

## Syllabus for GEOG677

### **Instructor**

*Name:* Jon Nordling, GISP  
*Office:* Online  
*Email:* jnordlin@umd.edu  
*Office Hours:* TBD

### **Teaching Assistant**

*Name:* TBD  
*Email:* TBD  
*Office Hours:* TBD

### **About the Course**

*Time:* 5:30pm – 8:00pm, Mondays (Lectures) & Tuesdays (Lab Sections)  
*Location:* Classroom: Lefrak 1171; Online (<http://elms.umd.edu/>)

### ***Description***

This course is designed to: (1) introduce the concepts and theories that are related to an increasingly important technology – Internet/Web GIS; (2) introduce various technologies or techniques for creating, analyzing, and disseminating GIS data and services via the Internet. The topics covered include the hardware/software structure of the Internet (e.g. server-client model, TCP/IP protocol), the evolution of Web GIS, and most importantly, different technology options. Students will be required to practice almost all of the Web GIS tools including client side mapping frameworks like the ArcGIS API for JavaScript, Mapbox, Leaflet, Google Map API, OpenLayers; server side systems including ArcGIS Enterprise (Server/Portal/DataStore), GeoServer; data formats for the web WMS, WFS, Feature Services, MapServices. Students will also be exposed to the experience of working with the Cloud environment such as AWS EC2 and Azure.

### ***Textbooks*** (optional)

1. Fu, Getting to Know Web GIS, Esri Press, 2015  
<http://www.amazon.com/Getting-Know-Web-GIS-Pinde/dp/1589483847>
2. Zhong-Ren Peng, Ming-Hsiang Tsou, Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks, ISBN: 978-0-471-35923-4. This book can be purchased from the UMD bookstore or Amazon (<http://www.amazon.com/gp/product/0471359238>). It has also been reserved in the UMCP McKeldin Library.
3. Fu, *Web GIS: Principles and Applications*, ESRI Press 2010, ISBN: 9781589482456

### ***Course Communication***

We will frequently use email for communication in the class and we will only use UMD email addresses. Be sure that the email address on TESTUDO is your UMD account. Each student will also need permissions to the OpenLab. Instructions for getting these accounts will be given at orientation and on the first day of class.

Assignments, announcements, data sets, etc. will be made available to registered students via Canvas: <http://elms.umd.edu/>. You are strongly recommended to log in Canvas and check the announcements regularly (at least once a day or subscribe for notification). You also need to check your UMD email account often so that you will get all the information sent to the class.

### ***Assignments***

There are totally seven (7) lab assignments to be completed. Each of these lab assignments will count 10% of the final grade. Late submission of lab reports will result in a reduction of the grade for that assignment of 10 points (out of 100 in total) per day. However, in some rare situations (e.g. medical or family emergency), if you need extra time, you will have to contact the instructor or the teaching assistant before the due date so that the deadline may be extended.

### ***Final Project***

A final project is required to complete this course. In this project, students will need to integrate the concepts and techniques covered in the course to design an Internet GIS application. This application will be published and remain active on web to be graded. The project should preferably be relevant to the student's academic field or professional work.

In addition, a written proposal of the final project ( $\geq 2$  pages; single line space) must be submitted by the date specified in the Course Schedule. The proposal should: (1) identify a research topic; (2) provide background information; (3) explain why it is important; (4) identify the targeted audience or users; (5) describe data to be used and how to collect them; and (6) list the expected functions of the to-be-completed Internet GIS tool. Students are encouraged to contact the instructor early during the semester to discuss potential topics and scope. This proposal accounts for 5% of the final grade.

The grading of the final project depends on the functionality, creativity, complexity, robustness, and the user-friendliness of the Internet GIS Application, which accounts for 20% of the final grade.

The project must be carried out individually or in a group of two members. This project should be limited in scope and designed for completion during the semester.

### ***Grading***

The distributions of grade among lab assignments, participation, and final project are:

Lab Assignments =	70%
Final Project =	25%
Participation =	5%

The plus/minus grading system will be used to assign student grades which will be determined as follows:

97-100 =	A+
93-96.99 =	A
90-92.99 =	A-
87-89.99 =	B+
83-86.99 =	B
80-82.99 =	B-
77-79.99 =	C+

73-76.99 = C  
 70-72.99 = C-  
 67-69.99 = D+  
 63-66.99 = D  
 60-62.99 = D-  
 <60 = F

Minor adjustments to this scale might be made based on the performance of the class as a whole.

