George Mason University
GGS 110: Introduction to Geoinformation Technologies
Fall Semester 2022 (August 22 – December 14)

Class meeting: W 12:00 PM – 1:15 PM	**Instructor**: Nathan Burtch
Class location: Exploratory Hall 2310	**Email:** nburtch@gmu.edu
Sect/Credits: 001 / 3 credit hours	**Instructor office:** EXPL 2413
Teaching assistant: TBA	**Office hours:** T 10 – 11:00 AM via Zoom
TA email: TBA	W 10 – 11:00 AM in person

General Information

Catalog description: This course introduces students to basic geoinformation technology concepts and applications. Students learn about and apply spatial data collection analytic tools and methods, including geographic information systems, and web-based map developments. Lectures examine social trends, ethical issues including privacy state of the art technological research and developments of geoinformation technologies in industry, government, education, and everyday life.

Course overview: Geoinformation technologies are becoming ubiquitous in our technologically-connected world. This course is intended as a general introduction to a variety of geoinformation technologies, including geographic information systems (GIS), global positioning systems (GPS), remote sensing (RS), and geovisualization. Students will be introduced to the concepts of each of these larger fields and learn hands-on with labs that interact with geospatial data and software. By developing these skills, students will be able to take courses that delve into more specifics for each of these geospatial technologies, and also better understand how these technologies affect day-to-day life.

This course provides both theoretical and practical experience. The theoretical component consists of lectures, and the practical experience is through self-paced geoinformation labs. In lectures, students will learn various geoinformation technologies and concepts in terms of theory and methods. Demonstrations of concepts using geospatial software will be provided. In labs, students will apply these principles through hands-on experience with real world datasets, generally with an introduction by the professor.

Hybrid course: GGS 110 is presented as a hybrid course, with live in-person and asynchronous online materials. The general pattern of the course is as follows. An asynchronous video lecture will be posted on Blackboard prior to each week to serve as an introduction to a topic. Students should watch this introduction and complete assigned readings prior to the in-person class on Wednesday. In person, new material will be introduced utilizing lecture, software demonstrations, and class discussions. After the in-person class, there will again be asynchronous material available on Blackboard. This generally consists of videos serving as the conclusion to the weekly topic, along with an overview of the week's lab assignment.

The course has been designed in weekly segments (see the schedule at the end of the syllabus for a specific schedule). Segments will be released in order in a prescribed manner. Students will be given access to asynchronous materials weekly as the semester progresses. In other words, you will get the materials necessary for each week as the week approaches. This is done to ease logistical problems

of students being at significantly different sections of the course. Please do not ask for advanced access to materials.

Target audience: This course is intended for anyone interested in the multifaceted aspects of geoinformation technologies, which include geographic information systems, remote sensing, GPS, cartography, and web mapping. This is a survey course covering all these technologies and more. GGS 110 serves as a gateway to upper level courses to build a deeper understanding of geoinformation science. GGS 110 is required for anyone majoring in geography and geoinformation science (both BS and BA GEOG degrees), as well as for the GIS minor. Non-GGS majors and undeclared majors are all welcome and encouraged to take this course.

Applicable learning outcomes: Successful completion of this course will enable students 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, demonstrate the process of creating data, and discuss the fundamental concepts of data quality.

Mason Impact: This course has been designated as a Mason Impact course. The structure of this course utilizes the goals of the Mason Impact program as noted in the program's mission statement. The mission statement of Mason Impact, as noted at https://uge.gmu.edu/mason-impact/, states that:

> Mason Impact prepares students to tackle significant global questions and challenges by investigating meaningful questions, engaging multiple perspectives, and creating new knowledge within the context of Undergraduate Research and Creative Activities, Civic Engagement, Entrepreneurship, and Global Activities.

Prerequisites: No prior coursework is required, but basic computer skills are a must.

Enrollment and repeat policy: GGS 110 follows the general Mason policy that an undergraduate course can be repeated for grade up to three times. Understand that each academic unit can have more restrictive limits on specific courses. Students that repeat the course must submit all newly completed work.

