

Syllabus (GGS692)

General Information

- Instructor: Dr. Dieter Pfoser
- Where: Exploratory 2103
- When: Tuesday 4:30-7:10pm (max)
- Course website: Canvas + MS Teams
- Credits: 3.0
- Office Hours: Tuesday 3-4pm and reachable on the course MS Teams channel (all students will be invited)

Course Objectives

Managing, analyzing and communicating geospatial data is at the core of an emerging Billion-Dollar industry. This course will provide the students with the knowledge to build data-driven Web mapping applications and so communicate and interact with the data using nothing more than a Web browser. The course will cover a variety of open-source software packages for web mapping and will provide pointers to commercial solutions where appropriate. To communicate findings in reports and presentations, we have to carefully weave our content into an interesting narrative that tells compelling stories to our audiences. As such, we also discuss data visualization and storytelling techniques to enrich the visual appearance of our Web application. In the context of a project-based approach, we will leverage open-source intelligence techniques to collect data and investigate a current issues using a data-driven approach.

The specific goals are

- To design, develop, and implement custom web mapping applications using open standards and open-source software.
- To be mindful of data visualization and storytelling techniques and enable students to improve their user interface design and presentation skills using a project-based approach.

Learning Outcomes

By the end of the course each student will be able to:

1. Articulate and effectively communicate concepts and ideas related to Spatial Data and Web Mapping to experts, non-experts, and other professionals in a work environment.
2. Have a broad knowledgebase on fundamentals, theory and techniques of Spatial Data in the context of Web Mapping applications.



3. Have the ability to appropriately apply the knowledge acquired in the course for various hypothetical and real-world data processing tasks.
4. Given a problem or task, be able to effectively analyze it, identify key elements and potential difficulties, and define a strategy for successfully addressing it.
5. Perform a critical review of the potential, effectiveness, and reliability of specific solutions.

Textbooks

Required reading:

- **Introduction to Web Mapping**, Michael Dorman, continuously updated version, <https://geobgu.xyz/web-mapping2/> ↗ (<https://geobgu.xyz/web-mapping2/>).
- Selected readings incl. tutorials and other sources will be distributed via the course website - Web mapping and programming.

Additional reading (not required, but interesting):

- **Storytelling with Data: A Data Visualization Guide for Business Professionals**. C. Nussbaumer-Knaflic. Amazon
 - Link
 - GMU Library link (login required) https://wrlc-gm.primo.exlibrisgroup.com/permalink/01WRLC_GML/19u1omk/cdi_askewsholts_vlebooks_9781119002062 ↗ (https://wrlc-gm.primo.exlibrisgroup.com/permalink/01WRLC_GML/19u1omk/cdi_askewsholts_vlebooks_9781119002062)
- **Database System Concepts**. Abraham Silberschatz, Henry Korth, S. Sudarshan. McGraw-Hill Science/Engineering/Math; 6 edition (January 27, 2010). Any edition is fine for the course, since we will only use a few basic chapters - order as used book!
 - GMU Library link <http://magik.gmu.edu/cgi-bin/Pwebrecon.cgi?BBID=1252251> (<http://magik.gmu.edu/cgi-bin/Pwebrecon.cgi?BBID=1252251>)

Technology Requirements


Hardware

Activities and assignments in this course will regularly use CANVAS available at <https://canvas.gmu.edu>. Students are required to have regular, **reliable access to a computer with an updated operating system** (recommended: Windows 11 or Mac OSX 14 or higher) and a stable broadband Internet connection (cable modem, DSL, satellite broadband, etc., with a consistent 20 Mbps [megabits per second] download speed or higher. You can check your speed settings using the speed test at fast.com.)

Activities and assignments in this course will regularly use **web-conferencing software** (Zoom/MS Teams). In addition to the requirements above, students are required to have a device with a functional

camera and microphone. In an emergency, students can connect through a telephone call, but video connection is the expected norm.

