Department of Geography and Geoinformation Science
College of Science
George Mason University

GGS 110: Introduction to Geoinformation Technologies

Fall 2025

About the Course

Time	Tuesday and Thursday 01:30 PM - 02:45 PM
Location	Exploratory Hall 2310
Credits	3 Credit Hours
Prerequisites	None
Modality	In-person
Website	https://canvas.gmu.edu
Textbook	Introduction to Geospatial Technologies (6th ed.) by Bradley A. Shellito.

About Instructor

Instructor	Armita Kar (she/her)
Office Hours	Thursday 3:00 PM - 4:00 PM or By Appointment
Office Location	Exploratory Hall 2215 (Zoom)
Email	akar3@gmu.edu
Teaching Assistant	Meng Yuan (myuan5@gmu.edu)
Learning Assistant	Jacob Anderson (jander72@gmu.edu)

1 Course Overview

Geoinformation technologies have become an inevitable part of our daily lives. From an individual to institutional level, we all use geoinformation technologies to analyze and understand our physical world and its underlying spatial patterns, relationships, and interactions. Using geoinformation technologies ensures the effective functioning of our daily activities, empowers us to find solutions to our multifaceted global challenges, and paves the way for safe, sustainable, and more interactive urban environments.

1.1 Course Goals

This course aims to introduce the basic theories of geoinformation technology and their wide-ranging applications in industry, government, education, and everyday life. The course content covers four main topics: concepts of geospatial location, geographic information systems (GIS), remote sensing (RS), and visualizations.

- The first topic describes how geospatial locations are measured and projected from the 3D earth surface to a 2D map and how we utilize global position systems, a core element of any geoinformation technology, to capture location data.
- Next, the lectures on GIS cover spatial data formats, cartographic principles for mapping spatial data, and data processing and analyzing methods for solving real-world problems.
- The lectures on RS discuss how we acquire images of earth surfaces from space and how to present, interpret, and analyze those images.
- The last section covers advanced geovisualization techniques, such as webmaps and story maps, and how public and private agencies use them to monitor, assess, and overcome existing social and environmental challenges.

Lastly, the course concludes with a discussion of future trends in geoinformation technology and ethical considerations around their usage. This topic explores how the integration of AI can revolutionize geoinformation technology, while highlighting the potential privacy violations that may arise from utilizing them.

The class will meet twice a week. In most weeks, the class on Tuesday will be a lecture covering the theories and methods, and the following Thursday, we will have a lab involving hands-on activities using geospatial data and software on the same topic. There may be a few exceptions; please review the course outline and tentative schedule provided with this syllabus.

1.2 Mason Impact

GGS110 is a Mason Impact course. The course structure follows Mason Impact program goals, as noted in the program's mission statement:

MASON IMPACT

The Mason Impact program prepares students to tackle significant global questions and challenges by investigating meaningful questions, engaging multiple perspectives, and creating new knowledge.

1.3 Learning Outcomes

Upon successful completion of this course, students will be able to –

- Describe the fundamental concepts of geoinformation science and technology.
- Demonstrate proficiency in the basic functions of geospatial software and hardware.
- Demonstrate awareness of fundamental remote sensing and spatial analysis techniques.
- Understand how knowledge is visualized and disseminated to the public through basic proficiency in map creation and design principles, including thematic map display, employment of map projections, and cartographic design.
- Demonstrate how to access different sources of data, understand the process of creating data, and discuss the fundamental concepts of data quality.
- Identify potential applications of geoinformation technologies in multiple social and environmental contexts and ask meaningful questions about its ethical considerations.

2 Course Materials

2.1 Reading Materials

- Required textbook: Introduction to Geospatial Technologies. 6th ed. by Bradley A. Shellito.
    - Both the E-book (ISBN: 9781319436599) and paperback (ISBN: 9781319322250) versions will work.
    - Purchasing options: The book can be rented or purchased at the GMU Bookstore, book's student resource site, and 3rd party sites (e.g., Amazon). You can also access the book through Canvas if you opt in for the GMU bookstore's First Day program.
- Class lectures and other reading materials will be posted on Canvas.

