SSCI 591 (35729), Web GIS

Syllabus

Units: 4

Term — Day — Time: Summer, 2019, Online

Location: Online

Instructor: Elisabeth Sedano, JD, PhD
Office: AHF B57C
Office Hours: Mon 12-1 pm PT and Thurs 12:30-1:30 pm PT
Also available by appointment via email

Contact Info: sedano@usc.edu, 213-740-9582, www.bluejeans.com/sedano

Library Help: Andy Rutkowski
Office: VKC 36B
Office Hours: Tue 10 am-12 pm and Thurs 4:30-5:30 pm PT

IT Help: Richard Tsung
Office: AHF 145D
Office Hours: By appointment
Contact Info: ctsung@usc.edu, 213-821-4415 (office)
Course Scope and Purpose

Today, the ability to construct and implement of high-quality web GIS applications is a critical asset to both academic and professional portfolios. Learning to program innovative web-based mapping applications facilitates sharing and dissemination of your work, and at the same time expands your overall application development skillset. Familiarity with web scripting languages and how these are utilized to implement web GIS applications provides in-depth insight into how many government and commercial organizations, as well as individuals, develop these tools. The main goal of this course is to help you become comfortable with coding web-based mapping applications.

This course will provide you with the most up-to-date software tools and information necessary for developing customized web GIS applications according to current industry standards. It is assumed that students taking this course have no prior programming experience and are new to web scripting and application development. Essential practical, as well as theoretical concepts of web GIS, are covered. You will learn to develop web GIS applications through popular platforms such as Google Maps, Mapbox, ArcGIS Server, ArcGIS.com and use various Application Programming Interfaces (APIs). You will also learn the fundamentals of web GIS system architecture as well as advanced programming topics including web mashups and distributed geospatial web services. Experience using Web 2.0 technologies that focus on user-generated content, geoportals for finding and accessing geospatial information, and web mapping interoperability in terms of utilizing open source universal data standards is also provided. In addition, the essentials of user experience and user interface design (UX/UI) are covered, including their importance in e-business and e-government web mapping interests.

This class is an elective for the Geographic Information Science & Technology M.S. and Graduate Certificate Programs and is an elective course in the Spatial Informatics M.S. Program.

Learning Outcomes

When you have completed this course, you will be able to:

- Recognize different web scripting languages commonly used in web GIS application development and use several of these technologies to extend open source and proprietary GIS software functionality.
- Critically evaluate the benefits and challenges of developing web GIS applications using different software technologies and system architectures, including local infrastructure versus cloud-based computing.
- Explain how web GIS technologies are applicable to academia, e-business, and e-government.
- Develop and implement innovative web GIS projects, geospatial web services, mashups, Volunteered Geographic Information (VGI) and Public Participation GIS (PPGIS) applications.
- Identify web map application design problems and solutions in order to make end user experiences and interfaces easy to use and aesthetically pleasing.
• Solve application development challenges, such as debugging scripts and integrating disparate code modules together into single applications.
• Conceptualize, design, implement, and write up the results of a unique web GIS application based on individual interests and goals in the final course project.

Prerequisite(s): None
Co-Requisite(s): None
Concurrent Enrollment: None
Recommended Preparation: SSCI 581: Concepts for Spatial Thinking

Course Structure

This is a graduate level course, so you should expect this class to be intellectually challenging. As graduate students, you are expected to engage with the information you are learning and to explore the heady cauldron of ideas, opinion, and analysis that describe our collective effort to thoroughly interrogate the subject at hand. Learning arises from active engagement with the knowledge found in our reading materials and with one another. As in any graduate class, the instructor’s role is that of a guide who keeps you on this path of discovery, and you will find that you will learn much from your fellow classmates. The challenge for the instructor is to replicate such an academic experience within the milieu of “online learning.”

All course materials will be organized through Blackboard. The main theoretical concepts will be provided through text readings and self-directed research you will do in the published literature and on the web and through hands-on experimentation with various tools and technologies.

The course will unfold on a weekly basis. Each week will be focused on a particular aspect of web GIS. In order to encourage collaboration, for some assignments, the class will be divided into small groups to work on programming assignments. Students will share and test each other’s work in brief online discussion threads. Students are encouraged to share questions and problems in discussion forums, to be explored in that congenial setting. The aim is to encourage deep-learning by active participation. You will finish the course by completing a web GIS project on a topic of your choice on your own.

This is a four credit, one semester course. Students should expect to spend 10-15 hours per week completing the work in this course.

Technological and Communication Requirements

ArcGIS is provided online via the SSI Server, and ArcGIS Server is also provided for this course; hence, you do not need to install Esri software on your own computer.

