George Mason University
GGS 655: Geovisualization
Spring Semester 2025 (January 21 – May 14)

Class meeting: M 4:30 PM – 7:10 PM
Class location: EXPL 2312
Sect/Credits: 001 / 3 credit hours
Instructor office: EXPL 2413

Instructor: Nathan Burtch
Email: nburtch@gmu.edu
Office hours: W 10:00 AM – 12:00 PM (via Zoom)

General Information

Classmate contact information:

Name	Email	Phone

Catalog description: Cartography course focused on thematic map design, with an objective to produce a portfolio of well-designed, professional grade maps. Theoretical concepts and principles will be introduced using practical examples and written assignments. Includes theoretical concepts and applications of interactivity and animation, and research on map design and analytic cartography.

Course overview: This course builds on the concepts learned in GGS 551 through utilizing cartographic principles with different software to create advanced geovisualizations. Students will explore different mapping platforms and geovisualization techniques, creating complex static cartographic products, animation, and dynamic web maps.

GGS 655 is designed as a project-based learning (PBL) environment. Project-based learning is an active learning pedagogy in which students work on projects that involve real-world problems or situations. Multiple times through the semester, students will need to devise a research question, create or acquire data, develop a cartographic methodology, and complete a report and presentation. Through this method, students will develop skills in problem solving, critical thinking, creativity, and both written and oral communication. Rather than utilizing labs or assignments that have step-by-step instructions, students must engage the questions and software directly and develop their skills to complete projects. In many ways, this method of course delivery is intended to reflect the challenges students will soon see (or are currently seeing) in the modern geoinformational workforce, where you will need to create meaningful end products but chances are unlikely that detailed step-by-step instructions will be given.

Choose a project topic: Students will develop all of the cartographic projects based on the same topic. Students will develop their individual topical ideas early in the semester. Topics should be more specific than general, but do not need to be hyper-specific. Over the course of your geovisualizations, you can (and are encouraged to) utilize different scales (global, national, regional, local, and all in between as applicable to your topic). If you are leaning towards a broader topic (like 'earthquakes') you can create a better topic by specifying by region ('along the San Andreas fault'), type ('effects of 7.0 magnitude earthquakes'), time frame ('in the past 100 years'), or other scale

('economic impact of earthquakes'). Overall, **be creative and pick something you are interested in!** You can use geovisualization methods on nearly any topic, be it phenomenon you may have already completed geographic coursework on (climate, urbanization, sustainability, health) or not (sports, music, religion).

While each of the cartographic projects will be based on the same topic, you are expected to create unique, original, and aesthetic compositions each time. At a baseline, it means that you will need varied datasets, rather than simply showing the same thing multiple ways. As well, you can use varied scales, methods, visualizations, and techniques to create unique products. In other words, you should have a topic that you can thoughtfully investigate from different perspectives, allowing the full set of your projects to be thematically connected through differentiated visual and data-based analyses.

Target audience: This course is co-listed at the 400/600 level; it is therefore intended for both undergraduate and graduate students interested in geovisualization. GGS 655 can serve as an elective course for the GECA MS and the ESGS PhD programs. This course is appropriate for any student that has completed GGS 551 and wants to develop further cartographic skills.

Applicable learning outcomes: Successful completion of this course will enable students to:
1. Develop graduate-level research questions and analytic frameworks within cartographic methods to answer the questions
2. Independently develop and manage high-quality projects, while providing pedagogical guidance to others in using software for geovisualization
3. Both constructively critique classmates' products and provide critical commentary to cartographic literature
4. Analyze critically and creatively on best methods to visualize patterns and relationships

Prerequisites: It is recommended that students complete GGS 550 and GGS 551 with a B- or better prior to enrolling in GGS 655.

Enrollment and repeat policy: This course may only be repeated under special circumstances. Students enrolling in this course again must submit all newly completed work.

Course Materials

Required text:
Slocum, T.A., R.B. McMaster, F.C. Kessler, and H.H. Howard. 2023. *Thematic cartography and geovisualization.* 4th ed. Boca Raton: CRC Press.

