

GEOGRAPHY, BS

Banner Code: SC-BS-GEOG

Undergraduate Advising

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The Geography, BS is designed to offer students the opportunity to study the integrated social and environmental processes that continuously shape and reshape the world we live in. This major provides students with broad training across the core subdisciplines of geography (human, physical, and GIScience), emphasizing application and technique-driven coursework, in addition to a rigorous science and mathematics curriculum. Students will find numerous opportunities for employment in both the private and public sectors, as well as in academia. Given their interdisciplinary approach and uniquely spatial perspective, geographers are well suited to address important local, regional, and global challenges in today's world.

The Department of Geography and Geoinformation Science (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/>) fosters a supportive, active learning environment in which students are encouraged to work closely with both faculty and peers. The curriculum in this major provides students with the analytical, technical, and practical training that prepares them to be successful in an ever-evolving job market. For students who wish to pursue their interest in geography via a more flexible degree program, the department also offers a Geography, BA (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/geography-ba/>).

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Undergraduate Admissions Policies (<https://catalog.gmu.edu/admissions/undergraduate-policies/>) section of this catalog.

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

Policies

Students must fulfill all Requirements for Bachelor's Degrees (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#text>) including the Mason Core (<https://catalog.gmu.edu/mason-core/>).

GGG 415 Seminar in Geographic Thought and Methodology (Mason Core) (<https://catalog.gmu.edu/mason-core/>) fulfills the writing intensive requirement.

For policies governing all undergraduate programs, see AP.5 Undergraduate Policies (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/>).

Requirements

Degree Requirements

Total credits: minimum 120

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

Candidates for the Geography, BS degree must complete the Core Courses, Breadth and Experience Courses, Elective Courses, and one concentration, all with a minimum GPA of 2.00:

Geography

Core Courses

Code	Title	Credits
GGG 102	Physical Geography (Mason Core) (https://catalog.gmu.edu/mason-core/)	3-4
or GGS 121	Dynamic Atmosphere and Hydrosphere (Mason Core) (https://catalog.gmu.edu/mason-core/)	
or GGS 122	Dynamic Geosphere and Ecosphere	
GGG 103	Human Geography (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
GGG 110	Introduction to Geoinformation Technologies	3
GGG 300	Quantitative Methods for Geographical Analysis	3
GGG 310	Cartographic Design	3
GGG 311	Geographic Information Systems	3
GGG 415	Seminar in Geographic Thought and Methodology (Mason Core) (https://catalog.gmu.edu/mason-core/) ¹	3
GGG 485	Capstone in Geography and Geoinformation Science (Mason Core) (https://catalog.gmu.edu/mason-core/)	3

Total Credits **24-25**

¹ Fulfills the writing intensive requirement.

Breadth and Experience Courses

Code	Title	Credits
Spatial Computing		
GGG 366	Spatial Computing	3
GGG 379	Remote Sensing	3
MATH 113	Analytic Geometry and Calculus I (Mason Core) (https://catalog.gmu.edu/mason-core/)	4

Systematic Courses

Select one from the following courses:		3
GGG 301	Political Geography (Mason Core) (https://catalog.gmu.edu/mason-core/)	

GGG 302	Global Environmental Hazards
GGG 303	Geography of Resource Conservation (Mason Core) (https://catalog.gmu.edu/mason-core/)
GGG 304	Population Geography (Mason Core) (https://catalog.gmu.edu/mason-core/)
GGG 305	Economic Geography
GGG 306	Urban Geography
GGG 307	Geographic Approaches for Sustainable Development
GGG 309	Introduction to Weather and Climate
GGG 312	Physical Climatology
GGG 314	Severe and Extreme Weather
GGG 321	Biogeography
GGG 340	Health Geography
GGG 344	Military Geography
GGG 346	Geography of Religions and Belief Systems
GGG 357	Urban Planning
GGG 399	Select Topics in GGS

Regional Courses

Select one from the following courses: 3

GGG 315	Geography of the United States
GGG 316	Geography of Latin America
GGG 317	Geography of China (Mason Core) (https://catalog.gmu.edu/mason-core/)
GGG 320	Geography of Europe
GGG 325	Geography of North Africa and the Middle East
GGG 326	Geography of Eastern Europe and Russia
GGG 333	Issues in Regional Geography
GGG 380	Geography of Virginia

Total Credits 16**Elective Courses**

Code	Title	Credits
Select 3 credits of GGS courses (https://catalog.gmu.edu/courses/ggs/)		3
Select 6 credits of upper division GGS courses (https://catalog.gmu.edu/courses/ggs/)		6

Total Credits 9**Geoinformatics Concentration (GINF)**

Geoinformatics is a technical field of study in geography in which digital spatial information is captured, stored, processed, visualized, and analyzed. Geoinformatics encompasses theories and methods of understanding geoinformation, and broadly incorporates geographic information systems (GIS), remote sensing (RS), cartography and geovisualization, and spatial computing. Students that complete the Geoinformatics Concentration develop skills in applying spatial scientific techniques to digital spatial information, in order to address complex challenges in social and environmental systems.