Instead, every student must meet the following technology requirements:

• A computer with a fast Internet connection, and
• A functional webcam and a microphone for online presentation and meetings.
SSI Server and Tech Support – For some assignments, this course utilizes the SSI Server which is a virtual desktop giving access to many different professional software. If you are unable to connect to the server or experience any type of technical issue, send an email using your USC account to SSI Tech Support at spatial_support@dornsife.usc.edu, (note underscore) making sure to copy (cc) me on the email.

Communications – This is a distance learning course, so most of our interactions will be asynchronous (not at the same time). All materials to be handed in will be submitted via Blackboard. It is each student's responsibility to stay informed about what is going on in our course. In addition to email about time-sensitive topics, any important announcements will be posted on the Announcement page in Blackboard. Be sure to check these each time you log onto Blackboard.

I will send via email or Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all email sent from Blackboard or from me. Do not ignore course email until the day before assignments are due. Also double check to be sure that email sent from the USC blackboard account does not go into your junk mail.

I will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 72 hours delay. In the rare case when I expect to be off-line for more than 72 hours, I will post an announcement on the Blackboard site.

Discussion Forums – On the Blackboard site, I will post a series of discussion threads relevant to various sections of the course. Discussions provide a key means for student-to-student discussion and collaboration that can replicate the face-to-face contact and student engagement of traditional classrooms. Here, students can provide support to each other while working on their assignments, sharing hints and helpful tips, as you would in a classroom laboratory. Please post your questions about assignments there, as you would ask them publicly in the classroom. I monitor the discussion threads and offer comments when necessary, but more importantly, consider the discussion board a key way to connect with your classmates and share your discoveries.

Required Readings and Supplementary Materials

There are two required textbooks (Fu & Sun 2011 and Fu 2016). These can be purchased from the USC bookstore or online outlets such as Amazon.


These books will be supplemented with Reading Notes and a mixture of readings from academic journals, professional reports, and authoritative websites.
As well, for several of the assignments in this course, you will conduct online library research to find articles that apply specific techniques in an application area of your choice.

In addition, six Lynda.com courses are supplied with this course.

- Williamson, James. 2014. HTML Essential Training
- Marini, Joe. 2015. JQuery Essential Training
- Nodder, Chris. 2017. UX Design Techniques: Overview
Description and Assessment of Assignments

Your grade in this course will be determined on the basis of several different assessments:

*Resume Assignment – 1 worth 2 points.* We require all current students to post and maintain a public resume, short biography and recent photo on our shared SSI Student Community Blackboard site. Please prepare your resume in the SSI template which will be provided to you. Unless you opt out, your resume will be included in the Spatial Sciences Institute Graduate Programs Resume Book. This resume book is compiled annually and, along with our web presence, is used to promote our programs, and more importantly, your skills, experience and professional aspirations.

*Reading Assignments – 5 worth a total of 10 points.* These will focus on the text and other assigned readings. Their objective is to help you evaluate and integrate the information you have acquired from the course readings. Some of these will involve discussions and collaborative work, most will be individual efforts. Others will stimulate in-depth investigation into the ontology and semantics of core geospatial datasets integrated into programming assignments.

*Discussions – 4 worth a total of 8 points.* Structured discussions will focus on combinations of theory and practice. You will post new message and replies to messages posted by your classmates (i.e. two per forum) at specified times throughout the semester.

*Programming Assignments – 9 worth a total of 45 points.* In order to demonstrate that you understand the basic concepts and skills learned in the class, you will complete seven assignments that involve the use of web scripting languages and web GIS software. Once you have completed each assignment, you will turn in a copy of some digital output from the final part of the assignment such as a .jpg at the final step, and/or some combination of a few brief text answers, the script itself or hyperlinks to your original working web pages and web-based mapping applications resulting from your code.

**Final Project**

To integrate your learning of all the material covered in the course, you will design, undertake and report on individually chosen web GIS project that will be the context of discussion in several of the assignments. The six components of the Final Project are:

*Proposal - 3 points.* One individual meeting (live via BlueJeans) and a brief written description of the web GIS application you would like to build and how you plan to do it.

*Draft Report - 3 points.* A draft of the first four sections of the written report including the Introduction, Study Area, Data, and Design.

*Application Implementation - 15 points.* The web GIS application will consist of a unique, live website with an interactive web map, including any data required in your application. The application must work as described in your Final Project Report.

*Final Project Report - 8 points.* A written report on your project methodology, data and application development outcomes, including how to install and run your application.
**Demo Video – 2 point.** A demo video that demonstrates the full functionality of your web GIS application project.

**Presentation - 4 points.** A presentation and live demonstration of your web GIS application (live via BlueJeans™), open to all students in the course.