Krygier, J., and D. Wood. 2024. *Making maps: A visual guide to map design for GIS*. 4th ed. New York: Guilford Press.

The Slocum et. al. text is a new, updated edition of a seminal cartographic textbook, and will be a great addition to your library. The Krygier and Wood text a new, updated version as of 2024. Additionally, the 3rd edition is available freely online through the GMU library. **However, access is limited so that only one student at a time can have online access.** You will need to use your MasonLive/email account to log in for access. Below is the link to the book. Click the link (you may

want to bookmark it) to bring up the library page. There is a section with the header "Available Online"; click the link to find the full text availability to access the book. It appears you can also get a PDF copy of both.

To access the Krygier and Wood text, use the following link: https://wrlc-gm.primo.exlibrisgroup.com/discovery/fulldisplay?docid=alma9943190783404105&context=L&vid=01WRLC_GML:01WRLC_GML&search_scope=MyInst_and_CI&isFrbr=true&tab=Everything&lang=en

In addition to these texts, other readings will be posted to Canvas. Students are expected to read before class and be prepared to discuss topics from the readings.

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: This course will utilize multiple pieces of software. In general, the choices of software are yours. Likely this will include ArcGIS, Adobe Creative Cloud, Microsoft Office, and other software you find useful. Most of you have likely used ArcGIS and are at least familiar with some of the software Adobe provides.

You are encouraged to have viable storage for your data and projects. This may be your local machine hard drive, a USB flash drive/portable hard drive, or cloud storage (like Microsoft One Drive). Think about backing up data periodically through the semester!

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

Students are required to have a Mason NetID and associated @gmu.edu email account, which will allow you access to Canvas and lab computers. Please use this university email account when contacting the professor regarding this class; as explained in the Administrative section below, the course professor will not respond to messages sent from a non-Mason email address. Students may

also use Microsoft Teams to communicate with the professor, 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

Map projects (32%): Over the course of the semester students will complete four (4) cartographic projects. These projects are designed to allow students to explore different types of geovisualization and different tools for crafting well designed end products. Along with a finalized cartographic product, students will submit a written report detailing the questions asked, methods, design process, and answers derived from the cartographic project. Details for each of these projects and expectations for reports will be posted on Canvas.

Final Story Map (10%): The cartographic projects completed during the semester will culminate with a final project using the Esri Story Map application. Using Story Maps, students will combine text, cartography, and multimedia from the prior four projects, plus additional contextual analysis, to design a high-quality web-based cartographic experience. Each student will present their Story Map to the class during the final exam period for the course. Details will be posted later in the semester on Canvas.

Presentations and evaluations (6%): After submission of map reports, approximately half of the students in the class will present their maps. The purpose is two-fold; students will be able to see products that their peers are creating (thus getting ideas for improving their own maps), and students will receive critical feedback for their own work. Each presentation will be a brief, informal, in-person session where students will display their work and describe their rationale and cartographic choices. A schedule will be determined in the first week of class for each student's two presentations. Two-thirds of the presentation grade will be for the two presentations, and one-third will be composed of completing evaluations of three of your classmates' maps each time.

Final exam (18%): The final exam will use essay-based questions regarding topics from assigned readings and discussions in class to assess knowledge of course topics. The final exam will be administered in class during the final regular week of the semester.

Participation (5%): In-class discussions are an important part of this course. Students are expected to discuss readings and concepts with the class. Students will earn 1 participation point for each quality, pertinent contribution, with a maximum of 3 points that can be earned per *class week*. Occasionally points can also be earned in discussion board posts or other activities. There are 13 class weeks in which discussions/questions can occur, so a maximum of 39 points can be earned. 25 points will be the initial point set that represents 100% for the category and maximum points earnable. This means that students are not required to participate every day, but most days. The professor may choose to lower the 100% threshold depending on the direction of the semester.