Code	Title	Credits
Select 6 courses from the following; no more than two courses outside of the GGS prefix are permitted:		18-19

GGG 308	Field Mapping Techniques
or GEOL 303	Field Mapping Techniques
GGG 354	Data Analysis and Global Change Detection Techniques
GGG 411	Geovisualization
GGG 416	Satellite Image Analysis
GGG 422	Drone Remote Sensing
GGG 426	Physical Fundamentals of Remote Sensing
GGG 429	Remote Sensing of the Environment and Earth System
GGG 432	Spatial Modeling for Public Health
GGG 462	Web-based Geographic Information Systems
GGG 463	RS: GIS Analysis and Application
GGG 470	Special Topics in Geographic Techniques
GGG 499	GGG Independent Study (when the topic has been approved by an advisor)
BUS 210	Business Analytics I (Mason Core) (https://catalog.gmu.edu/mason-core/)
CDS 130	Computing for Scientists (Mason Core) (https://catalog.gmu.edu/mason-core/)
CDS 205	Introduction to Agent-based Modeling and Simulation
CDS 230	Modeling and Simulation I
CDS 292	Introduction to Social Network Analysis (Mason Core) (https://catalog.gmu.edu/mason-core/)
CDS 403	Machine Learning Applications in Science
CDS 421	Computational Data Science
CRIM 320	Crime and Place
CS 112	Introduction to Computer Programming (Mason Core) (https://catalog.gmu.edu/mason-core/)
EVPP 430	Fundamentals of Environmental Geographic Information Systems
GEOL 340	Modern Methods in Geology
IT 214	Database Fundamentals
IT 416	Machine Learning for Information Sciences
MIS 303	Introduction to Business Information Systems (Mason Core) (https://catalog.gmu.edu/mason-core/)
SOCI 213	Statistics for the Behavioral Sciences (Mason Core) (https://catalog.gmu.edu/mason-core/)
SOCI 405	Analysis of Social Data
STAT 250	Introductory Statistics I (Mason Core) (https://catalog.gmu.edu/mason-core/)
STAT 260	Introduction to Statistical Practice I
STAT 334	Introduction to Probability Models and Simulation
STAT 350	Introductory Statistics II

SYST 130	Introduction to Computing for Digital Systems Engineering (Mason Core) (https://catalog.gmu.edu/mason-core/)
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Total Credits **18-19**

Geospatial Intelligence Concentration (GI)

The geospatial intelligence (or geointelligence) concentration is designed for students to deepen their knowledge about computational approaches to geoinformation, with particular emphasis in techniques of remote sensing and digital image analysis. While geospatial intelligence has a strong Department of Defense connotation, the techniques developed in this concentration have wide applicability regarding location intelligence over a diverse range of uses and in public, private, and non-profit sectors.

Code	Title	Credits
Core Courses		
GGS 384	Special Topics in Geospatial Intelligence	3
CRIM 310	Introduction to the Intelligence Community	3

Remote Sensing Electives		
Select three courses from the following:		9
GGS 416	Satellite Image Analysis	
GGS 422	Drone Remote Sensing	
GGS 426	Physical Fundamentals of Remote Sensing	
GGS 429	Remote Sensing of the Environment and Earth System	
GGS 470	Special Topics in Geographic Techniques (When the topic has been approved by an advisor)	
GGS 499	GGS Independent Study (When the topic has been approved by an advisor)	

Intelligence Electives		
Select one course from the following:		3-4
CDS 468	Image Operators and Processing	
CRIM 312	Intelligence Analysis Techniques	
CRIM 350	Counterintelligence	
CRIM 460	Surveillance and Privacy in Contemporary Society	
or GOVT 460	Surveillance and Privacy in Contemporary Society	
GOVT 346	American Security Policy	
GOVT 347	International Security	
MATH 175	Mathematics of Cryptography: An Introduction	
SOCI 391	Big Data, Technology, and Society	
SOCI 405	Analysis of Social Data	

Total Credits **18-19**

Urban Science Concentration (URBS)

We are living in an increasingly urban world. As concentrations of human activity, cities and urban environments are data-rich, requiring geo-computational approaches to understand complex city systems and urban challenges. Through this concentration, students will apply geoinformational techniques to large-scale data to urban phenomenon like transportation, mobility, urban planning, and urban development.