**Grading Breakdown**

The table below summarizes the course assessments and their point distribution:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Number</th>
<th>Points Each</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Assignments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Resume</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Reading Assignments</td>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Discussions</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Programming Assignments</td>
<td>9</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>Project Components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Proposal</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>- Draft Report</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>- Application Implementation</td>
<td>1</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>- Final Report</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>- Demo Video</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>- Presentation</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>-</td>
<td>100</td>
</tr>
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</table>

**Assignment Submission Policy**

Unless otherwise noted, assignments must be submitted via Blackboard by the due dates specified in the Course Schedule below and on the assignment instructions.

Unless otherwise noted, all assignments are due by 11:59 pm PT on Mondays or Thursdays. Final Project components have different due dates as indicated on the Course Schedule below. Your attention to on-time assignment submission is essential if I am to meet my goal to return comments on your submitted assignments before the next one is due. Sometimes this is impossible, so I will post a notice on anticipated delays if needed.

Strict penalties apply for late assignments as follows:

- All assignments will be penalized 2 points up to FOUR days late. No points will be given for submissions more than FOUR days late. Note that all assignments worth 2 points will receive 0 points if submitted late.
- Additionally, no written work will be accepted for grading after 5 pm PT on the last day of class.
# Course Schedule

<table>
<thead>
<tr>
<th>Week 1 5/15</th>
<th>Topics/Daily Activities</th>
<th>Readings and Assignments</th>
<th>Deliverables/Due Dates</th>
</tr>
</thead>
</table>
| **Introduction:**  
Introduction to the course | Fu & Sun (2011) Ch.1  
Jones & Purves (2008)  
Wang (2016)  
Resume Assignment  
Programming Assignment 1  
Reading Assignment 1 | Resume Assignment:  
Friday, 5/17 |

<table>
<thead>
<tr>
<th>Week 2 5/20</th>
<th>Topics/Daily Activities</th>
<th>Readings and Assignments</th>
<th>Deliverables/Due Dates</th>
</tr>
</thead>
</table>
| **Web Development Basics (1):**  
The basics of internet scripting languages, and creating basic web pages using HTML5 and JavaScript | Williamson (2014)  
Chellman (2016)  
Programming Assignment 2 (first scripting language)  
Reading Assignment 1 | Programming Assignment 1:  
Monday, 5/20  
Reading Assignment 1:  
Thursday, 5/24 |

| Week 3 5/28*  
*Monday, 5/27 is university holiday | Topics/Daily Activities | Readings and Assignments | Deliverables/Due Dates |
|-------------|-------------------------|--------------------------|------------------------|
| **Web Development Basics (2):**  
Styling web pages & introduction to user experience (UX) & user interface (UI) concepts | Marini (2015)  
Williamson (2012)  
Nodder (2017)  
Programming Assignment 2 (second scripting language)  
Discussion 1 | Programming Assignment 2 (first scripting language):  
Tuesday, 5/28 |

<table>
<thead>
<tr>
<th>Week 4 6/3</th>
<th>Topics/Daily Activities</th>
<th>Readings and Assignments</th>
<th>Deliverables/Due Dates</th>
</tr>
</thead>
</table>
| **Google Maps API (1):**  
Introduction to the Google Maps API and the uses of various web scripting languages | Fu & Sun (2011) Ch.2  
Programming Assignment 3  
Reading Assignment 2 | Programming Assignment 2 (second scripting language):  
Monday, 6/3  
Discussion 1:  
Thursday, 6/7 |

<table>
<thead>
<tr>
<th>Week 5 6/10</th>
<th>Topics/Daily Activities</th>
<th>Readings and Assignments</th>
<th>Deliverables/Due Dates</th>
</tr>
</thead>
</table>
| **Google Maps API (2):**  
Creating web maps embedded in web pages using Google Maps API: Static & Real-Time Data Display, Services, and Libraries | Programming Assignment 4  
Discussion 2 | Programming Assignment 3:  
Monday, 6/10  
Reading Assignment 2:  
Thursday, 6/13 |

<table>
<thead>
<tr>
<th>Week 6 6/17</th>
<th>Topics/Daily Activities</th>
<th>Readings and Assignments</th>
<th>Deliverables/Due Dates</th>
</tr>
</thead>
</table>
| **Mapbox API**  
Introduction to the Mapbox API and mapping with vector tiles | Programming Assignment 5  
Prep for Project Proposal Meeting | Programming Assignment 4:  
Monday, 6/17  
Discussion 2:  
Thursday, 9/24 |