2.2 Technical Resources

- **GMU Email account and NetID**: You must use your GMU email account and NetID to access Canvas, OneDrive, and lab computers.

- **Computer access**: Personal access to a computer with an operating system of Windows 10 or Mac OSX 10.13 or higher and a stable internet connection can be beneficial, but not mandatory. Alternatively, you may use the **GGS Computer lab** to complete assignments. Once registered for a GGS class, you have 24/7 access to the GGS Computer Lab, Exploratory Hall 2102, via your student ID. Please email at ggs@gmu.edu to report issues. You can also use the GMU Virtual Computing Lab (https://www.vcl.gmu.edu/).

- **Data storage:** I encourage you to carry a 32GB USB flash drive or of higher storage capacity to store and access the lab files. After completing each lab, I suggest using OneDrive cloud storage to save your data and lab work as a backup.

- **Canvas**: This course will extensively use Canvas for course materials distribution (if not provided in the textbook), lab submissions, and exams.

3 Activities and Grading

The course has four main activities: 12 labs (48%), 6 graded in-class activities (12%), 2 mid-term exams (20%), and a final exam (20%).

Category	Count	Points in each	Total points	Percentage of total grade
Lab	12	20	240	48 %
Mid-term exam	2	50	100	20 %
Final exam	1	100	100	20 %
Graded in-class activities	6 (Best 4 will be considered)	15	60	12 %
Total			500	100

3.1 Labs

This course has 12 labs, each due the following week. Each lab involves hands-on activities related to the concept discussed in the previous lecture. You get to work with various geoinformation tools, software, and websites, and get firsthand experience exploring, visualizing, and analyzing geospatial data. These platforms are either open source or access granted through the GMU geography department. The lab questions are designed to assess your understanding of key concepts and encourage critical thinking about the potential of geoinformation technologies in addressing global challenges.

I will post the lab instructions on Canvas (if not available in the textbook). You are welcome to join the course Discord group and discuss any lab-related queries there with your peers and course instructors. However, each student is responsible for completing the work on their own and submitting their individual assignments. Each lab is worth 20 points, totaling 240 points. The labs will account for 48% of the total grade. Please submit your lab work only in Microsoft Word document (.docx or .doc) or Adobe PDF (.pdf) file format.

3.2 Exams

The exams (mid-terms and final) will be closed-book and administered via Canvas. Although the exams are conducted online, **you are required to be present in class to take them**. The question formats may vary, including multiple-choice, true-false, and open-ended questions.

There will be two non-cumulative mid-term exams, each worth 50 points (20% of the total grade). The first mid-term exam will cover concepts of geospatial location, while the second will focus on geographic information systems. You should review both class lectures and course textbooks to succeed in these exams.

The final exam will be cumulative and worth 20% of the total grade. It will be held during the assigned final exam period. Approximately 70% of the questions will be on topics taught after the midterm exams, while the remaining questions will cover topics from the entire course.

3.3 Graded In-class Activities

There will be six graded in-class activities. **The dates for these activities will be determined spontaneously and will not be announced in advance.** Each activity will be based on the topic discussed in the immediately preceding class and may take place in various forms, such as individual minute papers or group-based discussions, to promote active learning. The activities will be individually graded, and the best four out of six will count toward your final grade. Each activity is worth 15 points, totaling 12% of the final grade.

3.4 Grading Scale

Grades	Percentage Required	Grades	Percentage Required
A+	96 to 100	**C+**	76 to 79.9
A	93 to 95.9	**C**	73 to 75.9
A-	90 to 92.9	**C-**	70 to 72.9
B+	86 to 89.9	**D**	60 to 69.9
B	83 to 85.9	**F**	<60
B-	80 to 82.9		