Code	Title	Credits
Core Courses		
GGS 306	Urban Geography	3
CDS 303	Scientific Data Mining	3
Urban Electives		
Select two courses from the following: ¹		6-7
GGS 357 or GOVT 357	Urban Planning	
ANTH 382	Urban Anthropology (Mason Core) (https://catalog.gmu.edu/mason-core/)	
ARTH 311	Design of Cities (Mason Core) (https://catalog.gmu.edu/mason-core/)	
CONF 329	Community Engagement and Collaborative Problem Solving	
EVPP 442	Urban Ecosystems and Processes	
EVPP 490	Special Topics in Environmental Science and Policy (When the topic is "Urban Smart Growth Strategies")	
GOVT 464	Issues in Public Policy and Administration (when title is "Urban Economic Development in Smart Growth Era")	
NUTR 435	Urban Agriculture	
SOCI 332	The Urban World (Mason Core) (https://catalog.gmu.edu/mason-core/)	
Mapping and Spatial Analysis Electives		
Select one course from the following:		3
GGS 308	Field Mapping Techniques	
GGS 411	Geovisualization	
GGS 416	Satellite Image Analysis	
GGS 432	Spatial Modeling for Public Health	
GGS 462	Web-based Geographic Information Systems	
GGS 463	RS: GIS Analysis and Application	
GGS 470	Special Topics in Geographic Techniques (When the topic has been approved by an advisor)	
GGS 499	GGS Independent Study (When the topic has been approved by an advisor)	
Computational Data Science Electives		
Select one course from the following:		3
CDS 201	Introduction to Computational Social Science	
CDS 205	Introduction to Agent-based Modeling and Simulation	
CDS 230	Modeling and Simulation I	
CDS 292	Introduction to Social Network Analysis (Mason Core) (https://catalog.gmu.edu/mason-core/)	
CDS 301	Scientific Information and Data Visualization	
CDS 302	Scientific Data and Databases (Mason Core) (https://catalog.gmu.edu/mason-core/)	

CDS 421	Computational Data Science
Total Credits	18-19

¹ Other urban topics courses may be taken with advisor approval.

Mason Core and Elective Credits

In order to meet a minimum of 120 credits, this degree requires additional 51-53 credits, which may be applied toward any remaining Mason Core (<https://catalog.gmu.edu/mason-core/>) requirements, Requirements for Bachelor's Degrees (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2>), and electives. Students are strongly encouraged to consult with their advisors to ensure that they fulfill all requirements.

Mason Core

Some Mason Core (<https://catalog.gmu.edu/mason-core/>) requirements may already be fulfilled by the major requirements listed above. Students are strongly encouraged to consult their advisors to ensure they fulfill all remaining Mason Core (<https://catalog.gmu.edu/mason-core/>) requirements.

Students who have completed the following credentials are eligible for a waiver of the Foundation and Exploration (lower level) requirement categories. The Integration category (upper level) is not waived under this policy. See Admissions (<https://catalog.gmu.edu/admissions/undergraduate-policies/#transfertext>) for more information.

- VCCS Uniform Certificate of General Studies
- VCCS or Richard Bland Associate of Science (A.S.), Associate of Arts (A.A.), Associate of Arts and Sciences (A.A.&S.), or Associate of Fine Arts (A.F.A.)

Code	Title	Credits
Foundation Requirements		
	Written Communication (lower-level) (https://catalog.gmu.edu/mason-core/#written)	3
	Oral Communication (https://catalog.gmu.edu/mason-core/#oral)	3
	Quantitative Reasoning (https://catalog.gmu.edu/mason-core/#quantitative)	3
	Information Technology and Computing (https://catalog.gmu.edu/mason-core/#information-technology)	3
Exploration Requirements		
	Arts (https://catalog.gmu.edu/mason-core/#arts)	3
	Global Contexts (https://catalog.gmu.edu/mason-core/#global-contexts)	3
	Global History (https://catalog.gmu.edu/mason-core/#global-history)	3
	Literature (https://catalog.gmu.edu/mason-core/#literature)	3
	Natural Science (https://catalog.gmu.edu/mason-core/#natural-science)	7
	Social and Behavioral Sciences (https://catalog.gmu.edu/mason-core/#social-behavioral-science)	3
	Just Societies (optional) (https://catalog.gmu.edu/mason-core/#justsocieties) ¹	
Integration Requirements		
	Written Communication (upper-level) (https://catalog.gmu.edu/mason-core/#written)	3

