George Mason University
**GGS 110: Introduction to Geoinformation Technologies**
Fall Semester 2020 (August 24 – December 16)

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| **Course:** GGS 110 (Online) | **Instructor**: Nathan Burtch |
| **Website:** https://mymason.gmu.edu | **Email:** nburtch@gmu.edu |
| **Section/Credits:** DL2 / 3 credit hours | **Instructor office:** EXPL 2413 |
| **Teaching assistant:** TBA | **Office hours:** MWF 12 – 1 PM |
| **TA email:** TBA | Via Zoom |

## 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. Both lectures and labs will occur asynchronously in video recordings. Each week lectures will be offered as a set of videos broken into shorter sections, while labs will be one video that provides an overview of the assignment. See the schedule at the end of the syllabus for a specific schedule.

**Online course:** GGS 110 is presented as an asynchronous online course. "Asynchronous" means that there are no specific timed gatherings for this course (E.G.: we don't meet for lectures at specific times like in-classroom courses). Still, there will be specific due dates for graded work in the course that you are expected to meet. It is incumbent upon each student to organize their time and work through materials in a timely and efficient manner.

The course has been designed in weekly segments (see the schedule at the end of the syllabus). Segments will be released in order in a prescribed manner. Students will not have access to the entirety of the course materials from the start; 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 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:** This course 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. 2018. Introduction to geospatial technologies. 4th ed. W. H. Freeman and Company, New York.
ISBN 13: 978-1-319-06045-9

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. In addition, there may be other readings posted on Blackboard for you to complete.

Please note that the assigned textbook is **the 4th edition**. Since the book order occurred, the publisher has created a 5th edition. Your professor has reviewed the 5th edition and there are some updates, but either edition is fine. Feel free to contact your professor if you purchase the 5th edition and want to know if there are specific changes to be award of. The unfortunate change from the publisher is that the 4th edition student resource site has been removed. Necessary datasets will be available on Blackboard, and the professor will provide corrections or updates where datasets are slightly different from those described in the textbook.

**GGS computer lab and virtual computing:** *Due to social distancing policies in Mason's Safe Return to Campus, the lab in EXPL 2102 is closed for the Fall 2020 semester.*

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/downloads/ workspace-app/). 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. 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.

The online nature of this class necessitates 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.

# Grading

**Lab assignments (36%):** 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 thirteen (13) labs overall, with the lowest score dropped.

**Midterm exams (12% each – 24% total):** There will be two midterm exams in this course. Midterms will generally be composed of multiple-choice questions, with some other options sometimes mixed in. Exams will cover topics from lectures and readings. You will not be expected to use the software from labs for exams, but again, completing labs will help with concepts. Each exam will be weighted equally (12% of the overall grade). The midterm exams are not cumulative.

**Final exam (16%):** A cumulative final exam will be given during the final exam period. This longer exam will have more concepts from topics that have not yet been examined (the last third of the course) but will pull questions from the entirety of the semester. The final exam will still be composed of multiple choice questions, but will be supplemented with essays about core concepts discussed over the course of the semester.

**Quizzes (12%):** For each section of recorded lectures, a one or two question multiple-choice quiz will be administered. The questions will be based on topics covered during that section of lecture. Each weekly lecture will have 5 points of quizzes, and the lowest lecture quiz total will be dropped from the grade calculation. The set of quiz responses for weekly lectures need to be completed by the end of Friday of each week.

**Discussions (12%):** There will be five group discussions in this course. Most discussions will require two parts: posting and commenting. Topics will be provided for each discussion. Topics will generally revolve around finding/using online resources.

**Grading Scale:**

| Grades | Percentage Required | Grades | Percentage Required | Assignment | Percentage of Total Grade |
|---|---|---|---|---|---|
| **A+** | 96 to 100 | **C+** | 76 to 79.9 | Labs (13) | **36%** |
| **A** | 93 to 95.9 | **C** | 73 to 75.9 | Midterms (2) | **24%** |
| **A-** | 90 to 92.9 | **C-** | 70 to 72.9 | Final exam | **16%** |
| **B+** | 86 to 89.9 | **D** | 60 to 69.9 | Quizzes (13) | **12%** |
| **B** | 83 to 85.9 | **F** | <60 | Discussions (5) | **12%** |
| **B-** | 80 to 82.9 | | | | |

**Make-up and late assignment policies:** Due dates are explicitly stated. Assignments in this course (which are listed above as "Labs") will be accepted past the ascribed due date until December 11th. No work will be accepted past that date. Late penalties are assigned in a two-tiered system. Assignments turned in **within seven (7) days will result in a 25% deduction** for the assignment. Assignments **later that seven (7) days will result in a 50% deduction** for the assignment.

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 can sometimes 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 before class for you to have a chance to make up the work. **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. **Make-up exams will be given only for University approved excused absences**. **No late quizzes are accepted**. 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/](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. **Students must list everyone they collaborated with on each lab, if applicable.**

**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. **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 is in compliance 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.