3.5 Course Outline and Tentative Schedule

*** The syllabus is subject to change; please review Canvas for the most up-to-date version ***

Week	Date	Topic	Reading and Assignment Due
Introduction			
1	Aug 26	Course introduction and syllabus	
	Aug 28	Introduction to geoinformation technologies	Chapter 1
Concepts of Geospatial Location			
2	Sep 2	Coordinate systems and map projections	Chapter 2
	Sep 4	Lab 1: Coordinates & Position Measurements with Google Earth Pro	
3	Sep 9	Georeferencing	Chapter 3
	Sep 11	Lab 2: Georeferencing a graphic image	Lab 1
4	Sep 16	Global Positioning System (GPS)	Chapter 4
	Sep 18	Lab 3: GPS applications	Lab 2
Geographic Information Systems (GIS)			
5	Sep 23	**Mid-term Exam 1** GIS: Attributes and data types	Chapter 5
	Sep 25	Data visualization and cartography	Chapter 7 Lab 3
6	Sep 30	Lab 4: Introduction to ArcGIS Pro	
	Oct 2	Lab 5: Thematic mapping	
7	Oct 7	Spatial analysis	Lab 4 Chapter 6
	Oct 9	Lab 6: Spatial operations and querying	Lab 5 **(due Oct. 12)**
	Oct 13	**Fall break (Monday)**	
8	Oct 14	Network analysis	Chapter 8
	Oct 16	Lab 7: Shortest path analysis and geocoding	Lab 6
Remote Sensing (RS)			
9	Oct 21	**Mid-term Exam 2**	
	Oct 23	Aerial photography and remote sensing	Chapters 10 and 11 Lab 7
10	Oct 28	RS in studying topography, climate, and environment	Chapters 12 and 13
	Oct 30	Lab 8: RS color composition and interpretation	
11	**Nov 4**	**Election day (No class)**	
	Nov 6	Lab 9: Digital terrain analysis	Lab 8
Advanced Geovisualizations			
12	Nov 11	3D modeling	Chapter 14
	Nov 13	Lab 10: 3D modelling and visualization	Lab 9
13	Nov 18	Next wave in Geoinformation technology: GeoAI and Ethical considerations	Reading posted on Canvas
	Nov 20	Lecture and lab 11: Intro to ArcGIS Online and Web map design	Chapter 15 Lab 10
14	**Nov 25**	Lecture and lab 12: Story maps design and applications **(Class meets online)**	Reading posted on Canvas Lab 11
	Nov 27	**Thanksgiving Recess (No class)**	
15	Dec 2	Exam review	Reading posted on Canvas Lab 12
	Dec 4	Exam review	
16	**Dec 9**	**Reading day (No class)**	
	Dec 11	**Final exam**	

4 Student Engagement Policies

4.1 Attendance

There is no attendance grade. I encourage you to attend classes regularly to understand the course concepts better and follow the lab instructions. Research shows that a student is significantly more likely to excel in a course if attended regularly. Additionally, I will not make any special accommodations if you miss a class unannounced. You are responsible for contacting me and catching up on missed materials or instructions.

I will provide reasonable accommodations for university-approved excused absences, such as religious observations and university activities. To receive approval, please notify me with documentation within the first two weeks of the semester.

I will also make an exception for personal emergencies, such as illness and family crises. To request an exception, please email me as soon as the situation arises. Please note that you are responsible for following up with me to discuss potential make-up work options (e.g., time extensions for labs with no penalties and make-up exams).

4.2 Make-up Exams

I will only allow make-up exams (midterm and final) for university-approved excused absences. If you need provisioning for a make-up exam, you must notify me before class. There is no provision for make-up work for graded in-class activities.

4.3 Late Lab Assignment

The due dates and times for each lab are posted on Canvas. A submission will be considered late if marked as late on Canvas. The following penalties apply to late submissions:

- A 10% grade reduction if the assignment is submitted within 2 days of the due date.
- A 25% grade reduction if the assignment is submitted within 7 days of the due date.
- Submissions over 7 days late will receive 0 points unless a time extension has been granted for exceptional circumstances, as discussed above.

You should be proactive in completing your lab assignments early to avoid last-minute technical issues such as "didn't have internet," "computer system error," or "Canvas was giving me an error." No time extensions will be granted for such cases. You may choose to submit partial work on time or submit late and receive a grade with late penalties.