Writing Intensive (https://catalog.gmu.edu/mason-core/#wi) ²	3
Mason Apex (https://catalog.gmu.edu/mason-core/#apex) ³	3
Total Credits	40

¹ In addition to covering content related to the designated category, Exploration level courses marked with a Just Societies "flag" are specifically designed to help students learn how to interact effectively with others from all walks of life, including those with backgrounds and beliefs that differ from their own. Students who wish to increase their knowledge and skills in this area may choose to enroll in a Just Societies-flagged course. Students interested in this approach to completing their Mason Core Exploration Requirements should work closely with their advisor to identify the appropriate Just Societies-flagged courses.

² Most programs include the writing-intensive course designated for the major as part of the major requirements; this course is therefore not counted towards the total required for Mason Core.

³ Minimum 3 credits required.

Honors

Honors in the Major

To graduate with departmental honors in Geography, students must have a minimum GPA of 3.50 in GGS courses, an overall GPA of 3.50, and complete the following courses each with a grade of 'B+' or above:

Code	Title	Credits
GGS 463	RS: GIS Analysis and Application	3
GGS 499	GGS Independent Study ¹	3
	3 credits of 500-699 level GGS courses (https://catalog.gmu.edu/courses/ggs/) ²	3

¹ Before registering for this course, students must have identified a topic under the guidance of a full-time faculty member following departmental guidelines.

² Eligibility for these courses is restricted to students who obtain permission from the undergraduate coordinator or those in the Accelerated Master's program.

Accelerated Master's

Bachelor's Degree (any)/Geographic and Cartographic Sciences, Accelerated MS

Overview

Offered by the Department of Geography and Geoinformation Sciences (GGS) (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/>) in the College of Science (<https://catalog.gmu.edu/colleges-schools/science/>), this bachelor's/accelerated master's degree program enables highly qualified undergraduates to obtain any Mason bachelor's degree and the Geographic and Cartographic Sciences, MS (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/geographic-cartographic-sciences-ms/>) degrees within an accelerated timeframe. The program strategy enables students to undertake graduate coursework during their final year in the bachelor's degree. In the case of a 120 credit bachelor's

program, this accelerated master's option can be completed as a 138 credit program (thesis option) or 145 credit program (comprehensive exam option). This accelerated pathway prepares students for professional careers where geoinformation management, geographic analysis, and geospatial visualization are of importance.

Students in this accelerated degree program must fulfill all university requirements for the bachelor's program and the Geographic and Cartographic Sciences, MS (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/geographic-cartographic-sciences-ms/>). While the information below is largely comprehensive, students are strongly encouraged to also review AP.6.7 Bachelor's/Accelerated Master's Degrees (<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>).

Application Requirements

Students with an overall GPA of at least 3.0 may apply for provisional acceptance into this accelerated master's program after completing at least 60 undergraduate credits. Additionally, students they must have completed the following courses with a combined GPA of 3.0 or better: GGS 300 Quantitative Methods for Geographical Analysis, GGS 311 Geographic Information Systems, and any one upper level GGS-prefixed course.

Applicants to all graduate programs at Mason must meet the admission standards and application requirements for graduate study as specified in the Admissions section of this catalog. However, this accelerated master's does not require GRE test scores, letters of recommendation, CV/resume, or a statement of interest.

During the bachelor's degree status, accelerated master's students must complete the graduate courses indicated on their Accelerated Master's Program Application (obtained from the Office of Academic and Student Affairs) with a minimum grade of B- in each course. They must maintain a minimum GPA of 3.0 in all coursework and in coursework applied to their major.

At the beginning of their final undergraduate semester, they must submit the Bachelor's/Accelerated Master's Transition Form (found on the Office of the University Registrar website). Students are encouraged to begin their master's program in the semester immediately following the term of undergraduate degree conferral, but may elect to delay enrollment in for one semester. Students should consult with their faculty advisor in the Department of Geography and Geoinformation Science and the Office of Academic and Student Affairs to obtain further guidance.

Accelerated Option Requirements

Students admitted to this program may start taking graduate courses after completing 75 undergraduate credits. It is recommended that students register for one of the following courses in their first semester of accelerated coursework:

Code	Title	Credits
GGS 551	Cartographic Design	3
GGS 553	Geographic Information Systems	3
GGS 560	Quantitative Methods	3
GGS 579	Remote Sensing	3

Including the course chosen above, up to 12 credits of graduate coursework may be applied to both undergraduate degree and the master's degree. If students earn at least a B- in these classes, they are granted advanced standing in the master's program and must

then complete 18 (thesis option) or 25 (comprehensive exam option) additional credits to receive the master's degree. All other master's degree requirements must be met.