Software

- A supported web browser (Chrome, Firefox, Safari)
- Canvas (<https://canvas.gmu.edu>)
- Adobe Acrobat Reader (free download)
- PDF Creator - An open source PDF printer (free download)
- Microsoft Office (purchase, also available at Citrix Virtual Computing Environment - <https://its.gmu.edu/service/citrix-virtual-lab/>)
- Visual Studio Code - free download at <https://code.visualstudio.com/> 
(<https://code.visualstudio.com/>)
- MS Teams - <https://its.gmu.edu/service/microsoft-teams/> - use your GMU Office 365 account

Online Tools

Visit the Web page to create an account

- Codepen - <https://codepen.io> - our Web-hosted Web programming tool

Format

- This hybrid course will be taught as a combination of lectures, topic/problem-oriented discussion (flipped classroom), and tutorials based on independent reading and class discussion.
- There will be a midterm and a course project (no final).
- The course will be project driven.
- Evaluation will be based on (i) participation in lectures, (ii) assignments, (iii) midterm and (iv) the course project.

Course outline and schedule

This course will cover the following topics (please note that the topics and their order are subjected to change at the discretion of the instructor, any changes will be announced in class).

The course topics and dates are subject to change.

Week of	Mod. #	Topic	Presentations
1/21	1	Introduction and overview of the course - project orientation, project topics, Web development, JavaScript/Leaflet intro, Codepen	
1/28	2	Leaflet, functionality, AJAX, GeoJSON	
2/4	3	Data, interactivity	
2/11	4	Leaflet advanced examples	

2/18	5	Mapbox, Visual Studio	
2/25	6	Mapbox, Github	
3/4	7	Midterm	
3/11		Spring Break	
3/18	8	Data and data cleaning (open refine)	
3/25	9	Deck.GL, Mapbox integration	
4/1	10	Web development frameworks	
4/8	11	Data visualization and storytelling (Part 1)	
4/15	12	Data visualization and storytelling (Part 2)	
4/22	13	Project work	
4/29	14	Project presentations	Final projects due

Please check the GMU Semester Calendar (<https://registrar.gmu.edu/calendars/>) for holidays, etc.

Grades

Assessment is based on experience points (XP), which you can earn for completing tasks! Every assignment, quiz, or activity is worth a certain number of XP. You "level up" as you accumulate points.

Level 1: 0-400 XP

Level 2: 401-600 XP

Level 3: 601-750 XP

Level 4: 751-840 XP

Level 5: 841-920 XP

Level 6: 921-1000 XP

Level X: 1001+XP

You can collect XP as follows:

- Participation: 10XP for each class you show up to. Extra points for your contributions during class (answering questions, initiating discussion, etc).
- Assignments: total of 250XP. Extra points for bonus assignments.
- Midterm: 250XP. Extra points for bonus questions.
- Project (40%): 400XP (report, presentation, prototype).

Please note that in general all assignments will not have the same weight. XP for individual assignments will be indicated.

Final grades at the end of the course will be assigned using a combination of absolute achievements and relative standing in the class.

Exams

In class midterm exam. No final exam.

Project

The course will include one project addressing a Web mapping application and including data management aspects as well as communicating this data using the tools and techniques discussed in class. The project will include (i) a written report, (ii) a software demonstrator and (iii) an in-class presentation of the project results incl. a live demonstration.

The specific format and timing of the project will be discussed in class.

The project will be graded based on the following criteria.

- **Academic merit** of your project
- **Quality of the written report.** The project results need to be communicated in a written report. Please remember that your report is a professional document, and should therefore be formatted and constructed accordingly. A template will be made available. Submission of a hardcopy of the report will be made in class; submission of a softcopy (in PDF) will be made through Blackboard.
- **Quality of the demonstrator.** A working prototype system needs to be submitted.
- **Quality of the presentation.** Students will be required to present their results in-class. The presentation will include a demonstration of the developed system.

Late Work Policy

No Late Work Accepted: Assignments are due on the specified deadline, and late submissions will not be accepted.

Advance Communication: If you foresee any challenges meeting a deadline, you must contact the instructor at least 24 hours in advance to discuss possible accommodations. Extensions will only be granted for valid reasons.

