USC Dornsife
Dana and David Dornsife
College of Letters, Arts and Sciences

SSCI 591, Web GIS

Syllabus

Units: 4

Term Day Time: Fall, 2021
Lecture: Tuesdays and Thursdays, 10:00-11:50 AM PT

Location: SCT 1501K & DENDornsife

Instructor: Jennifer N Swift, Ph.D. GISP
Office: AHF B57D
Regular Office Hours: Mondays 8:30am-9:30am am PT. Additional hour TBA. Also available most days and times by appointment via email.
Contact Info: jswift@usc.edu, 213-740-5841 (office), see contact page on D2L for Zoom Room

Library Help: Andy Rutkowski
Office: VKC B36B
Office Hours: Tuesdays 10:00 a.m.-12:00 p.m. and Thursdays 4:30-5:30 p.m.
Contact Info: arutkows@usc.edu, 213-740-6390 (office), see contact page on D2L for Zoom Room

IT Help: Richard Tsung
Office: AHF B57E
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 and mobile mapping applications. Today, the ability to construct and implement high-quality web GIS and mobile GIS applications is a critical asset in a variety of disciplines and industries. Learning to program innovative web and mobile mapping applications facilitates dissemination of your work, and at the same time expands your overall application development skillset. Familiarity with internet scripting languages and how these are utilized to implement web and mobile GIS applications provides in-depth insight into how many government and commercial organizations, as well as individuals, develop these tools.

This course will use modern software tools and information to develop and implement customized web and mobile GIS applications. The students taking this course have varying levels of prior programming experience and may be new to web scripting and web and mobile GIS application development. Essential practical as well as theoretical concepts of web and mobile GIS are covered. You will learn to develop applications through popular platforms such as Esri ArcGIS and Google Maps and use various Application Programming Interfaces (APIs). You will learn the fundamentals of web GIS system architecture, optimization for mobile GIS, 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 and mobile mapping applications.

By both necessity and design, this course serves several different audiences. This class is an elective for the Geographic Information Science & Technology M.S. Program's Spatial Data Management and Analytics Tracks and the and Graduate Certificate Program, is required in the Geographic Information Science & Technology M.S. Program's Coding and Apps Track, and is an elective in the Geospatial Leadership Graduate Certificate Program, in the Remote Sensing for Earth Observations Graduate Certificate Program, and in the Spatial Data Science 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 and mobile GIS technologies are applicable to academia, e-business, and e-government.

- Identify web and mobile 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.

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

Class Conduct

Harassment, sexual misconduct, interpersonal violence, and stalking are not tolerated by the university. All faculty and most staff are considered Responsible Employees by the university and must forward all information they receive about these types of situations to the Title IX Coordinator. The Title IX Coordinator is responsible for assisting students with supportive accommodations, including academic accommodations, as well as investigating these incidents if the reporting student wants an investigation. The Title IX office is also responsible for coordinating supportive measures for transgender and nonbinary students such as faculty notifications, and more. If you need supportive accommodations, you may contact the Title IX Coordinator directly (titleix@usc.edu or 213-821-8298) without sharing any personal information with me. If you would like to speak with a confidential counselor, Relationship and Sexual Violence Prevention Services (RSVP) provides 24/7 confidential support for students (213-740-9355 (WELL); press 0 after hours).

Course Structure

The main theoretical concepts are provided through in-class lectures, instructor-guided peer-peer activities and discussions during class meetings, , simultaneously conducted online through class meeting links in D2L, and directed reading of the textbooks and supplementary readings. Additional readings will be assigned to expand on the text when needed. The course will generally unfold on a multi-weekly basis. When possible, assignments will be given in advance, but usually they will be posted on or before Mondays.

Workload – 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 GIST Server; hence, you do not need to install it on your own computer. Instead, every student must have the following technology requirements:

- A computer with a fast Internet connection.
- A functional webcam and a microphone for all class meetings and presentations.
- An up-to-date web browser to access the Server.

If a student does not have access to any of these, please speak with the instructor at the start of the semester. Also, see the USC ITS Student Toolkit here: https://keepteaching.usc.edu/students/student-toolkit/

SSI Server and Tech Support – 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 issues, send an email using your USC account to SSI Tech Support at spatial_support@usc.edu, making sure to copy (cc) me on the email.

Communications – This course is an on campus, in person course that accommodates remote/distance learning as well (DEN), so our interactions will be synchronous and asynchronous (not at the same time). All materials to be handed in will be submitted via D2L. 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 D2L. Be sure to check these each time you log onto D2L.

I will send via email through D2L any notices that are time sensitive. Please be sure that you read as soon as possible all email sent from D2L 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 D2L account does not go into your junk mail!