Course Materials

Required text: Shellito, Bradley A. 2020. Introduction to geospatial technologies. 5th ed. W. H. Freeman and Company, New York.
ISBN 13: 978-1319249519

The course textbook is available from various outlets in various forms. It is available through the Mason bookstore or through your online provider of choice. There should be an available e-book

version, which is the same as the hard copy, but there are various short-term purchase options that are less expensive. Please note that the assigned textbook is **the 5th edition**. With this 5th edition, you will gain access to a student resource site by MacMillan. You will need access to that page for various datasets.

GGS computer lab and virtual computing: The lab in EXPL 2102 is open 24 hours for you to use. Registration in a GGS class should automatically grant you access. Please contact ggsit@gmu.edu to report issues.

Mason provides access to Mason Labs virtual computing through your web browser. In order to access it, you will need to install both a Mason VPN (https://its.gmu.edu/service/virtual-private-network-vpn/) and the Citrix Workspace app (https://www.citrix.com/products/receiver.html). After logging into the VPN, you can then access https://mymasonapps.gmu.edu/ using your Mason directory ID. Once inside, you will be able to access Mason Labs and have a virtual connection to a Mason lab computer with some specialized software. You can connect to the Microsoft One Drive cloud storage that each Mason student has or connect to local storage drives.

Software, hardware, and data: During the semester we will make use of a variety of software. All *should* be accessible for use on your personal computer, and will be available in the GGS computer lab. Most if not all of the software used in this course will be open source or otherwise freely available. Note that there may be some compatibility issues between different software and builds of operating systems.

Many of the files we will use are very large! You are encouraged to have a USB flash drive or portable hard drive in order to store and access files. 16 GB of storage or more is preferable. You may also use the drive to install some of programs we use. Cloud storage is another option, either to keep all your files or to use as a common backup.

It is recommended that students have the technological bandwidth to stream data; students should have regular, reliable access to a computer with an updated operating system and a stable broadband Internet connection (consistent 1.5 Mbps or higher download and upload speed; you can use https://www.speedtest.net/ to check the speed of your connection).

Online materials and email: This course will make extensive use of Blackboard at Mason. Course materials such as assignments will be available only in electronic version on Blackboard. Also, students will be expected to submit assignments online through Blackboard. **Only Word document (.docx or .doc) or Adobe PDF (.pdf) file formats will be accepted,** with some exceptions. Grades will be posted on Blackboard as well. Make sure you are familiar and comfortable with the Blackboard interface.

Students are required to have a MasonLive/Email account, which will allow you access to Blackboard and lab computers. Please use this university email account when contacting the professor regarding this class; your professor will not respond to messages sent from a non-Mason email address. Students may also contact the professor through Microsoft Teams, although students should not expect instant responses from these direct chats; in other words, Teams is not a 24/7 direct support line for the class.

Grading

Lab assignments (52%): Each lecture topic is connected to a hands-on geoinformation lab assignment. Labs are constructed to guide you through exploring specific concepts and tools in geoinformation technologies. While each lab is different, for some you will utilize the "lab" portion of the textbook. A lab document will be posted on Blackboard that will provide questions or activities for assessment. Your answers should be entered into a document, which is submitted for assessment. You are expected to give thoughtful answers where necessary. Labs are due the week following their introduction. There will be fourteen (14) labs overall, with the lowest score dropped.

Unit quizzes (6% each – 24% total): There will be four quizzes in this course, one each for the four topical units of the class (see course schedule). Unit quizzes will generally be composed of multiple-choice questions, with some other options sometimes potentially mixed in. Quizzes will cover topics from lectures and readings. You will not be expected to use the software from labs for quizzes, but again, completing labs will help with concepts. Each quiz will be weighted equally (6% of the overall grade). The unit quizzes are not cumulative and are completed via Blackboard outside of class ('take home" exams), each due by the Sunday at the end of the unit.

