Department of Geography and Geoinformation Science

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GGS 462/692
Web-based GIS

1. General Information

Instructor:	Dr. Dieter Pfoser
Where:	Tuesday 4:30-7:10pm, Exp 2103
When:	Fall 2018
Course website:	Blackboard
Credits:	3.0
Prerequisites:	Graduate Students: GGS 550 or permission of instructor.
Instructor's Office Hours:	Tuesday 3-4pm

2. Course Objectives

Managing geospatial data is at the core of an emerging Billion-Dollar industry. This course will provide the students with the knowledge to curate, store, manage and query geospatial data by means of powerful database management systems. Moreover, to communicate the data, the students will learn how to build Web mapping applications on top of a database 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.
The specific goals are
- To enable students to develop a good understanding of the principles and techniques of spatial databases incl. to perform common various types of queries and spatial analyses.
- To design, develop, and implement custom web mapping applications using open standards and open-source software.

3. Learning Outcomes

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

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

4. **Textbooks**

Required reading:
- **Learning Web Design**, Jennifer Niederst Robbins, 5th ed., 2018. (https://learningwebdesign.com) Available online through GMU library https://proquest-safaribooksonline-com.mutex.gmu.edu/9781491960196 - requires login when accessing from outside GMU.
- **Selected readings** incl. tutorials and other sources will be distributed via the course website - Web mapping and programming

Additional reading (not required, but interesting):
- 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

5. **Technology Requirements**

Hardware
You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and to a fast, reliable broadband Internet connection (e.g., cable, DSL).
You will need computer speakers or headphones to listen to recorded content. A headset microphone is recommended for live audio sessions using course tools like Blackboard Collaborate. For the amount of computer hard disk space required to take an online course, consider and allow for the space needed to: 1) install the required and recommended software and, 2) save your course assignments.

Software
- A supported web browser (See Blackboard Support for supported web browsers)
- Blackboard Courses (Log into http://mymason.gmu.edu, select the Courses Tab)
- Blackboard Collaborate (Select Tools from the Blackboard Course Menu, then select "Blackboard Collaborate")
- Adobe Acrobat Reader (free download)
- PDF Creator - An open source PDF printer (free download)
- Microsoft Office (purchase, also available in the GGS computer lab which is located in Exploratory Hall 2101)

Tools
Visit the following two Web pages and create accounts!
- **Codepen** – https://codepen.io - our Web-hosted Web programming tool
- **Cartodb** - http://www.cartodb.com - our Web-hosted database software (you can get a free account at Carto by signing up for the Github Education pack https://education.github.com/students)

In addition, we will be using a **Virtual machine** that has a Node.js developer installed for the last third of the course! More information to come…

6. **Format**

The course will be taught as a combination of lectures, topic/problem oriented discussion, and tutorials based on independent reading and class discussion.

7. 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 (minor) change.

Week of	Mod. #	Topic	Assignment
8/27	1	Introduction and overview of Web mapping approaches	
9/3	2	Javascript introduction	Lab 1
9/10	3	Leaflet.js basics, building a simple Web mapping application	
09/17	4	Leaflet.js functionality, extending Web mapping application, AJAX, integrating Web mapping services using GeoJSON (WFS)	Lab 2
09/24	5	Database context - relational databases, spatial data and getting to know the tools used in the course	
10/1	6	Web mapping, Leaflet, database and interactivity	Lab 3
10/8	7	*Midterm – programming challenge*	Project outline
10/14		**Fall break**	
10/22	8	Project pitches	
10/29	9	Mapbox GL	
11/5	10	Mapbox GL	Lab 4
11/12	11	Web frameworks, React and Mapbox	
11/19	12	React and Mapbox	Lab 5
11/26	13	Buffer date	
12/3	14	Project presentations	Final projects due

Please check the GMU Semester Calendar for holidays, etc.

8. Grades

Each assignment and written exam will be given a numerical grade on a 0-100 scale. Some assignments may include bonus tasks. At the end of the term all the marks will be totaled as a <u>weighted average</u> according to the following weights:

Lab assignments (incl. Forum posts)	**35%**
Midterm	**25%**
Project	**40%**

Please note that in general all assignments will not have the same weight. The weight of each individual assignment will be indicated on the assignment form. Final grades at the end of the course will be assigned using **a combination of absolute achievements and relative standing in the class**.