Reserve Graduate Credit

During the bachelor's degree status, students may take up to 6 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. With 12 credits counted toward the undergraduate and graduate degrees plus the maximum 6 reserve credits, the credits necessary for the graduate degree can be reduced by up to 18. The ability to take courses for reserve graduate credit is available to all high achieving undergraduates with the permission of the department. To apply the reserved credits to the master's degree, students must request their transfer from the undergraduate degree to the graduate degree via the Bachelor's/Accelerated Master's Transition Form found on the Office of the University Registrar website.

Bachelor's Degree (any)/Geoinformatics and Geospatial Intelligence, Accelerated MS

Overview

Offered by the Department of Geography and Geoinformation Sciences (GGS) (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/>) in the College of Science (<https://catalog.gmu.edu/colleges-schools/science/>), this bachelor's/accelerated master's degree program enables highly qualified undergraduates to obtain any Mason bachelor's degree and the Geoinformatics and Geospatial Intelligence, MS (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/geoinformatics-geospatial-intelligence-ms/>)degrees within an accelerated timeframe. The program strategy enables students to undertake graduate coursework during their final year in the bachelor's degree. In the case of a 120 credit bachelor's program, this accelerated master's option can be completed as a 138 credit program. This accelerated pathway prepares students for professional careers where geoinformation management, geographic analysis, and geointelligence and geovisualization are of importance.

Students in this accelerated degree program must fulfill all university requirements for the bachelor's program and the Geoinformatics and Geospatial Intelligence, MS (<https://catalog.gmu.edu/colleges-schools/science/geography-geoinformation-science/geoinformatics-geospatial-intelligence-ms/>). While the information below is largely comprehensive, students are strongly encouraged to also review AP.6.7 Bachelor's/Accelerated Master's Degrees (<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>).

Application Requirements

Students with an overall GPA of at least 3.0 may apply for provisional acceptance into this accelerated master's program after completing at least 60 undergraduate credits. Additionally, students must have completed the following courses with a combined GPA of 3.0 or better: GGS 300 Quantitative Methods for Geographical Analysis, GGS 311 Geographic Information Systems, and any one upper level GGS-prefixed course.

Applicants to all graduate programs at Mason must meet the admission standards and application requirements for graduate study as specified in the Admissions section of this catalog. However, this accelerated

master's does not require GRE test scores, letters of recommendation, CV/resume, or a statement of interest.

During the bachelor's degree status, accelerated master's students must complete the graduate courses indicated on their Accelerated Master's Program Application (obtained from the Office of Academic and Student Affairs) with a minimum grade of B- in each course. They must maintain a minimum GPA of 3.0 in all coursework and in coursework applied to their major.

At the beginning of their final undergraduate semester, they must submit the Bachelor's/Accelerated Master's Transition Form (found on the Office of the University Registrar website). Students are encouraged to begin their master's program in the semester immediately following the term of undergraduate degree conferral, but may elect to delay enrollment in for one semester. Students should consult with their faculty advisor in the Department of Geography and Geoinformation Science and the Office of Academic and Student Affairs to obtain further guidance.

Accelerated Option Requirements

Students admitted to this program may start taking graduate courses after completing 75 undergraduate credits. It is recommended that students register for one of the following courses in their first semester of accelerated coursework:

Code	Title	Credits
GGS 553	Geographic Information Systems	3
GGS 579	Remote Sensing	3
GGS 664	Spatial Data Structures	3
GGS 684	Selected Topics in Geospatial Intelligence	3

Including the course chosen above, up to 12 credits of graduate coursework may be applied to both undergraduate degree and the master's degree. If students earn at least a B- in these classes, they are granted advanced standing in the master's program and must then complete 18 additional credits to receive the master's degree. All other master's degree requirements must be met.

Reserve Graduate Credit

During the bachelor's degree status, students may take up to 6 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. With 12 credits counted toward the undergraduate and graduate degrees plus the maximum 6 reserve credits, the credits necessary for the graduate degree can be reduced by up to 18. The ability to take courses for reserve graduate credit is available to all high achieving undergraduates with the permission of the department. To apply the reserved credits to the master's degree, students must request their transfer from the undergraduate degree to the graduate degree via the Bachelor's/Accelerated Master's Transition Form found on the Office of the University Registrar website.