Check-in meetings (4%): Students are expected to meet with the professor for one-on-one conferences, or check-in meetings. These 10-minute meetings will give students a chance to discuss their questions and progress on each of the projects for the course. The expectation is that students will have a minimum of 10 of these meetings, consisting of two meetings per project (four map reports and the final Story Map). Students will be able to sign up for a specific time slot for meetings

throughout the semester.

Literature review (20% G): Students in GGS 655 will complete a literature review on a cartographic/geovisualization topic of their choosing. Details will be provided during the semester. Students will present their findings to the entire class during the final week of class.

Software demonstration (5% G): Each student in GGS 655 is expected to demo different software or data procedures to the class. Depending on enrollment, this may be individualized or done in small groups. These demos will be utilized for the infographic, animation, and 3-D visualizations. Students will choose software and data, and provide the class with a 15-minute demonstration.

Graduate grading scale:

Grade	*Percent Required*			*Assignment*	*Total Grade %*		
A+	96 to 100	**B**	83 to 85.9	Map project (4)	**32%**	Participation	**5%**
A	93 to 95.9	**B-**	80 to 82.9	Final Story Map	**10%**	Check-ins	**4%**
A-	90 to 92.9	**C**	70 to 79.9	Pres./Eval.	**6%**	Lit review	**20%**
B+	86 to 89.9	**F**	<70	Final exam	**18%**	S/W demo	**5%**

Graduate student expectations: In order to earn graduate credit, students enrolled in GGS 655 have additional expectations. Graduate students are expected to develop deeper knowledge of the topics presented in class and synthesize with higher-level cartographic products and writing. In other words, expectations for the work produced in GGS 655 are commensurate with expectations of a 600-level course. Details on differential grading of graduate students on the above graded items will be provided on Canvas.

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. Assessed/graded items in this course, with the exception 'live' or in class items like participation and project presentations, will be accepted past the ascribed due date until **May 12th.** 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 than seven (7) days will result in a 25% deduction** for the item. This penalty begins 1 minute after the due date. Technical excuses ("computer system error", "didn't submit correctly on Canvas", etc.) will not be accepted as reasons for late work. You are expected to start work early. **Never underestimate the time you will spend on the assignments.**

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. 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.

Incomplete policy: Students may request an incomplete for this course if they (a) currently have a 75% grade based on submitted coursework and relative weighting; (b) have completed at least 50% of coursework materials; (c) cannot complete scheduled coursework for a cause beyond reasonable control; and (d) submit an Incomplete Grade Contract with the professor. In general, students have until the 9th week of the following full semester to complete their work (unless it is the student's final semester). All incomplete work will be assigned late penalties as outlined in this syllabus.

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. **Student use of Generative-AI models or tools must also conform to the Honor Code.**

Course materials and student privacy: All course materials posted to Canvas 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 of our synchronous meetings in this class may be recorded to provide necessary

information for students in this class. Recordings will be stored on Canvas 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.**

Student privacy is governed by the Family Educational Rights and Privacy Act (FERPA). In addition to the privacy concerns outlined above, FERPA dictates how communication between students and faculty can occur electronically. Students must use their Mason email accounts to discuss anything pertaining to their enrollment in this course. I will not answer questions from non-Mason email addresses pertaining to this class.

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 faculty contact sheet from DS authorizing your accommodation is needed before any accommodation can be made. The faculty contact sheet 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: This course, as a part of George Mason's community, promotes and upholds Mason's core values of diversity and inclusion. Members of this class should seek to 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 Diversity, Equity, and Inclusion (DEI, https://diversity.gmu.edu/) for training, resources, and to submit incidence reports. 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 Canvas 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.

Sexual harassment, sexual misconduct, and interpersonal violence: *The following statement is adapted from the Stearns Center for Teaching and Learning.* George Mason is a place for faculty, staff, and students to learn, live, and work. As such, Mason is committed to providing all of us this place that we call campus that is free of discrimination, sexual harassment, sexual misconduct, and other acts of interpersonal violence. All members of this campus are encouraged to seek support in cases of discrimination, sexual harassment/misconduct, or interpersonal violence. University Policy 1202 provides information on the reporting process and resources available. Resources are also linked below.