**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.'

**Mason diversity statement:** *From https://stearnscenter.gmu.edu/professional-development/mason-diversity-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.

**Mason policy on sexual harassment, sexual misconduct, and interpersonal violence:** As a faculty member and designated "Responsible Employee," I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434), Counseling and Psychological Services (703-993-2380), Student Health Services, or Mason's Title IX Coordinator (703-993-8730; 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. As an

asynchronous online course, in general these cancellations should not delay our course. However, there may be times in which university-wide closures or delays will affect Blackboard availability or the ability to submit coursework. In these situations, your professor will make an announcement via Blackboard and/or email. 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 is in some way interrupted, 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.

**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.

## GGS 110 Course Schedule

| Week | Lecture/Lab Topic | Coursework |
|---|---|---|
| **Unit 1: Geoinformation technology and location** | | |
| Week 0: Aug 24 – Aug 30 | Intro to geoinformation technologies<br>0.1. Course logistics<br>0.2. Geography and geoinformation technologies<br>0.3. The Geospatial Revolution<br>0.4. Harnessing geoinformation<br>0.5. Dimensions of data<br>0.6. Neogeography | **Read** Chapter 1<br>**Discussion 1:**<br>- Post due Wednesday, 8-26<br>- Comments Tuesday, 9-1 |
| Week 1: Aug 31 – Sep 6 | Where am I? Locations and coordinates<br>1.1. Location and geodesy<br>1.2. Ellipsoids and datums<br>1.3. Geographic coordinate systems<br>1.4. Time zones<br>1.5. Map projections<br>1.6. Examples of map projections<br>1.7. Planar coordinate systems<br>Lab 1 – Google Earth | **Read** Chapter 2<br>**Quiz 1:**<br>- Due Friday, 9-4<br>**Lab 1:**<br>- Due Thursday, 9-10 |
| Week 2: Sep 7 – Sep 13 | The Global Positioning Systems (GPS)<br>2.1. What is GPS?<br>2.2. GPS segments<br>2.3. GPS broadcast signals<br>2.4. Calculating position<br>2.5. Locational errors<br>2.6. Differential GPS<br>2.7. GPS applications<br>Lab 2 – GPS/Geocache | **Read** Chapter 4<br>**Quiz 2:**<br>- Due Friday, 9-11<br>**Lab 2:**<br>- Due Thursday, 9-17 |
| **Unit 2: Geographic Information Systems** | | |
| Week 3: Sep 14 – Sep 20 | GIS and digital data<br>3.1. Components of GIS<br>3.2. Conceptual representation of data<br>3.3. The vector data model<br>3.4. The raster data model<br>3.5. Comparing models<br>3.6. Levels of measurement<br>3.7. Attribute data and tables<br>3.8. Joining data<br>3.9. Metadata<br>3.10. GIS software and file types<br>Lab 3 – Exploring GIS data | **Read** Chapter 5<br>**Quiz 3:**<br>- Due Friday, 9-18<br>**Lab 3:**<br>- Due Thursday, 9-24<br>**Discussion 2:**<br>- Post due Wednesday, 9-16<br>- Comments Tuesday, 9-22 |

| Week | Lecture/Lab Topic | Coursework |
|------|-------------------|------------|
| Week 4:<br>Sep 21<br>–<br>Sep 27 | Spatial analysis: Location-based relationships<br>   4.1. Spatial analysis basics<br>   4.2. Queries<br>   4.3. Spatial queries<br>   4.4. Buffers<br>   4.5. Dissolve<br>   4.6. Overlays<br>   4.7. Map algebra<br>   4.8. Suitability analysis and modeling<br>Lab 4 – Analytical concepts in GIS | **Read** Chapter 6<br>**Quiz 4:**<br>- Due Friday, 9-25<br>**Lab 4:**<br>- Due Thursday, 10-1 |
| Week 5:<br>Sep 28<br>–<br>Oct 4 | Networks and address matching<br>   5.1. Spatial network models<br>   5.2. Spatial networks and technology<br>   5.3. Route selection / shortest path<br>   5.4. Geocoding addresses<br>   5.5. The process of geocoding<br>Lab 5 – Networks and geocoding | **Midterm 1 exam:**<br>- Due Friday, 10-2<br>**Read** Chapter 8<br>**Quiz 5:**<br>- Due Friday, 10-2<br>**Lab 5:**<br>- Due Thursday, 10-8 |
| Week 6:<br>Oct 5<br>–<br>Oct 11 | Lining it up: Georeferencing data<br>   6.1. Reprojecting data<br>   6.2. Aligning geospatial data<br>   6.3. Selecting control points<br>   6.4. Transformations<br>Lab 6 – Georeferencing | **Read** Chapter 3<br>**Quiz 6:**<br>- Due Friday, 10-9<br>**Lab 6:**<br>- Due Thursday, 10-15<br>**Discussion 3:**<br>- Post due Wednesday, 10-7<br>- Comments Tuesday, 10-13 |
| **Unit 3: Remote sensing** | | |
| Week 7:<br>Oct 12<br>–<br>Oct 18 | Aerial photography and photogrammetry<br>   7.1. A brief history of remote sensing<br>   7.2. Unmanned aircraft systems<br>   7.3. Aerial photography<br>   7.4. Photogrammetry<br>   7.5. Image interpretation<br>   7.6. Recognition elements in image<br>       interpretation<br>Lab 7 – Image interpretation | **Read** Chapter 9<br>**Quiz 7:**<br>- Due Friday, 10-16<br>**Lab 7:**<br>- Due Thursday, 10-22 |
| Week 8:<br>Oct 19<br>–<br>Oct 25 | Remote sensing and digital data<br>   8.1. Types of remote sensing<br>   8.2. The physics of light<br>   8.3. The electromagnetic spectrum<br>   8.4. Atmospheric effects<br>   8.5. Energy and surfaces<br>   8.6. Spectral signatures<br>   8.7. Bands and band combinations<br>Lab 8 – Color composites | **Read** Chapter 10<br>**Quiz 8:**<br>- Due Friday, 10-23<br>**Lab 8:**<br>- Due Thursday, 10-29 |

