

Geography 576 Geospatial Web and Mobile Programming

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Office Hours: Mon 1 pm – 2:30 pm, Thu 11 am – 12:30 pm or by appointment

Basic Course Information

- Both lectures and labs are online, which can be accessed at any time during the offering period. The course materials are available through [Canvas](#) (UW NetID login required).
- When writing an E-mail to me, please be sure to follow the format “**G576-LastName Question**” in the title, otherwise the email may be deleted as junk mail.
- Response time: I will respond to email and the [Canvas](#) discussion board once a day during the week. While I will do my best to stay on top of class related emails, I anticipate that some messages will slip under the radar due to time constraints and the large number of students I teach this semester. If you have sent me an email but have not heard back from me within 48 hours, please send me a follow-up email.

Course Overview

This course is designed to introduce the fundamental skills necessary to develop web applications and program spatial analytical functions in web environment. Students will also acquire skills for developing spatial mobile apps on devices such as phones and tablets. Those skills will allow students develop web and mobile applications to support geospatial data access, analysis, sharing, and synthesis over the internet. Previous java programming knowledge is not essential, but basic programming experience is required. The main content of this course will include:

- JAVA programming basics;
- Geospatial programming tools, languages and libraries: GeoTools, Servlet, JavaServer Page(JSP), JavaScript (JS), Google Maps APIs, Leaflet, HTML, CSS, XML etc;
- Web and mobile GIS design and development;

Please note that this course does not provide a thorough grounding in Java, web or mobile programming, and only cover enough of the essentials so that the students can synthesize GIS and mapping libraries and tools for online geospatial tasks.

Course Learning Objectives

Upon completion of the course modules, the student is expected to:

- Develop web and mobile device programs for geospatial data mapping and visualization using JAVA, JSP and JS;

- Use GIS programming and mapping toolkits, e.g., GeoTools, Google Maps APIs, Leaflet etc;
- Determine, track and record a mobile device's current location;
- Design and develop a web portal and mobile App to retrieve, manipulate, and visualize geospatial datasets;
- Develop critical thinking skills about the design and implementation of a web/mobile system for different geospatial applications

Course Requirements

Graduate standing or an introductory GIS course (GEOG 170, GEOG 370 or GEOG 377), and one programming course (GEOG 378, CS 301, CS 302, or CS 367)

Course Materials

- No textbook is required; all course materials (e.g., lecture notes, lab, syllabus, exam review sheets, and updates) will be posted at <https://canvas.wisc.edu/courses/37952>.
- Recommended Readings:
 - Fu, P. and Sun, J. 2011. Web GIS: Principles and Applications, Redlands: Esri Press.
 - Android Programming Tutorials: Easy-To-Follow Training-Style Exercises on Android Application Development. CommonsWare, LLC, 2009. 0981678025.
- Additional Reading Material: Additional reading material will be provided as needed in the modules.

Course Assignments

Quizzes

There will be two text-based quizzes, usually consisting of multiple-choice questions based on the lecture material. The quiz period **closes at midnight one week after the day of opening**. Once you begin a quiz, you will have **30** minutes to complete it.

NOTE: Students may use course materials, books and internet resources to answer quiz questions. However, they may not consult with other individuals either in person by other means (such as the internet).

Lab Assignments

You will complete seven lab assignments throughout the semester. Most labs will consist of step-by-step programming exercise to gain hands-on practice about programming. Plagiarism is not tolerated. As with other evaluated items, any offense results in a zero for the lab assignment and disclosure of the impropriety to the Department and University. Labs are due **by midnight Monday of the following week**.

Term project

A project that using spatial web and mobile programming skills to solve problems is required. **A one page project proposal and a final project report or demonstration video are required by the respective due dates**. Each project will be carried out individually or in a group of three or four students; **graduate students are allowed to**

work alone only if the project is a component of their thesis research. For the web/mobile system implementation, **graduate** students should include **more functions** than that of undergraduate students. To present and share your projects with your peers, students can submit a project report or record a video of web/mobile system design and implementation. For a project report, while **undergraduate students** should submit a **10 page project report** including the motivation, design, implementation, analysis, and conclusion sections, **graduate** students need to submit a report with **at least 15 pages** and include an extra section of the **state-of-art work**. Guidelines of the number of required functions for the system implementation, the term project report or video demonstration for both undergraduate and graduate students will be released during the semester.

Late Assignments

Late lab assignments will be accepted, but are penalized **10%** per day, including weekends. Assignments will not be accepted more than 4 days after the due date. If you cannot submit a lab by the deadline because of a valid excuse or emergency, you must contact me before the deadline. Late quizzes will not be allowed without a prior excuse.