Students should be aware of **faculty's duty of mandatory reporting**. As a faculty member, I am designated as a "Non-Confidential Employee," and must report all disclosures of sexual assault, sexual harassment, interpersonal violence, stalking, sexual exploitation, complicity, and retaliation to Mason's Title IX Coordinator per University Policy 1202 (linked above). If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as the Student Support and Advocacy Center (SSAC) at (703) 993-3686 or Counseling and Psychological Services (CAPS) at (703) 993-2380. You may also seek assistance or support measures from Mason's Title IX Coordinator by calling (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 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.

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 655 Course Schedule

Dates	Lecture Topics	Coursework Due
Unit 1: Multivariate mapping		
Week 1 Jan 27	Course intro & map topic discussion / Cartographic design and critique	**Read** *Krygier & Wood* (Ch. 2, 6, 7); *Mattern* (Web); *Slocum et. al.* (Ch. 13)
Week 2 Feb 3	Cartographic review: Color / Story telling	**Read** *Krygier & Wood* (Ch. 8); *Slocum et. al.* (Ch. 10); *Wilke* (Ch. 29); *Caquard & Cartwright*; *Roth*; *Grant* (Ch. 1)
Week 3 Feb 10	Cartographic review: Type / Thematic mapping	**Read** *Krygier & Wood* (Ch. 3, 4, 9); *Slocum et al.* (Ch. 4, 5, 12, 15, 18, 19)
Week 4 Feb 17	Cartographic review: Symbol / Multivariate mapping	**Read** *Krygier & Wood* (Ch. 10, 11, 12); *Slocum et al.* (Ch. 20, 22); *Tufte* (Ch. 5)
Unit 2: Infographics		
Week 5 Feb 24	Map presentations / Infographics	**Map report 1** Multivariate map **Read** *Campbell* (Ch. 15); *Thompson* (Web); *Tufte* (Pg. 115 – 121); *Tufte* (Ch. 5)
Week 6 Mar 3	Data visualization and geovisualization	**Read** *Slocum et. al.* (Ch. 3, 25, 26); Kraak & Ormeling (Ch. 10)
Spring Recess	*Spring Recess – No class*	
Unit 3: Cartographic animation		
Week 7 Mar 17	Map presentations / Animated cartography	**Map report 2** Infographic **Read** *Peterson* (Ch. 3); *Slocum et. al.* (Ch. 24); *Anthamatten* (Pg. 150 – 153)
Week 8 Mar 24	Guest speaker, film, or 3D Maker Space – Info TBA	
Week 9 Mar 31	Mapping ethics and propaganda	**Read** *Campbell* (Ch. 16); *Krygier & Wood* (Ch. 1); *Monmonier* (Ch. 7)
Unit 4: Three-dimensional cartography		
Week 10 Apr 7	Map presentations / 3D cartography	**Map report 3** Animation **Read** *Harder & Brown* (Ch. 6); *Slocum et. al.* (Ch. 17); *Anthamatten* (Pg. 154 – 157)
Week 11 Apr 14	Fantasy cartography	**Read** *Harmon* (Pg. 44 – 57); *Padron* (Ch. 6); *Gazzard* (Ch. 39)
Week 12 Apr 21	Web mapping	**Read** *Slocum et. al.* (PDF); *Muehlenhaus* (Ch. 27); *Anthamatten* (Pg. 158 – 165)
Unit 5: Esri Story Maps		
Week 13 Apr 28	Map presentations / Esri Story Maps	**Map report 4** 3D map **Read** *Harder & Brown* (Ch. 3)
Week 14 May 5	Graduate student presentations / **Final exam**	**Final Exam** **Graduate literature review**
Finals May 12	Story Map presentations: *Monday, May 12 or TBA online*	**Final Story Map**

Note: The GGS 655 course schedule is tentative and is subject to revision by the instructor