Final exam (16%): A cumulative final exam will be given during the final exam period, live in class. This longer exam will be cumulative to the entirety of the semester. The final exam will still be composed of multiple choice questions, but will be supplemented with short answers and essays about core concepts discussed over the course of the semester.

Asynchronous video participation (8%): As a hybrid course, there are asynchronous elements to this class. Each week's topic will have three asynchronous segments; a topic introduction, a topic outro, and a lab overview. Students are expected to watch the introduction prior to the Wednesday class and watch the outro and lab overview by the end of the following Sunday. To monitor participation in viewing these videos, there will be embedded questions in the videos. Each week students will answer one embedded question for each set of materials (three questions overall). Each question is assessed out of 3 points (3 points if answered correctly, 2 points if answered incorrectly, 0 points for non-attempts, with 1 point deduction from above for late responses).

Grading Scale:

Grades	Percentage Required	Grades	Percentage Required	Assignment	Percentage of Total Grade
A+	96 to 100	**C+**	76 to 79.9	Labs (14)	**52%**
A	93 to 95.9	**C**	73 to 75.9	Unit quizzes (4)	**24%**
A-	90 to 92.9	**C-**	70 to 72.9	Final exam	**16%**
B+	86 to 89.9	**D**	60 to 69.9	Async vid (14)	**8%**
B	83 to 85.9	**F**	<60		
B-	80 to 82.9				

Note on attendance: Regular attendance is an expectation. Those that make a habit of missing class tend to do worse in this course than those that do attend. It is in your best interest to come to class and participate as attendance will lead to a better understanding of course concepts. Students are responsible for any announcement given by the instructor during class regardless of their personal attendance.

Students that must miss classes because of religious observances or participation in University activities should provide documentation to the professor within the first two weeks of the course. Reasonable accommodations will be provided for work missed on those days. It is expected that if a student has one of these excused absences on a day in which an assignment is due that the student submits the assignment early.

Make-up and late assignment policies: Due dates are explicitly stated. All assessed/graded items in this course (listed above) will be accepted past the ascribed due date until **December 6th**. Late penalties are assigned in a two-tiered system. Items turned in **within seven (7) days will result in a 10% deduction** for the item. Items **later that seven (7) days will result in a 30% deduction** for the item. This penalty begins 1 minute after the due date. Technical excuses ("computer system error", "didn't submit correctly on Blackboard", etc.) will not be accepted as reasons for late work. You are expected to start the work early. **Never underestimate the time you will spend on the assignments.** If you cannot complete the assignment on time, it may be better to turn in partially completed work than nothing at all.

If you are ill or physically indisposed and cannot submit work on time, you must notify the instructor beforehand for you to have a chance to make up the work without late penalty. **Special dispensation is available for students with difficulties due to COVID-19 illness or quarantine**; please contact the instructor to make any special accommodations in this regard.

This policy may seem strict, but it is in your best interest to turn in everything on time to avoid falling irrecoverably behind. Please contact the instructor if you are struggling and you will receive aid as best as the instructor can provide.

Administrative

Academic integrity: *The following statement is adapted from the Stearns Center for Teaching and Learning.* No grade is important enough to justify academic misconduct. The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code, which you can read fully at the Office for Academic Integrity (https://oai.gmu.edu/mason-honor-code/). The Honor Code Pledge reads as follows:

> To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University Community and with the desire for greater academic and personal achievement, we, the student members of the university community, have set for this Honor Code: Student Members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

The Mason Honor Code defines cheating, plagiarism, stealing, and lying. It is expected that you understand these definitions. If you have any doubts about what constitutes cheating, plagiarism, stealing, or lying in the academic context, please see your professor. **Acts of academic dishonesty in this course may be penalized with failure of either the work in question or the entire course.**

While collaboration and group learning is encouraged in this course, each student **absolutely must** turn in their own work, from their own computer, and any discussion must be theirs alone, and not attributable to another person or group, *except where noted* (for example, quoting authors as a small portion of your scholarly work). This also applies to online sources; you cannot copy the words of anyone else for any graded part of this course. It is not enough to exchange a few synonyms within a sentence! You must write, summarize, and analyze with your own words and ideas.

