation until defending their dissertation.

Select 12-24 credits from the following:
- GGS 998 Dissertation Proposal
- GGS 999 Dissertation

Total Credits 12-24

Dissertation Committee
All students will be assigned a temporary academic advisor when they first enroll in the program. No later than the end of the second year, each student should identify a dissertation advisor and form a doctoral committee. The committee will be chaired by a GGS tenure or tenure-track professor and be composed of at least 50% GGS faculty. All members of the committee must be Mason Graduate Faculty and approved by the department’s director of academic programs.

Candidacy Examination
After completing all required courses, each student must take a candidacy exam administered by the dissertation committee. The exam will have written and oral components. Its purpose is to determine whether the student has acquired adequate general knowledge in the selected subject area, as well as much more detailed knowledge of the specific research topic planned for the dissertation.

Dissertation Proposal and Advancement to Candidacy
After students have completed all required courses and passed the candidacy exam, they should prepare an acceptable dissertation proposal. After the dissertation proposal is approved and the appropriate paperwork is completed, the student will be advanced to candidacy.

Doctoral Dissertation
The degree will be awarded upon completion of the required coursework and successful defense of a PhD dissertation that makes an original and significant contribution to the field.