4.4 Classroom Conducts and Participation

As the course instructor, I will ensure that the class maintains a welcoming, engaging, and respectful learning environment, and I ask for your cooperation in this regard. Classroom participation is highly appreciated. I encourage you to raise your hand and share your questions, concerns, and thoughts at any time during the class. However, please avoid using inappropriate language or expressing thoughts that might be hurtful to your peers.

4.5 Student Use of Electronic Devices

You may use electronic devices (phones and tablets) for learning purposes, such as note-taking and reading course materials. Please ensure that your use of these devices does not distract others, and keep them in silent mode throughout the entire class. Additionally, **do not use electronic devices for audio or video recording without my consent**.

You must comply with Mason's student code of conduct. Disruptive behavior will result in classroom removal.

4.6 Proper Address and Pronoun Use

I welcome you to share your chosen name and gender pronouns via the Mason-provided website: https://registrar.gmu.edu/updating-chosen-name-pronouns/. These changes will appear in the Canvas class sites and other places, helping me to best address you in class and via email.

My pronouns are she/her/hers. You can address me by my first name, "Dr. Kar" or "Prof. Kar", as you feel comfortable.

4.7 Contacting Me

Please feel free to email me with any questions about course topics or assignments. I will do my best to respond to emails received on weekdays within 24 hours and weekend emails within 48 hours. You may send a gentle reminder if you do not receive a response within this timeframe. If you need further assistance, you can also schedule an appointment to meet me in person or via Zoom during my office hours.

Please use your GMU email account for any correspondence related to this class. I suggest you avoid last-minute requests, as I may not have immediate time available to help you before deadlines.

5 University Policies and Support Services

5.1 Academic Standards

Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- **Honesty:** Providing accurate information in all academic endeavors, including communications, assignments, and examinations.

- **Acknowledgement:** Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.

- **Uniqueness of Work:** Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's procedures. Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgement, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

5.2 Accommodations for Students with Disabilities

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit https://ds.gmu.edu/ for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu. Phone: (703) 993-2474.

Student responsibility: Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor *in advance* of any relevant class meeting, assignment, or exam.

5.3 FERPA and Use of GMU Email Addresses for Course Communication

The Family Educational Rights and Privacy Act (FERPA) governs the disclosure of education records for eligible students and is an essential aspect of any course. **Students must use their GMU email account** to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

Student responsibility: Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

5.4 Title IX Resources and Required Reporting

As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, **all non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct** (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see University Policy 1202: Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence. Questions regarding Title IX can be directed to the Title IX Coordinator via email to TitleIX@gmu.edu, by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

Student opportunity: If you prefer to speak to someone **confidentially**, please contact one of Mason's confidential employees in Student Support and Advocacy (SSAC), Counseling and Psychological Services (CAPS), Student Health Services (SHS), and/or the Office of the University Ombudsperson.

5.5 AI use policy

Students must complete all course labs and assignments independently, without relying on generative AI tools. All data processing, map visualizations, and written responses must be the students' own work. AI tools may be used only for grammar and sentence refinement. In certain labs (e.g., creating web maps or story maps), students may use AI for brainstorming or generating ideas, but all implementation must be their own.

Students should also recognize both the benefits and limitations of AI in learning and research. While AI can provide useful suggestions, it is not always accurate or reliable. Students are expected to critically evaluate AI-generated knowledge and rely primarily on the course textbook and other assigned materials. Violations of this policy will be considered academic misconduct. If you have any questions about whether a specific use of AI is permitted, please ask for clarification in advance.

5.6 University-wide Closures and Class Cancellations/Delays

There may be times during the semester in which George Mason University announces university-wide closures or delays. Should inclement weather or another emergency force Mason to close, causing our class to cancel meeting times, we will not meet. Check the Mason website and our own Canvas site for updates. Other cancellations or delays to class will be announced via canvas by your professor. In the event that this course has missed meeting times, the course schedule, assignment deadlines, and other course alterations will be decided upon and announced via canvas and email by the professor. You are expected to stay abreast of any changes.