| Week | Lecture/Lab Topic | Coursework |
|---|---|---|
| Week 9:<br>Oct 26<br>–<br>Nov 1 | Remote sensing satellite systems<br>    9.1. The sensors of remote sensing<br>    9.2. Satellite orbits<br>    9.3. Spatial resolution and swath<br>    9.4. The Landsat program<br>    9.5. Other satellite systems<br>    9.6. Differentation / resolution<br>Lab 9 – Analyzing remotely sensed imagery | **Read** Chapter 11<br>**Quiz 9:**<br>- Due Friday, 10-30<br>**Lab 9:**<br>- Due Thursday, 11-5<br>**Discussion 4:**<br>- Post due Wednesday, 10-28<br>- Comments Tuesday, 11-3 |
| Week 10:<br>Nov 2<br>–<br>Nov 8 | Elevation and digital landscaping<br>    10.1. Representing terrain in geoinformation<br>        technology<br>    10.2. Topographic maps<br>    10.3. Digital terrain models<br>    10.4. Types of digital terrain data<br>    10.5. Lidar basics<br>    10.6. Using digital terrain models<br>    10.7. Modeling elevation<br>Lab 10 – Digital terrain analysis | **Midterm 2 exam:**<br>- Due Friday, 11-6<br>**Read** Chapter 13<br>**Quiz 10:**<br>- Due Friday, 11-6<br>**Lab 10:**<br>- Due Thursday, 11-12 |
| <td colspan="2" align="center">**Unit 4: Cartography and geovisualization**</td> |
| Week 11:<br>Nov 9<br>–<br>Nov 15 | Cartography and maps<br>    11.1. Map basics<br>    11.2. Scale and generalization<br>    11.3. Map elements<br>    11.4. Cartographic design<br>    11.5. Typography in maps<br>    11.6. Color in maps<br>    11.7. General reference and thematic maps<br>    11.8. Classification of map data<br>    11.9. Distributing GIS-based maps<br>Lab 11 – Thematic mapping | **Read** Chapter 7<br>**Quiz 11:**<br>- Due Friday, 11-13<br>**Lab 11:**<br>- Due Thursday, 11-19 |
| Week 12:<br>Nov 16<br>–<br>Nov 22 | 3D geovisualization<br>    12.1. 3D modeling<br>    12.2. Heights and textures<br>    12.3. 3D mapping<br>    12.4. Sketchup modeling<br>    12.5. Esri 3D software<br>    12.6. Geographic virtual reality<br>Lab 12 – Modeling in 3D | **Read** Chapter 14<br>**Quiz 12:**<br>- Due Friday, 11-20<br>**Lab 12:**<br>- Due Thursday, 12-3<br>**Discussion 5:**<br>- Post due Wednesday, 11-18<br>- Comments Tuesday, 11-24 |
| Thanks-<br>giving | *Thanksgiving break – no class* | |

| Week | Lecture/Lab Topic | Coursework |
|------|-------------------|------------|
| Week 13:<br>Nov 30<br>–<br>Dec 6 | Web mapping and geoinformation professionals<br> 13.1. The geospatial cloud<br> 13.2. Web mapping<br> 13.3. Esri Story Maps<br> 13.4. Professional organizations<br> 13.5. Being a geoinformation professional<br>Lab 13 – Story Maps | **Read** Chapter 15<br>**Quiz 13:**<br>- Due Friday, 12-4<br>**Lab 13:**<br>- Due Thursday, 12-10 |
| Finals<br>Week | Final exam | **Final exam:**<br>- Due Friday, 12-11 |

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