While I am usually on campus or on-line all day and will probably respond to emails from students very quickly, 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 D2L site.

Discussion forums – On the D2L 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 you may have experienced in traditional classrooms. Here students can provide support to each other while working on your 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

The required textbooks for this course are:

- Fu, P., and J. Sun. 2011. *Web GIS: Principles and Applications*. Redlands, CA: Esri Press.
- Fu, P. 2020. *Getting to Know Web GIS*. 4th ed., Redlands, CA: Esri Press. While you may purchase this book if you wish to own a bound copy, it is available online through the USC Libraries. Sign on to the USC Libraries and search for this title.
  Used copies of both books are widely available online, so there is no need to pay the full retail price.

Supplementary readings will be assigned from various sources including but not limited to:

- Amazon. 2021. Amazon web services simple monthly calculator." Accessed March 15, 2021. https://calculator.s3.amazonaws.com/index.html.
- Arribas-Bel, Dani, and Jon Reades. 2018. "Geography and computers: Past, present, and future." *Geography Compass* 12(10): e12403.
- Awange, Joseph, and John Kiema. 2019. "Web GIS and Mapping." In *Environmental Geoinformatics*, *Environmental Science and Engineering*, 249-262. Springer: Cham, Switzerland.
- Gibbons, Rich. 2019. "Counting the costs of IaaS and SaaS. Computing Weekly." TechTarget, Inc. Accessed March 15, 2021. https://www.computerweekly.com/feature/Counting-the-costs-of-IaaS-and-SaaS.
- 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, United Kingdom: World Academic Press.
- Huang, Q. 2019. "Programming of Mobile GIS Applications." *The Geographic Information Science & Technology Body of Knowledge, 1st Quarter 2020 ed.* John P. Wilson (Ed).
- Nittel, Silva, Lars Bodum, Kieth C. Clarke, Michael Gould, Paulo Raposo, Jayant Sharma, and Maria Vasardani. 2016. "Emerging technological trends likely to affect GIScience in the next twenty years." In *Advancing geographic information science: The past and next twenty years*, edited by Harlan Onsrud and Werner Kuhn, 45-48. Needham, Massachusetts: GSDI Association Press.
- Quinn, Sterling. 2018. "Web GIS." *The Geographic Information Science & Technology Body of Knowledge, 1st Quarter 2018 ed.* John P. Wilson (Ed).
- Ricker, Britta and Robert E. Roth. 2018. "Mobile Maps and Responsive Design." *The Geographic Information Science & Technology Body of Knowledge, 2nd Quarter 2018 ed.* John P. Wilson (Ed).
- Roth, Robert. 2015. "Interactivity and cartography: A contemporary perspective on user interface and user experience design from geospatial professionals." *Cartographica* 50(2): 94-115
- Swift, Jennifer, and Daniel Goldberg. 2019. "Web GIS Programming." *The Geographic Information Science & Technology Body of Knowledge, 1st Quarter 2019 ed.* John P. Wilson (Ed).
- Yue, Peng, Raul Ramachandran, and Peter Baumann. 2015. "Editorial: Intelligent GIServices." *Earth Science Informatics* 8: 461–462.
- Zhao, Peisheng, Theodore Forester, and Peng Yue. 2012. "The geoprocessing web." *Computers & Geosciences* 47:3-12

You will also conduct online library research to find articles that apply specific techniques in an application area of your choice for several of the assignments in this course.

Description and Assessment of Assignments

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

Resume Assignment - 2 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.

Projects - 5 worth a total of 60 points. These assignments require students to complete the basic types of programming projects asked of professional web GIS application developers in real world settings. Prompts will list helpful information, such as Esri, JavaScript and other web scripting tutorials, for becoming familiar with ways that concepts learned in the course are implemented in various geospatial software packages. The deliverables will be final written summaries of the students' goals, methods, data, and results for each project.

Reading and Research Discussions - 4 worth a total of 16 points. These assignments call on students to critically analyze required readings, identify relevant case studies employing the methodologies and concepts we cover in class, and to discuss them with the instructor and their classmates during synchronous meetings and/or online discussion forums via D2L.

Comprehensive Exam - 1 worth 22 points. The comprehensive exam will cover material learned throughout the duration of the semester. It may be mixed format and may consist of multiple choice, short answer, and simple problem questions.

Grading Breakdown

Assessment	Number	Points Each	Total Points
Resume Assignment	2	1	2
Reading and Research Assignments	4	4	16
Projects	5	12	60
Comprehensive Exam	1	22	22
Total	12		100

Assignment Submission Policy

Unless otherwise noted, assignments must be submitted via D2L by the due dates specified in the Course Schedule below and on the assignment instructions.

