The Earth Systems and Geoinformation Sciences (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 U.S. 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 AP6 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 AP6.5.2 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 AP6.8 Requirements for Graduate Certificates or AP6.9 Requirements for Master’s Degrees and AP6.10 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 choose from the following courses in the 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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GGS 560</td>
<td>Quantitative Methods</td>
<td>3</td>
</tr>
<tr>
<td>GGS 754</td>
<td>Earth Science Data and Advanced Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GGS 791</td>
<td>Advanced Spatial Statistics</td>
<td>3</td>
</tr>
<tr>
<td>GGS 650</td>
<td>Introduction to GIS Algorithms and Programming</td>
<td>3</td>
</tr>
<tr>
<td>GGS 664</td>
<td>Spatial Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>GGS 675</td>
<td>Location Science</td>
<td>3</td>
</tr>
<tr>
<td>GGS 692</td>
<td>Web-based Geographic Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>GGS 787</td>
<td>Scientific Data Mining for Geoinformatics</td>
<td>3</td>
</tr>
<tr>
<td>GGS 656</td>
<td>The Hydrosphere</td>
<td>3</td>
</tr>
<tr>
<td>GGS 657</td>
<td>The Lithosphere</td>
<td>3</td>
</tr>
</tbody>
</table>

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

Quantitative Core:

GGS 560 - Quantitative Methods
GGS 754 - Earth Science Data and Advanced Data Analysis
GGS 791 - Advanced Spatial Statistics

Geoinformatics Core:

GGS 650 - Introduction to GIS Algorithms and Programming
GGS 664 - Spatial Data Structures
GGS 675 - Location Science
GGS 692 - Web-based Geographic Information Systems
GGS 787 - Scientific Data Mining for Geoinformatics

Geosciences and Physical Geography Core:

GGS 656 - The Hydrosphere
GGS 657 - The Lithosphere
GGS 670 Introduction to Atmosphere and Weather
GGS 721 Biogeography
PHYS 575 Atmospheric Physics I

**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**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Research Synthesis</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Select one from the following:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>GGS 684 Selected Topics in Geospatial Intelligence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GGS 689 Seminar in Geographic Thought and Methodology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GGS 795 Seminar in Regional Analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Colloquium</strong></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>GGS 900 Geography and Geoinformation Science Colloquium (complete twice)</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits 5

**Electives**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In consultation with the advisor, students select credits necessary to reach 72 total credits</td>
<td>19-31</td>
</tr>
</tbody>
</table>

1 At least half of the elective credits taken at Mason must be from GGS courses.

**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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Select 12-24 credits from the following:</td>
<td>12-24</td>
</tr>
<tr>
<td></td>
<td>GGS 998 Dissertation Proposal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GGS 999 Dissertation</td>
<td></td>
</tr>
</tbody>
</table>

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 four members. GGS tenure or tenure-track faculty should be at least 50% and have larger committee membership than any other Mason department/academic unit or external organization. At least one member should be a tenure or tenure-track faculty member from another Mason department or program outside of GGS. All members of the committee must be Mason Graduate Faculty and approved by the department’s chair.

**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.