Course materials and student privacy: All course materials posted to Blackboard or other course sites are private; by federal law, any materials that identify specific students (via their name, voice, or image) **must not be shared** with anyone not enrolled in this class. Video recordings of class meetings that include audio or visual information from other students are private and must not be shared. Live video conference meetings (e.g. Collaborate or Zoom) that include audio or visual information from other students must be viewed privately and not shared with others in your household. Some or all of our synchronous meetings in this class may be recorded to provide necessary information for students in this class. Recordings will be stored on Blackboard and will only be accessible to students taking this course during this semester. **Sharing of instructor-created materials** (lectures, notes, videos, assignments, exams, etc.) to others not currently enrolled in this specific section of this class, **including to public or private online "study" sites, is considered a violation of Mason's Honor Code.**

Disability statement: This course complies with Mason policies for students with disabilities. Students with disabilities are encouraged to register with Disability Services (DS). DS can be contacted by phone at (703) 993-2474, or in person at SUB I Suite 2500, or online by the link at the end of this section. Students who suspect that they have a disability, temporary or permanent, but do not have documentation are encouraged to contact DS for advice on how to obtain appropriate evaluation. A memo from DS authorizing your accommodation is needed before any accommodation can be made. The memo should be furnished to the professor preferably within the first two weeks of class or as soon as an accommodation is made. Please visit https://ds.gmu.edu/ for more information.

Diversity, non-discrimination, and anti-racism: Mason President Gregory Washington has created the President's Task Force on Anti-Racism and Inclusive Excellence. Through a broad focus, the task force will help Mason become "a local, regional, and national beacon for the advancement of anti-racism, reconciliation, and healing." For President Washington's full statement, visit https://www2.gmu.edu/news/587381. Members of this classroom community must uphold Mason's core values of diversity and inclusion, and help maintain a learning environment of respect across identity, status, origin, and ability. Being inclusive and anti-racist is an active, conscious practice involving self-reflection.

Mason's non-discrimination policy can be read at https://universitypolicy.gmu.edu/policies/non-discrimination-policy/. Please utilize the office of Compliance, Diversity, and Ethics (https://diversity.gmu.edu/) for training, resources, and to submit grievances. The following is a short portion of the Mason Diversity Statement; visit https://stearnscenter.gmu.edu/knowledge-center/general-teaching-resources/mason-diversity-statement/ to read the full statement:

George Mason University promotes a living and learning environment for
outstanding growth and productivity among its students, faculty and staff. Through

its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

Gender identity, pronoun use, and proper address: Students are welcome to share their chosen name and gender pronouns with the instructor and discuss how the instructor can best address you in class and via email. As well, students should be aware that they can use Mason-provided tools to update their chosen name and pronouns; these changes will appear in Blackboard class sites among other places. See https://registrar.gmu.edu/updating-chosen-name-pronouns/ for more information. Your instructor uses *he/him/his* pronouns. When addressing your instructor in writing or verbally, please use "Dr. Burtch" or "Prof. Burtch." The surname 'Burtch' is pronounced the same as 'birch.'

Instructor availability: Please do not hesitate to contact your instructor if you have questions about course topics or assignments. Your instructor will do his best to answer all weekday emails within 24 hours, and weekend emails within 48 hours. Should you not receive a response within that time frame, you may send a gentle reminder via email. Do try to avoid last-minute emails, as your instructor may not have email accessible immediately before deadlines. It is generally a good practice to avoid sending an email at the first sign of trouble with an assignment; often you will find the proper solution by giving yourself an hour or two to problem solve! Please make use of the office hours listed at the top of this document. Generally, issues can be clarified quickly in person or in a live online chat.

Safe return to campus: The COVID-19 pandemic has disrupted our lives. Administration at Mason has developed protocols outlined in the university Safe Return to Campus website (https://www2.gmu.edu/safe-return-campus). Please familiarize yourself with Safe Return to Campus protocols. This course will follow official Mason administration guidance on public health as those policies shift.