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.

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 classes.

Weekly Course Breakdown

<table>
<tr><th>Week</th><th>Topic</th><th>Assignments</th><th>Deliverables: Due Dates</th></tr>
<tr><td colspan="4">Module 1 | Introduction to Internet Scripting for Web GIS</td></tr>
<tr><td>Week 1
8/23</td><td>Introduction
to the Course and
Building Web Pages</td><td rowspan="3">Resume Assignment
Reading & Research
Discussion (RRD) 1
Project 1
Awange and Kiema
Fu and Sun, Ch. 1, 2
Quinn
Swift & Goldberg</td><td rowspan="3">Resume Assignment 1:
Monday, 8/30
RRD1 Forum Posts:
See Prompt
RRD1 Synchronous
Discussion:
Thursday, 9/2
Project 1 Workflow:
Tuesday, 9/7</td></tr>
<tr><td>Week 2
8/30</td><td>Basic Internet
Scripting with
JavaScript</td></tr>
<tr><td>Week 3
9/6*
9/6 is a
university holiday</td><td>Using the JavaScript
Library</td></tr>
<tr><td colspan="4">Module 2 | Fundamentals of Web Maps, Applications, and Services</td></tr>
<tr><td>Week 4
9/13</td><td>Geospatial Web
Services, Web Maps,
Apps, and
Dashboards</td><td rowspan="2">Project 2
RRD2
Fu, Ch. 1-3, 5-9
Fu and Sun, Ch. 3
Yue et al.</td><td rowspan="2">Project 1 Report:
Monday, 9/13
RRD2 Forum Posts:
See Prompt
Project 2 Workflow:
Tuesday, 9/21
RRD2 Synchronous
Discussion:
Thursday, 9/23</td></tr>
<tr><td>Week 5
9/20</td><td>Raster and
Geoprocessing
Services in Web GIS
Apps and Notebooks</td></tr>
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Week	Topic	Assignments	Deliverables: Due Dates
Module 3 | Web GIS API's			
Week 6 9/27	Sharing Data and Code: Mashups, Geoportals and NSDI	Project 3 RRD3 Fu, Ch 10. Fu and Sun, Ch. 4, 6, 7 Zhao et al. 2012	Project 2 Report: Monday, 9/27 RRD3 Forum Posts: See Prompt RRD3 Synchronous Discussion: Thursday, 10/7 Project 3 Workflow: Tuesday, 10/12
Week 7 10/4	Introduction to Web GIS APIs		
Week 8 10/11* *10/14-10/15 is a university holiday	Coding with Google Maps and Other Web GIS API'S		
Module 4 | Web GIS Applications for Mobile Devices			
Week 9 10/18	User Experience/User Interface (UX/UI) Design	Project 4 RRD4 Fu, Ch. 4 Huang Ricker & Roth Roth	Project 3 Report: Monday, 10/18 RRD4 Forum Posts: See Prompt Project 4 Workflow: Tuesday, 10/26 RRD4 Synchronous Discussion: Thursday, 10/28
Week 10 10/25	Building Web GIS applications for mobile devices		
Module 5 | Web GIS Application Development in the Cloud			
Week 11 11/1	Cloud-Based Infrastructure	Project 5 Fu, Ch. 8, 9 Amazon Arribas-Bel et al. Gibbons Nittel et al.	Project 4 Report: Monday, 11/1 Project 5 Workflow: Tuesday, 11/16 Project 5 Report: Tuesday, 11/30 Resume Assignment 2: Wednesday, 12/1 All assignments must be submitted no later than 5:00 PM PT on 12/3
Week 12 11/8	Developing Web GIS Applications in the Cloud		
Week 13 11/15	Future challenges for Web and Mobile GIS Programmers		
Week 14* 11/22* *11/24-11/26 is a university holiday	Project 5 Workflow Reviews		
Week 15 11/29	Resume Workshop & Comprehensive Exam Review		
Exam Week 12/8-15	**Comprehensive Exam**		Tuesday, December 14, 8:00 AM – 10:00 AM PT

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 https://policy.usc.edu/files/2020/07/SCampus-Part-B-1.pdf. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems

Counseling and Mental Health– (213) 740-9355 – 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
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) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) – (213) 740-5086 |Title IX Compliance – (213) 821-8298
equity.usc.edu, titleix.usc.edu
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment– (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, 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.

USC Campus Support and Intervention – (213) 821-4710
campussupport.usc.edu
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
Emergency assistance and avenue to report a crime. Latest updates regarding safety, 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 D2L 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.