Geography 510: Geographic Software Design Fall 2015 T/R 11:10-12:25

Instructor: Bruce A. Ralston Office Hours: Tuesday 9:00 – 10:30 or by appointment
Email: bralston@utk.edu Office: 318 BGB

Required Texts (all electronic texts):

Building Web and Mobile ArcGIS Server Applications with JavaScript, Pimpler, Packt Publishing (2014)
OpenLayers 3 Beginner's Guide, Gratier, Spencer and Hazard, Packt Publishing (2015)
Interactive Map Designs with Leaflet JavaScript Library, Packt Publishing (2013)

Required Accounts: If you do not have one, you will need an ArcGISOnline account. I will make the necessary arrangements.

In addition to the texts, we will make use of several web resources including the w3schools.com pages on HTML, CSS, and JavaScript. We will also work with each API's documentation and example pages. Finally, as UT students you have free access to Lynda.com courses. I will mention some that you may find useful.

General Comments:

This course will focus on developing GIS programs for internet GIS, and mobile (Android and iOS) applications. The goals of the course are for students to develop web and mobile based applications. A major area of focus will be internet mapping mashups using HTML5, CSS, and JavaScript. These development tools will be used with several Application Programming Interfaces, or APIs: ArcGIS Web API, Google Maps API, OpenLayers,and Leaflet. For mobile applications we will use Apache Cordova. In addition to building web pages and apps, we will focus on two major server side spatial data servers, ArcGIS Server and Geoserver.

This is an interesting time web/mobile GIS (and in software in general). There are three distinct business models for providing tools we will use to build our web sites and serve our data. These are commercial software, free but not open source software, and the free and open source software. The commercial software space is dominated by ESRI with their ArcGIS Server, ArcGIS Online (their cloud), the ArcGIS web app builder (a cloud based authoring tools), and the ArcGIS API (Application Programming Interface) for JavaScript. In the free, but not open source space, the dominant player is Google with their Google Maps API for JavaScript. In the FOSS world, we will look at OpenLayers and Leaflet (these are mapping APIs), and Geoserver (similar to ArcGIS Server).

As we work on assignments, I will introduce the programming skills you need to complete each assignment. By then end of the semester, you will have been exposed to many programming concepts and applications.

I will make the following assumptions:

- You are familiar with GIS
- You are familiar with the web
- You do not know how to program
- You are able to learn
- If you don't understand something you will ask questions[1]

[1] This is VERY important!

Grades will be based on a series of homework assignments and a final project. At first the assignments will be ***WATCH***, ***COPY***, *and extend*. Later they will become *watch, copy, and* ***EXTEND***. At various times, the professor will say something like the following: "For extra credit, you might want to try the following…." Such assignments are not required, but they do tend to boost one's grade, assuming they are done correctly. The pace of the class will be determined by the abilities of the students, so I am not sure how fast we will proceed. However, I believe we can cover most of the topics listed below. For the final project, you need to build an interactive web mapping site or mobile application that uses at least some of the methods discussed in class. The subject matter and data you use are up to you.

It is permissible for students to help each other and collaborate on some work. However, if it seems one person in a team is doing all the work, or none of the work, then that will be noted and taken into account when grades are assigned.

A little encouragement: Whether you are a hardcore digit head or someone who just likes maps, the material is in this course is valuable. On many occasions (usually at GIS conferences), employers tell me, "We can get people who know some GIS software and we can get programmers. What we really need are people who know both." That is the goal of this and other GIS courses in our department.

This is a particularly interesting time in GIS software development. However, you should remember the old Chinese curse "May you live in interesting times!" The worlds of GIS and software development, particularly web and mobile development, change fast—***very*** fast. The line between the leading edge of technology and the bleeding edge of technology is very thin and very sharp. Up until about six years ago, for example, we spent a good deal of time learning ArcXML and ArcIMS. These are now passé and we will not work with them. Up until four or five years ago we have emphasized ArcServer and .NET development with something called a SOAP interface and the web ADF with VB .NET. That material now plays a much smaller role as the web mapping world has moved away from SOAP. For a while we used Adobe Flex and ActionScript to program Google Maps. Then earlier this decade Google dropped support for Flex (without much notice). It now appears that the dominant development model is with HTML5, CSS, and JavaScript. This is what we will learn to use. As one industry insider recently said to me, "This is the way the world is going." The point here is that no matter what you learn in this class about specific software and programming languages, it is likely to obsolete—or at least change—in a few years. However, the skills of design and logical structure tend to endure. While there are many possible languages one can use, there are some common logical structures and elements.

Tentative List of Topics and **Assignments**

Examples of Portals and Online Mapping
IIS, file locations, virtual directories
Introduction to editing web sites through Chrome tools
Editing an existing web site.
Introduction to JavaScript and CSS
Working with CSS files
JavaScript language syntax
JavaScript and HTML Controls
Creating an interactive web page with selected controls
The Google Maps API
Simple Map with pushpins, info windows, and audio content

KML files
GeoRSS
Mapping Social Media—Flickr and GeoRSS
Introduction to OpenLayers
Maps using Open Street Map data
Handling user interactions
JSON and GeoJSON
Creating a thematic map with JSON data
Introduction to Leaflet
Creating a mobile app with Leaflet
Serving your own data: ArcServer and Geoserver
Introduction to ArcServer and comparisons to other mapping products
Some non-programming tasks in ArcServer

- **Simple external service**
- **Simple internal service**
- **Caching web maps—how and why**
- **Thematic mapping in ArcServer**

Building a thematic Geoserver service
Using ESRI's web app builder
Beyond the web app builder: programming the ArcGIS API for JavaScript
ESRI Leaflet—this is brand new this summer!
Combining drawing, queries and buffering
Working with Data Grids and Selections
Synchronizing Map and Data Grid selections
Mobile Development in Cordova
Mobile Development Options

- **Writing Android and iOS Apps**
- **A simple tracking app**
- **A simple data collection app**

>>>>>>>>>>>>>>>>>>>>>The above is subject to change<<<<<<<<<<<<<<<<<<<<<<<<

If you do all the assignments correctly, you will surely get an A. If you do less than all required assignments but tackle some of the extra credit options, you will likely get an A. If you do less, you might still get an A—it depends on how far we get into these topics.

The material in this class is cumulative. That is, each topic will build on the topic that comes before it. The worst thing you can do is fall behind. Try your best to stay up to date with the topics and assignments in class.

Some No-Nos. Since we are meeting in a computer lab there is the temptation to surf the web during lecture, check your email, send texts and IMs. These are not appreciated. If this happens, I will assume you are bored and increase the pace and requirements of the course. You are not to work on assignments for other classes during class time—this is a Super No-No.

Official Disability Statement - If you need course adaptations or accommodations because of a documented disability or if you have emergency information to share, please contact the Office of Disability Services at 974-6087 or http://ods.utk.edu/. This will ensure that you are properly registered for services. In addition, please inform your instructor of such needs.

Official Honor Statement - "An essential feature of the University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the

University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

Official Geography Department's Extra-credit Policy Statement - "The Department of Geography does not permit students to do extra work or to resubmit work in order to improve a course grade during or after completion of a course unless a mechanism for doing so during the course is stated in the course syllabus distributed during the first week of the term, with such mechanism made equally available to all students in the course."