

# EARTH SYSTEMS SCIENCE, MS (AOES)

**Banner Code:** SC-MS-ESSC

## Academic Advising

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This is a shared program between the Department of Atmospheric, Oceanic, and Earth Sciences (<https://catalog.gmu.edu/colleges-schools/science/atmospheric-oceanic-earth-sciences/>) and the Department of Geography and Geoinformation Science (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/>).

The program addresses the growing demand for trained professionals in the Earth sciences. The degree emphasizes a research-oriented, global systems approach to studying the Earth and its systems- the atmosphere, the hydrosphere, and the lithosphere, including their interrelationships and interactions with the biosphere. Emphasis is on the observation, measurement, and analysis of Earth's systems.

Most student research projects and theses will relate to geologic and geographic topics, though studies of related topics in Earth science are welcome. Students completing the program are qualified to pursue careers that require knowledge of the basics of Earth systems science and the requisite tools, specifically pertaining to the area of Earth science that they choose to investigate. Students are encouraged to undertake a master's thesis but may choose a research project. In the latter case, students must pass a comprehensive exam.

## Admissions & Policies

### Admissions

University-wide admissions policies can be found in the Graduate Admissions Policies (<https://catalog.gmu.edu/admissions/graduate-policies/>) section of this catalog. International students and students having earned international degrees should also refer to Admission of International Students (<https://catalog.gmu.edu/admissions/international-students/>) for additional requirements.

### Eligibility

In addition to the university-wide requirements, applicants for this master's should have earned a BS degree in atmospheric, Earth, environmental, geological, geographical, ocean, or physical science from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent.

### Application Requirements

To apply for this program, prospective students should submit the George Mason University Admissions Application (<https://www2.gmu.edu/admissions-aid/apply-now/>) and its required supplemental documentation, two letters of recommendation, and a goals statement.

GRE scores are not required for admission into this program, but are encouraged if the student is seeking internal funding.

## Policies

For policies governing all graduate programs, see AP.6 Graduate Policies (<https://catalog.gmu.edu/policies/academic/graduate-policies/>).

### Transferring Previous Graduate Credit into this Program

Previously earned and relevant graduate credits may be eligible for transfer into this program; details can be found in the Credit by Exam or Transfer (<https://catalog.gmu.edu/policies/academic/graduate-policies/>) section of this catalog.

## Requirements

### Degree Requirements

Total credits: 30

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

Candidates must complete 10 credits of GGS courses and 10 credits of GEOL/CLIM courses toward their requirements. ("Culminating Experience" credits do not count towards this requirement).

### Earth Science Core

Code	Title	Credits
Select one course from each of the following groups:		9
<b>Atmosphere:</b>		
CLIM 610	Introduction to the Physical Climate System	
CLIM 614	Land-Climate Interactions	
GEOL 532	Paleoclimatology	
GGG 670	Introduction to Atmosphere and Weather	
PHYS 575	Atmospheric Physics	
<b>Hydrosphere:</b>		
CLIM 512	Physical Oceanography	
CLIM 712	Physical and Dynamical Oceanography	
GEOL 513	Hydrogeology	
GEOL 565	Paleoceanography	
GGG 656	The Hydrosphere	
<b>Lithosphere:</b>		
GEOL 506	Soil Science	
GGG 657	The Lithosphere	
or GEOL 601	The Lithosphere	
<b>Total Credits</b>		<b>9</b>

### Techniques

Code	Title	Credits
Select two courses from the following: <sup>1</sup>		6
GGG 553	Geographic Information Systems	
GGG 560	Quantitative Methods	
GGG 579	Remote Sensing	

GGG 680	Earth Image Processing	
GGG 754	Earth Science Data and Advanced Data Analysis	
<b>Total Credits</b>		<b>6</b>

<sup>1</sup> Other courses can be substituted with advisor approval.

## Colloquium

Code	Title	Credits
GGG 900	Geography and Geoinformation Science Colloquium	1
Select one from the following:		1
GEOL 536	Paleontology Seminar	
GEOL 792	Seminar in Earth Systems Science, Geology, Earth Science	
CLIM 991	Climate Dynamics Seminar	
<b>Total Credits</b>		<b>2</b>

## Electives

Code	Title	Credits
Select 10 credits from courses at the 500 to 900-level (excluding 700, 798, and 799 courses)		10
CLIM Courses ( <a href="https://catalog.gmu.edu/courses/clim/">https://catalog.gmu.edu/courses/clim/</a> )		
GEOL Courses ( <a href="https://catalog.gmu.edu/courses/geol/">https://catalog.gmu.edu/courses/geol/</a> )		
GGG Courses ( <a href="https://catalog.gmu.edu/courses/ggs/">https://catalog.gmu.edu/courses/ggs/</a> )		
EVPP Courses ( <a href="https://catalog.gmu.edu/courses/evpp/">https://catalog.gmu.edu/courses/evpp/</a> )		
<b>Total Credits</b>		<b>10</b>