Emergencies: In the case of unexpected emergencies, please reach out as soon as possible with appropriate documentation, and we will address the situation on a case-by-case basis.

Course Materials and Student Privacy

All course materials posted to the course site are private to this class; by federal law, any materials identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.

Video recordings – whether made by instructors or students – of class meetings that include audio, visual, or textual information from other students are private and must not be shared outside the class.

Live video conference meetings (e.g. Zoom) that include audio, textual, or visual information from other students must be viewed privately and not shared with others in your household or recorded and

shared outside the class.

Course Recordings

Meetings in this class might be recorded to provide necessary information for students that could not attend the class. Recordings will be stored on Blackboard and will only be accessible to students taking this course during this semester.

Campus Closure

If the campus closes or class is canceled due to weather or other concern, students should check Blackboard for updates on how to continue learning and information about any changes to events or assigned work.

Student Expectations

Academic Integrity: The integrity of the University community is affected by the individual choices made by each of us. As a Mason student, you should follow these fundamental principles at all times, as noted by the Honor Code: (1) All work submitted should be your own, without the use of inappropriate assistance or resources, as defined by the assignment or faculty member; (2) When you use the work, the words, the images, or the ideas of others—including fellow students, online sites or tools, or your own prior creations—you must give full credit through accurate citations; (3) In creating your work, you should not take materials you are not authorized to use, or falsely represent ideas or processes regarding your work. If you are uncertain about the ground rules or ethical expectations regarding the integrity of your work on a particular assignment or exam, you should ask your instructor for clarification. Support for you to complete your work is available; no grade is important enough to justify academic misconduct.

Generative-AI: Any student use of Generative-AI tools should follow the fundamental principles of the Honor Code.

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 <http://ds.gmu.edu> (<http://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


GMU Email: Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. Students must use their Mason email account to receive important University information,

including communications related to this class. I will not respond to messages sent from or send messages to a non-Mason email address.

Patriot Pass: Once you sign up for your Patriot Pass [<https://its.gmu.edu/knowledge-base/how-to-sign-up-for-patriot-pass-2> (<https://its.gmu.edu/knowledge-base/how-to-sign-up-for-patriot-pass-2>)], your passwords will be synchronized, and you will use your Patriot Pass username and password to log in to the following systems: Canvas, University Libraries, myMason, Patriot Web, Virtual Computing Lab, etc. [See <https://password.gmu.edu>] (<https://password.gmu.edu>)].

University Policies: Students must follow the university policies. [See <http://universitypolicy.gmu.edu>] (<http://universitypolicy.gmu.edu>)]. Responsible Use of Computing - Students must follow the university policy for Responsible Use of Computing. [See <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing>] (<http://universitypolicy.gmu.edu/policies/responsible-use-of-computing>)].

University Calendar: Details regarding the current Academic Calendar. [See <http://registrar.gmu.edu/calendars/index.html>] (<http://registrar.gmu.edu/calendars/index.html>)].

Students are expected to follow courteous Internet etiquette at all times; see <http://www.albion.com/netiquette/corerules.html>  (<http://www.albion.com/netiquette/corerules.html>) for more information regarding these expectations.

Student Services

University Libraries: University Libraries provides resources for distance students. [See <http://library.gmu.edu/distance> and http://infoguides.gmu.edu/distance_students].

Writing Center: The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing. [See <http://writingcenter.gmu.edu>] (<http://writingcenter.gmu.edu>)]. You can now sign up for an Online Writing Lab (OWL) session just like you sign up for a face-to-face session in the Writing Center, which means YOU set the date and time of the appointment! Learn more about the Online Writing Lab (OWL).

Counseling and Psychological Services: The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See <http://caps.gmu.edu>] (<http://caps.gmu.edu>)].

Family Educational Rights and Privacy Act (FERPA): The Family Educational Rights and Privacy Act of 1974 (FERPA), also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights. [See <http://registrar.gmu.edu/privacy>] (<http://registrar.gmu.edu/privacy>)].

Disclaimer: Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported by the instructor.

Note: Recording is permitted only with the prior written consent of the professor or if recording is part of an approved accommodation plan.