Grading

Assignments	Undergraduate	Graduate
Quizzes (2)	15%	15%
Lab Assignments (6)	50%	50%
Final project	35%	35% (Additional work on project implementation and final report)

Grading criteria

Undergraduate	Graduate	Grade
90 and above	93% and above	A
87 - 89.9%	90 - 92.9%	AB
83 - 86.9%	85 - 89.9%	B
80 - 82.9%	80 - 84.9%	BC
70 - 79.9%	75 - 79.9%	C
60 - 69.9%	60 - 74.9%	D
< 60%	< 60%	F

Plagiarism: Academic Integrity

All assignments must be completed on your own; plagiarism is not tolerated. Plagiarism is defined as copying someone else's work and giving the impression that it was created by you. Note that in the open-source software world, this works a little differently than when writing papers. As noted above, you *may* copy someone else's code you find online, provided any license included with the code allows you to do so, you give proper credit to the original author, AND a substantial part of the final product is still your own work. You will often find that you *have to* change and adapt others' code to your own purposes;

indeed, this is itself a programming skill. What we will not tolerate is receiving identical copies of a lab solution from multiple students; this will result in a 0 on the assignment for all students involved and disclosure of the impropriety to the Department and University.

Course Tentative Schedule

Module	Wk	Date			Assignment (Due Date) **
Module 1: Programming fundamentals	1	1/17- 1/22	Lecture1: Java Programming Intro	Lab1: Introduction to Eclipse and Java	
	2	1/23- 1/29	Lecture2: Java Language Fundamentals	Lab2: Java Syntax and Class	Lab1 Due (1/23)
	3	1/30- 2/5	Lecture3: Control Flow Statements		
	4	2/6- 2/12	Lecture4: Arrays and Collections	Lab3: Java Database Access and Servlet	Lab2 Due (2/6)
Module 2: WebGIS programming	5	2/13- 2/19	Lecture5: Web Application Development		
	6	2/20- 2/26	Lecture6: Web Technology I – Server Side	Lab4: Web GIS Application	
	7	2/27- 3/5	Lecture7: Web Technology II – Client Side		Lab3 Due (2/27)
	8	3/6- 3/12	Lecture8: WebGIS technologies	Optional Exercise: OpenGeo Suite (Optional; No need to submit)	
Module 3: Mobile GIS	9	3/13- 3/19	Lecture9: Intro to Android Programming	Lab5: Mobile GIS Application I: Android programming	Quiz2 Due (3/13)
	10	3/20- 3/26	Spring break		Lab4 Due (3/20)
	11	3/27- 4/2	Lecture9 Optional Excise: Getting started with Android Studio; In person meeting for project proposal discussion		Project proposal due (3/27)
	12	4/3- 4/9	Lecture10: Mobile GIS	Lab6: Mobile GIS Application II: Location-Based Service (LBS)	Lab5 Due (4/3)
Module 4: Project	13	4/10- 4/16	Final project consultation		
	14	4/17- 4/23			Lab6 Due (4/17)
	15	4/24- 4/30			
	16	5/1- 5/7	Final project report or video submission		Projects due (5/8)

*Keep in mind that changes to the syllabus and due dates may occur throughout the semester. If changes need to be made, you will be informed via the course website.

Technical Requirements

Operating System	Windows 7 or newer; Mac OS X 10.6 or newer; ChromeOS, Linux
Mobile Operating System Native App Support	Android 4.2 and newer
Processor	2 GHz or higher

Memory	4GB MB of RAM or higher
Hard Drive Space	50 GB free disk space
Browser	<ul style="list-style-type: none"> ● Internet Explorer 11 and Edge ● Chrome 50 and 51 ● Safari 8 and 9 ● Firefox 46 and 47 (Extended Releases are not supported) ● Flash 20 and 21 (used for recording or viewing audio/video and uploading files) <hr/> <p>To determine if your browser fits this criteria and for advice on downloading a supported version, please refer to the following Canvas Knowledgebase article.</p>
Plug-ins	Adobe Reader [Download from Adobe] Flash Player [Download from Adobe]
Additional Software	Microsoft Office (2003 or later) iTunes/QuickTime
Internet Connection	Broadband (cable or DSL) connection required
Printer	Access to graphics-capable printer
DVD-ROM	Not-required
Sound Card, Microphone, and Speakers	Required
Monitor	Monitor (Capable of at least 800 x 600 resolution)