## Culminating Experience

Choose the culminating experience of either a thesis or a project (either must total 3 credits):

### Thesis

Code	Title	Credits
Select 3 credits from the following:		3
GGG 799	Thesis	
GEOL 799	Master's Thesis in Earth Systems Science	
CLIM 799	Master's Thesis in Climate	
<b>Total Credits</b>		<b>3</b>

### Project

Code	Title	Credits
Select one from the following:		1
GGG 700	Comprehensive Exam	
GEOL 700	Comprehensive Exam	
CLIM 700	Climate Comprehensive Exam	
Select one from the following:		2
GGG 798	Master's Research Project	
GEOL 798	Master's Research Project in Earth Systems Science	
CLIM 798	Master's Climate Research Project	
<b>Total Credits</b>		<b>3</b>

## Accelerated Master's

## Geology, BS/Earth Systems Science, Accelerated MS

### Overview

Geology, and Earth sciences more broadly, are extremely important to society and our economy as they deal with our planet, our oceans, and our climate. Degrees in Earth science are broadly useful in industry, government, conservation, and many other areas of our economy. While there are many positions in the field that only require a bachelor's degree, many employers either prefer a Master's degree, or a Master's degree can be the key to further promotion within a particular organization. This Accelerated Master's degree is designed to give students the skills and the degrees that they need to be both initially successful, and to ensure long-term advancement in their chosen professions.

### Application Requirements

Applicants should be enrolled in the Geology, BS degree at Mason and have earned at least 60 credits. Previous coursework should include two semesters each of calculus, chemistry, and physics, and one semester of statistics. Applicants should have a minimum GPA of 3.00.

Applicants to all graduate programs at Mason must meet the admission standards and application requirements for graduate study as specified in the Graduate Admission Policies (<https://catalog.gmu.edu/admissions/graduate-policies/>) section of this catalog, excluding the GRE exam requirement (which is not required for those enrolled in the accelerated program). This includes three letters of recommendation (at least one from a former professor or someone with a PhD), a recent resume, a statement of interest/research goals (including information on the applicant's proposed MS research), and a letter from their advisor. This letter should state that the advisor agrees to take on the candidate as an MS student, addresses how the candidate would be a good fit for them, and indicate why the applicant's research topic would be suitable for study.

### Accelerated Option Requirements

Students admitted to this program may take graduate courses after completing 75 undergraduate credits, and up to 12 credits of appropriate graduate coursework may be used in partial satisfaction of the requirements for the undergraduate degree. If students earn at least a 3.00 GPA in these classes, they are granted advanced standing in the master's program and must then complete an additional 24 credits to receive the master's degree. All other requirements for the Earth Systems Science, MS, must be met.

To apply these credits to the master's degree, students must request that the credits be moved from the undergraduate degree to the graduate degree using the Bachelor's/Accelerated Master's Transition form found on the Office of the University Registrar's website (<https://registrar.gmu.edu/forms/>).

For more detailed information, see AP6.7 Bachelor's/Accelerated Master's Degrees (<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>). For policies governing all graduate programs, see AP6 Graduate Policies (<https://catalog.gmu.edu/policies/academic/graduate-policies/>).

## Reserve Graduate Credit

Undergraduate students may also take up to 6 additional and appropriate graduate credits as reserve graduate credit. These credits do not apply to the undergraduate degree, but will reduce the subsequent master's degree credits accordingly (e.g., with 12 credits counted toward the undergraduate and graduate degrees plus the maximum 6 reserve credits for the master's, an MS could be completed with 12 post-bachelor's credits). The ability to take courses for reserve graduate credit is available to all high achieving undergraduates with the permission of the department.

## Graduate Course Suggestions

Students should consult with an advisor before registering for graduate credits.

Code	Title	Credits
GEOL 504	Sedimentary Geology	4
GEOL 506	Soil Science	3
GEOL 510	Advanced Structural Geology	3
GEOL 513	Hydrogeology	3
GEOL 521	Geology of Energy Resources	3
GEOL 532	Paleoclimatology	3
GEOL 534	Vertebrate Paleontology	4
GEOL 536	Paleontology Seminar	1-2
GEOL 541	Great Events in Earth History	3
GEOL 553	Field Mapping Techniques	3