### ***Course Schedule***

This is a tentative schedule and may be adjusted to suit our class.

<b>Week</b>	<b>Date</b>	<b>Lecture Topics</b>	<b>Readings</b>	<b>Assignments</b>
<b>1</b>	Nov 26	Course Overview Introduction to Internet GIS - What is Internet GIS - The evolution of Web GIS - Demonstrations and Examples	Chapter 1	Exercise 1
<b>2</b>	Dec 3	Internet & Network & Security - Network Environments - Network Communication Models - Network Security - Web Protocols  3D GIS: Google Earth Pro, ArcScene Data Formats: KML, GeoJSON, WMS WFS etc.	Chapter 2	Lab 1 out
<b>3</b>	Dec 10	Client/Server Model Peer-to-Peer Model Distributed-Systems Architecture Web Client/Server Architecture  ArcGIS API for JavaScript Google Maps API	Chapter 3 Chapter 5	Lab 1 due  Lab 2 out
<b>4</b>	Dec 17	Overview of Web Mapping  Major Web GIS Platforms <ul style="list-style-type: none"> <li>- ArcGIS Enterprise (Server/Portal/DataStore)</li> <li>- GeoServer*</li> <li>- GeoMedia</li> <li>- CartoDB</li> <li>- Mapbox</li> <li>- MapServer</li> </ul>	Chapter 8	Lab 2 due  Lab 3 out

		GIS Information Products <ul style="list-style-type: none"> <li>- Story Maps for ArcGIS</li> <li>- Commercial off-the-shelf (COTS) software</li> <li>- Web AppBuilder for ArcGIS</li> </ul>		
5	Jan 7	Introduction to ArcGIS Enterprise <ul style="list-style-type: none"> <li>- What is ArcGIS Server/Portal/DataStore?</li> <li>- ArcGIS Enterprise Architecture</li> <li>- Service Types: WMS, WFS, Feature Services, MapServices</li> <li>- Creating/Publishing Map Services</li> <li>- Data Security</li> <li>- Creating Web Applications/Information Products</li> </ul>	Assigned Reading	Lab 3 due Lab 4 out
6	Jan 14	GIS in Cloud <ul style="list-style-type: none"> <li>- Amazon Web Services (AWS)             <ul style="list-style-type: none"> <li>- EC2 &amp; S3</li> </ul> </li> <li>- ArcGIS Online</li> <li>- CartoDB &amp; Mapbox Hosting</li> <li>- Azure</li> </ul> Markup/Languages/Integrations <ul style="list-style-type: none"> <li>- HTML/CSS/Javascript</li> <li>- XML/REST/API</li> </ul>	Assigned Reading	Lab 4 due Lab 5 out
7	Jan 21	Guest Lecture - TBD	Chapter 7	Lab 5 due Lab 6 out
8	Jan 28	Custom GIS Applications <ul style="list-style-type: none"> <li>- ArcGIS API for JavaScript</li> <li>- Leaflet &amp; OpenLayers API</li> <li>- Mapbox API</li> </ul> Examples and Live Development Demo	Assigned Reading	Lab 6 due Lab 7 out Final project proposal due on Feb 4
9	Feb 4	Google Earth Engine <ul style="list-style-type: none"> <li>- Overview</li> <li>- Earth Engine API</li> </ul> - ArcGIS City Engine <ul style="list-style-type: none"> <li>- Web GIS Augmented Reality</li> <li>- Mobility Apps for GIS</li> <li>- Web GIS and Mobile GIS Integrations Patterns</li> </ul>		Lab 7 due Exercise 2

<b>10</b>	Feb 11	<p>Other Advanced Topics</p> <ul style="list-style-type: none"><li>- High Availability Systems</li><li>- Scaling Cloud infrastructure</li><li>- Online GIS Communities (GeoNet, Spatial Community Slack)</li><li>- Continuing Education</li></ul> <p>Commercial Product Demos</p>		Final project due on Feb 18
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