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

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Library Help: Andy Rutkowski
Office: VKC 36B
Office Hours: Tue 10 am-12 pm and Thurs 4:30-5:30 pm PT
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IT Help: Richard Tsung
Office: AHF 145D
Office Hours: By appointment
Contact Info: ctsung@usc.edu, 213-821-4415 (office)

Course Scope and Purpose

The main goal of this course is to help you become comfortable with building web-based mapping applications. Today, the ability to construct and implement of high-quality web GIS applications is a critical asset for in a variety of disciplines and industries. Learning to program innovative web-based mapping applications facilitates 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.

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 ArcGIS and Google Maps, and use various Application Programming Interfaces (APIs). You will learn the fundamentals of web GIS system architecture, 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.
- 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.

Students may vary in their competency levels on these abilities. You can expect to acquire these abilities only if you honor all course policies, attend classes regularly, complete all assigned work in good faith and on time, and meet all other course expectations of you as a student.

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.

Required Readings and Supplementary Materials

There are two required textbooks. These can be purchased from online outlets such as Amazon or directly from Esri Press.

- Fu, Pinde, and Jiulin Sun. 2011. *Web GIS: Principles and Applications*. Redlands, CA: Esri Press, 296 pp. ISBN 9781589482456
- Fu, Pinde. 2018. *Getting to Know Web GIS*. 3rd ed., Redlands, CA: Esri Press, 486 pp. ISBN 9781589485211

These books will be supplemented with Reading Notes and a mixture of readings from academic journals, professional reports, and authoritative websites.

- Elwood, Sarah, Michael F. Goodchild, and Daniel Z. Sui. 2012. Researching volunteered geographic information: Spatial data, geographic research, and new social practice. *Annals of the Association of American Geographers* 102(3): 571-590
- Goodchild, Michael F. 2008. Spatial accuracy 2.0. In *Proceedings of the 8th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences*, edited by Michael F. Goodchild and Jingxiong Zhang, 1-7 Edgbaston, UK: World Academic Press. Retrieved from http://www.geog.ucsb.edu/~good/papers/453.pdf

- Jones, Christopher B., and Ross S. Purves. 2008. Web-based GIS. In *The Handbook of Geographical Information Science,* edited by John P. Wilson and A. Stewart Fotheringham, 559-580. Oxford, UK: Wiley-Blackwell

- Lin, Wen. 2013. When Web 2.0 meets public participation GIS (PPGIS): VGI and spaces of participatory mapping in China. In *Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice,* edited by Daniel Z. Sui, Sarah Elwood and Michael F. Goodchild, 83-103*.* New York, NY: Springer

- Peng, Zhong-Ren, and Ming-Hsiang Tsou. 2003. Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Network. New York, NY: John Wiley & Sons (Ch. 10 only)

- Holman, Justin. 2012. Spatial Career Guide: 5 Key Skills for Future GIS Software Developers*.* Retrieved from http://www.justinholman.com/2012/03/29/spatial-career-guide-5-key-skills-for-future-gis-software-developers/

- Roth, Robert. 2015. Interactivity and cartography: A contemporary perspective on user interface and user experience design from geospatial professionals. *Cartographica* 50(2): 94-115

- Zhao, Peisheng, Theodore Forester, and Peng Yue. 2012. The geoprocessing web. *Computers & Geosciences* 47:3-12

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.

- Marini, Joe. 2015. JQuery Essential Training
- Nodder, Chris. 2017. UX Design Techniques: Overview
- Rand-Hendriksen, Morten. 2019. JavaScript Essential Training
- Williamson, James. 2012. CSS: Styling Navigation
- Williamson, James. 2013. Web Development Foundations: Web Technologies
- Williamson, James. 2017. HTML Essential Training
- Winesett, Jeff. 2017. Amazon Web Services Essential Training

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. 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 and Research Discussions – 9 worth a total of 18 points. These assignments combine reading, research, and discussion to help you evaluate and process course concepts. Structured discussions will focus on combinations of theory and practice. After completing assigned reading, you will respond to questions posed in a Discussion Forum with a new post and you will reply to your classmates' posts.

Programming Assignments – 9 worth a total of 45 points. You will complete nine assignments that involve the use of web scripting languages and web GIS software. These assignments are your chance to work with the concepts you are learning in the Reading and Research Discussions. Your submissions you will be a combination of a brief written responses and URLs to original working web pages and web-based mapping applications that you have created and pushed to the SSI web server.