Sexual harassment, sexual misconduct, and interpersonal violence: *The following statement is adapted from the Stearns Center for Teaching and Learning. As a faculty member and designated "Responsible Employee," I am required to report all disclosures of sexual assault, interpersonal violence, stalking, sexual exploitation, and retaliation to Mason's Title IX Coordinator per* university policy 1412. *If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as the* Student Support and Advocacy Center *at 703-380-1434,* Counseling and Psychological Services *at 703-993-2380,* Student Health Services, *or* Mason's Title IX Coordinator *at 703-993-8730 or via email at titleix@gmu.edu).*

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 Blackboard site for updates. Other cancellations or delays to class will be announced via Blackboard 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 Blackboard and email by the professor. You are expected to stay abreast of any changes.

Use of electronic devices: Your professor encourages the use of devices that both aid your learning ability and do not distract from the learning of others. Except for mobile phones and audio/video recorders, you are free to use any electronic device that fulfills both of those conditions. All electronic devices should be muted or silenced. Please be respectful of the class and avoid use of social media during class which can distract both you and your classmates. You are expected to adhere to Mason's student code of conduct; disruptive behavior will result in classroom removal. Audio/video recording requires the consent of the professor.

GGS 110 Course Schedule

Week	Lecture/Lab Topic	Coursework Due
Unit 1: Geoinformation technology and location		
Week 0 Aug 24	Intro to geoinformation technologies Lab 0 – Eye in the Sky	**Read** Chapter 1
Week 1 Aug 31	Where am I? Locations and coordinates Lab 1 – Google Earth	**Read** Chapter 2 **Lab 0**
Week 2 Sep 7	The Global Positioning Systems (GPS) Lab 2 – GPS/Geocache	**Read** Chapter 4 **Lab 1** **Unit Quiz 1 (Sun. 9-11)**
Unit 2: Geographic Information Systems		
Week 3 Sep 14	GIS and digital data Lab 3 – Exploring GIS data	**Read** Chapter 5 **Lab 2**
Week 4 Sep 21	Spatial analysis: Location-based relationships Lab 4 – Analytical concepts in GIS	**Read** Chapter 6 **Lab 3**
Week 5 Sep 28	Networks and address matching Lab 5 – Networks and geocoding	**Read** Chapter 8 **Lab 4**
Week 6 Oct 5	Lining it up: Georeferencing data Lab 6 – Georeferencing	**Read** Chapter 3 **Lab 5** **Unit Quiz 2 (Sun. 10-9)**
Unit 3: Remote sensing		
Week 7 Oct 12	Aerial photography and photogrammetry Lab 7 – Image interpretation	**Read** Chapter 9 **Lab 6**
Week 8 Oct 19	Remote sensing and digital data Lab 8 – Color composites	**Read** Chapter 10 **Lab 7**
Week 9 Oct 26	Remote sensing satellite systems Lab 9 – Analyzing remotely sensed imagery	**Read** Chapter 11 **Lab 8**
Week 10 Nov 2	Elevation and digital landscaping Lab 10 – Digital terrain analysis	**Read** Chapter 13 **Lab 9** **Unit Quiz 3 (Sun. 11-6)**
Unit 4: Cartography and geovisualization		
Week 11 Nov 9	Cartography and maps Lab 11 – Thematic mapping	**Read** Chapter 7 **Lab 10**
Week 12 Nov 16	3D geovisualization Lab 12 – Modeling in 3D	**Read** Chapter 14 **Lab 11**
Nov 23	*Thanksgiving break – no class*	
Week 13 Nov 30	Web mapping and geoinformation professionals Lab 13 – Story Maps	**Read** Chapter 15 **Lab 12** **Unit Quiz 4 (Sun. 12-4)**
Week 14 Dec 7	**Final exam** *Wednesday, Dec 7, 10:30 – 1:10 PM*	**Lab 13**

Note: The GGS 110 course schedule is tentative and is subject to revision by the instructor