<table>
<thead>
<tr>
<th>Week 7 6/24</th>
<th>Topics/Daily Activities</th>
<th>Readings and Assignments</th>
<th>Deliverables/Due Dates</th>
</tr>
</thead>
</table>
| **Geospatial Web Services**  
Introduction to geospatial web services and creating basic web maps and apps in the context of the Esri ecosystem | Fu & Sun (2011) Ch.3  
Fu (2016) Chs.1,2,5,9  
Zhao, Forester, & Yue (2012)  
Programming Assignment 6  
Reading Assignment 3 | Programming Assignment 5:  
Monday, 6/24  
Project Proposal Meetings: individual times TBD |

| Week 8* 7/1  
*Thursday, 7/4 is university holiday | Topics/Daily Activities | Readings and Assignments | Deliverables/Due Dates |
|-------------|-------------------------|--------------------------|------------------------|
| **Geospatial Mashups:**  
The basics of web GIS mashups and geoprocessing services. Approaches for creating advanced applications using the Esri ArcGIS Server and spatial geodatabases | Fu & Sun (2011) Ch.4  
Fu (2016) Ch.3,6,8  
Elwood, Goodchild, & Sui (2012)  
Lin (2013)  
Programming Assignment 7  
Reading Assignment 4 | Programming Assignment 6:  
Monday, 7/1  
Reading Assignment 3:  
Friday, 7/5 |
<table>
<thead>
<tr>
<th>Week 9 7/8</th>
<th>Topics/Daily Activities</th>
<th>Readings and Assignments</th>
<th>Deliverables/Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 10 7/15</td>
<td>Web GIS Apps in the Cloud: Developing web GIS applications in a commercial cloud environment. Critical assessment of the benefits and challenges of cloud vs. local virtual environments</td>
<td>Fu &amp; Sun (2011) Ch.8 Programming Assignment 9 Discussion 3</td>
<td>Programming Assignment 8: Monday, 7/15 Final Project Proposal: Thursday, 7/18</td>
</tr>
<tr>
<td>Week 12 7/29</td>
<td>The Future of Web GIS: Evaluating current open source and proprietary technologies that support web GIS and how these might shape the future of web GIS application development</td>
<td>Fu &amp; Sun (2011) Ch.9,10 Holman (2012) Final Project Application Implementation</td>
<td>Draft Report: Monday, 7/29 Reading Assignment 5: Thursday, 8/1</td>
</tr>
<tr>
<td>Week 13 8/5</td>
<td>Complete Final Project: Complete the development of your Final Project web GIS application, written report on and demo video of the app, and presentation to your classmates. Share your thoughts on the class and revel in your accomplishments.</td>
<td>Final Project Application Implementation Final Project Presentation Final Project Report Final Project Demo Video Discussion 4</td>
<td>Application Implementation: Wednesday, 8/7 Presentation: Thursday, 8/8 Final Report: Friday, 8/9 Demo Video Friday, 8/9 Discussion 4: Friday, 8/9 All work must be submitted by 5:00 pm PT Friday, 8/9</td>
</tr>
</tbody>
</table>

**Statement on Academic Conduct and Support Systems**

**Academic Conduct**

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, [http://policy.usc.edu/scientific-misconduct](http://policy.usc.edu/scientific-misconduct).
**Support Systems**

**Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call**
[engemannshc.usc.edu/counseling](http://engemannshc.usc.edu/counseling)
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

**National Suicide Prevention Lifeline – 1 (800) 273-8255 – 24/7 on call**
[www.suicidepreventionlifeline.org](http://www.suicidepreventionlifeline.org)
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

**Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call**
[engemannshc.usc.edu/rsvp](http://engemannshc.usc.edu/rsvp)
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

**Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086**
[equity.usc.edu, titleix.usc.edu](http://equity.usc.edu, titleix.usc.edu)
Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

**Bias Assessment Response and Support – (213) 740-2421**
[https://titleix.usc.edu/reporting-options/](http://https://titleix.usc.edu/reporting-options/)
Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

**The Office of Disability Services and Programs – (213) 740-0776**
[dsp.usc.edu](http://dsp.usc.edu)
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

**Student Support and Advocacy – (213) 821-4710**
[studentaffairs.usc.edu/ssa](http://studentaffairs.usc.edu/ssa)
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.
Diversity at USC – (213) 740-2101
diversity.usc.edu
Information on events, programs and training, the Provost’s Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety – - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu
Non-emergency assistance or information.

Resources for Online Students
The Course Blackboard page and the GIST Community Blackboard page have many resources available for distance students enrolled in our graduate programs. In addition, all registered students can access electronic library resources through the link https://libraries.usc.edu/. Also, the USC Libraries have many important resources available for distance students through the link: https://libraries.usc.edu/faculty-students/distance-learners. These include instructional videos, remote access to university resources, and other key contact information for distance students.