9. Exams

The course includes a mandatory written exam (mid-term). The material covered in the exams will be announced in class. A student who cannot write a course examination or complete a course assignment because of an incapacitating illness, severe domestic affliction or other compelling reasons can apply for extension of time to complete an assignment.

10. Assignments:

The course will include several written assignments on selected topics from the material covered in class and in the assigned reading. Assignments may include tasks such as database queries, analysis of data processing results, and discussion/analysis of theoretical concepts and test cases. All assignments are mandatory. Typically, one week will be allocated for every assignment.

Assignments should be done **through the Blackboard course website**.

> **Please note**: Assignments should be submitted only through the Assignment submission section of the Blackboard system - DO NOT email assignments directly to the instructor.

11. Late lab submission:

Labs submitted **after the due date will not be accepted**. Exceptions to this policy may be made given serious circumstances at the discretion of the Instructor.

> **Please note**: Deferred of term work is a privilege and not a right; there is no guarantee that a deferral will be granted. Please make sure you notify the instructor as soon as you know a deferral is required.

12. General guidelines for ASSIGNMENT preparation and submission

a. Grades of assignments will be based on:
- **Academic merit** of your answers.
- **Conciseness** and **completeness** of your answers. Please write to the point and explicitly address the question or task. Avoid using unnecessary graphics (figures, tables, graphs etc.) unless they serve a specific purpose. Make sure to use captions and to refer to the graphics you include in your written answer. Graphics without any reference or accompanying explanation will be disregarded.
- **Organization** and **presentation**. Remember that your assignment report is a reflection of your thinking and learning process. Please organize your report in a logical fashion so that your answers could be easily identified. A general format for your presentation should, as a minimum, include the following components: (1) Question number, (2) Your written answer and/or description and discussion of your results, and (3) Visualization of your results, e.g. images, graphs, tables, as necessary.

b. Please remember that your assignment is a **professional document**, and should therefore be formatted and constructed accordingly. All assignments are to be typed. Hand-written assignments will not be accepted.

c. Submission of a hardcopy will be made in class; submission of a softcopy will be made through Blackboard.

d. The electronic submission of your assignment report has to be in **PDF format**.

e. If more than one file is submitted, you may submit a single **ZIP** file containing all the assignment files.

f. Each assignment submission should include a cover page with the following information: assignment title, assignment number, student name, and submission date.

g. Please make sure you have a backup of all the materials you submit.

13. **Project:**

The course will include one project addressing a Web mapping application and including data management aspects as well as communicating this data over the Web 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** as assessed by the instructor and fellow students during the presentation of the project.
- **Quality of the presentations of the project results** as assessed by the instructor and fellow students. Students will be required to present their results in-class. The presentation will include a demonstration of the developed system.

14. **Course website:**

The course has a Blackboard website. This website will provide you a single portal through which you may obtain lecture notes, retrieve assignment data and, review links to additional materials, and receive special announcements. Please notify ITU (and, if necessary, the instructor) if you encounter any problems accessing this website.

15. **Electronic communication:**

All course related email correspondence, including submission of assignments, should be made through the course Blackboard website. Please DO NOT send emails to the instructors' @gmu.edu address.

16. **Student Expectations:**
- **Academic Integrity:** Students must be responsible for their own work, and students and faculty must take on the responsibility of dealing explicitly with violations. The tenet must be a foundation of our university culture. [See http://academicintegrity.gmu.edu/distance].
- **Honor Code:** Students must adhere to the guidelines of the George Mason University Honor Code [See http://oai.gmu.edu/the-mason-honor-code/].
- **MasonLive/Email (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. All communication from the university, college, school, and program will be sent to students solely through their Mason email account. [See https://masonlivelogin.gmu.edu].

- **Patriot Pass:** Once you sign up for your Patriot Pass, your passwords will be synchronized, and you will use your Patriot Pass username and password to log in to the following systems: Blackboard, University Libraries, MasonLive, myMason, Patriot Web, Virtual Computing Lab, and WEMS. [See https://password.gmu.edu/index.jsp].
- **University Policies:** Students must follow the university policies. [See 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].
- **University Calendar:** Details regarding the current Academic Calendar. [See http://registrar.gmu.edu/calendars/index.html].
- **Students with Disabilities:** Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu].
- Students are expected to follow courteous Internet etiquette at all times; see http://www.albion.com/netiquette/corerules.html for more information regarding these expectations.

17. <u>**Student Services:**</u>
    - **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]. 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].
    - **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].

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.