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:

Assessment	Number	Points Each	Total Points
Weekly Assignments			
Student Resume	1	2	2
Reading and Research Discussions	9	2	18
Programming Assignments	9	5	45
Project Components			
- Proposal	1	3	3
- Draft Report	1	3	3
- Application Implementation	1	15	15
- Final Report	1	8	8
- Demo Video	1	2	2
- Presentation	1	4	4
Total	25	-	100

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

	Topics/Daily Activities	Assignments* and Readings *PA = Programming Assignment RRD = Reading and Research Discussion	Deliverables/Due Dates
Week 1 8/26	**Introduction** Intro to the course and building web pages with HTML5	Introductions Discussion Resume Assignment RRD 1 (Fu & Sun Chs.1-2; Jones & Purves) PA 1	Introductions Discussion: Friday, 8/30 Resume Assignment: Friday, 8/30
Week 2 9/3 * 9/2 is a university holiday	**Internet Scripting** The basics of internet scripting with JavaScript	PA 2	RRD 1: Tuesday, 9/3 PA 1: Thursday, 9/5
Week 3 9/9	**JavaScript and jQuery:** Using the popular JavaScript library to simplify its structure	RRD 2 PA 3	PA 2: Thursday, 9/12
Week 4 9/16	**Intro to Web Maps, Apps, and Services** Introduction to geospatial web services and creating basic web maps and apps in the context of the Esri ecosystem	RRD 3 (Fu & Sun Ch.3; Peng & Tsou; Zhao, Forester, & Yue) PA 4 (Fu Chs.1,2,3,5)	RRD 2: Monday, 9/16 PA 3: Thursday, 9/19
Week 5 9/23	**Advanced Apps; Raster and Geoprocessing Services** Expanded options for geospatial web services and advanced applications using the Esri ArcGIS Server and spatial geodatabases	RRD 4 (Fu & Sun Ch.6-7) PA 5 (Fu Chs.6-9)	RRD 3: Monday, 9/23 PA 4: Thursday, 9/26
Week 6 9/30	**Structures and Methods for Sharing Data and Code** The basics of web GIS mashups, geoportals, and the NSDI . Intro to APIs	RRD 5 (Fu & Sun Ch. 4; Elwood, Goodchild, & Sui); PA 6 (Fu Ch.10)	RRD 4: Monday, 9/30 PA 5: Thursday, 10/3
Week 7 10/7	**Expanding APIs** Drawing on APIs from Google and other web mapping sources	RRD 6 (Goodchild 2008; Lin) PA 7	RRD 5: Monday, 10/7 PA 6: Thursday, 10/10
Week 8* 10/14 *10/17-10/18 is a university holiday	**User Experience/User Interface (UX/UI)** Fundamental principles of web application design	RRD 7 (Roth)	RRD 6: Monday, 10/14

	Topics/Daily Activities	Assignments* and Readings *PA = Programming Assignment RRD = Reading and Research Discussion	Deliverables/Due Dates
Week 9 10/21	**Apps in the Cloud:** Basic concepts and services available for cloud-based infrastructure	PA8	PA 7: Monday, 10/21 RRD 7: Monday, 10/21
Week 10 10/28	**Final Project Proposal** Assess the platforms and skills you've learned in relation to your interests to propose a final project	Final Project Proposal	PA 8: Monday, 10/28
Week 11 11/4	**Your Choice: Building Web GIS in the Cloud OR Web Styling with CSS** Developing web GIS applications in a cloud environment OR learning the basics of CSS	PA 9	Final Project Proposal: Monday, 11/4 Project Proposal Meetings: Individual times TBD
Week 12 11/11	**Web GIS in Action** Evaluating current web GIS applications and technologies and how these might shape the future of web GIS application development	RRD 8 (Fu & Sun Ch.8-10; Holman)	PA 9: Monday, 11/11
Week 13 11/18	**Laying the Foundation** Research and draft the first four sections of your Final Project Report	Final Project Draft Report	RRD 8: Monday, 11/18
Week 14* 11/25 *11/27-12/1 is university holiday	**Work on Final Project** Continue the development of your application	Final Project Application Implementation	Draft Report: Monday, 11/25
Week 15 12/2	**Complete Final Project:** Complete the development of your Final Project web GIS application, written report on project, and demo video of the app. Share your thoughts on the class	Final Project: Application Implementation Demo Video Report RRD 9	Application Implementation: Thursday, 12/5 Final Report: Friday, 12/6 Demo Video: Friday, 12/6 RRD 9: Friday, 12/6 All work must be submitted by 5:00 pm PT Friday, 12/6
Finals Period 12/11-12/18	**Final Project Presentations** Present your project with a live demo of your web GIS and revel in your accomplishments	Final Project Presentations	Final Project Presentations: 12/11-12/18 (Exact date and times TBD)

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. 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.

Support Systems

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
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
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
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
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/
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

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

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.