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

SSCI 591, Web and Mobile GIS

Syllabus

Units: 4

Term Day Time: Fall, 2022, M and W 9:00-10:50 AM PT

Location: AHF 145D and DENDornsife

Instructor: Jennifer N Swift, Ph.D. GISP
Office: AHF B57D
Regular Office Hours: T 11:00 am-12:00 pm and Th 1-2:00 pm PT. 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: LIPA B40-A
Office Hours: Thu 10am - 12 pm or by appointment
Contact Info: arutkows@usc.edu,

IT Help: Dornsife Technology Services
Office Hours: SHS 260
Contact Info: spatial_support@usc.edu,213-740-2775

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 and use different web scripting languages commonly used in web GIS application development to extend open source and proprietary GIS software functionality.
- Critically evaluate the benefits and challenges of developing web GIS applications using different software and system architectures, including 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.

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
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).

COVID-19 policy -- Students are expected to comply with all aspects of USC's COVID-19 policy including, but not limited to, vaccination, indoor mask mandate, and daily TrojanCheck. Failure to do so may result in removal from the class and referral to Student Judicial Affairs and Community Standards. Students are recommended to keep safe physical distancing, whenever possible, to prevent any possible transmission. Please contact your instructor if you have any safety concerns.

Diversity and Inclusion – It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful to everyone, and you are also expected to respect of others regardless of their race, ethnicity, gender identity and expressions, cultural beliefs, religion, sexual orientation, national origin, age, abilities, ideas and perspectives, or socioeconomic status. Your suggestions are encouraged and appreciated. Feel free to let me know ways to improve the effectiveness of the course for you personally or for other students.

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/

Desire2Learn (D2L) – This course will utilize the Desire2Learn (D2L) learning management system which allows students to access course content, upload assignments, participate in discussion forms, among other learning experiences. The D2L platform provides flexibility in the learning experience where students can participate in the course residentially or remotely, synchronously (meeting together at the same time) or asynchronously (accessing videos and course content outside of class).

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 – All assignments given and all materials to be handed in will be submitted via D2L. The instructor will also create and monitor discussion forums through which students can discuss issues and assignments as needed. Students should read all email sent from D2L or from course instructor(s) as soon as possible. Also, students who do not regularly use their USC email accounts should double-check to be sure that mail sent from both the D2L accounts and the instructor's account (noted above) to your USC account is forwarded to an address used regularly and does not go into junk mail. The instructor will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 72 hours delay. In the rare case that an instructor is off-line for an extended periodof time, an announcement will be posted to the class D2L site. Due to the synchronous and asynchronous nature of this course, it is each student's responsibility to stay informed and connected with others in our course. In addition to email, students are expectedto login to D2L regularly to check for announcements.

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 textbook for this course is:

- Fu, P. 2022. *Getting to Know Web GIS*. 5th ed., Redlands, CA: Esri Press. This book is available online through Amazon and Barnes & Noble.

Supplementary readings will be assigned from various sources including:

- Amazon. 2022. Amazon web services simple monthly calculator." Accessed August 20, 2022. https://calculator.aws/.
- 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.
- Fu, P., and J. Sun. 2011. *Web GIS: Principles and Applications*. Redlands, CA: Esri Press.
- Gibbons, Rich. 2019. "Counting the costs of IaaS and SaaS. Computing Weekly." TechTarget, Inc. Accessed August 20, 2022. 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, Peter Baumann, Kaylin Bugbee, and Liangcun Jiang. 2015. "Towards Intelligent GIServices." *Earth Science Informatics* 8: 463-481.

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. A second resume assignment provides you a chance to add any newly learned tools and project products in this course to your resume. 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.

Schedule

Week	Topic	Assignments	Deliverables: Due Dates
Module 1 | Introduction to Internet Scripting for Web GIS			
Week 1 8/22	Introduction to the Course and Building Web Pages	Resume Assignment Reading & Research Discussion (RRD) 1 Project 1 Awange and Kiema (2019) Fu and Sun (2011), Ch. 1, 2 Quinn (2018) Swift & Goldberg (2019)	Resume Assignment 1: Monday, 8/29 RRD1 Forum Posts: See Prompt RRD1 Synchronous Discussion: Wednesday, 8/31 Project 1 Workflow: Wednesday, 9/7
Week 2 8/29	Basic Internet Scripting with JavaScript		
Week 3 9/6 *Monday, 9/5 is a university holiday (Labor Day)	Using the JavaScript Library		

Week	Topic	Assignments	Deliverables: Due Dates
Module 2 | Fundamentals of Web Maps, Applications, and Services			
Week 4 9/12	Geospatial Web Services, Web Maps, Apps, and Dashboards	Project 2 RRD2 Fu (2022), Ch. 1-3, 5-7 Fu and Sun (2011), Ch. 3 Yue et al. (2015)	Project 1 Report: Monday, 9/12 RRD2 Forum Posts: See Prompt Project 2 Workflow: Monday, 9/19 RRD2 Synchronous Discussion: Wednesday, 9/21
Week 5 9/19	Raster and Geoprocessing Services in Web GIS Apps and Notebooks		
Module 3 | Web GIS API's			
Week 6 9/26	Sharing Data and Code	Project 3 RRD3 Fu (2022), Ch. 10 Fu and Sun (2011), Ch. 4, 6, 7	Project 2 Report: Monday, 9/26 RRD3 Forum Posts: See Prompt RRD3 Synchronous Discussion: Wednesday, 10/5 Project 3 Workflow: Monday, 10/10
Week 7 10/3	Introduction to Web GIS APIs		
Week 8 10/10* *10/13-10/14 is a university holiday	Coding with Google Maps and Other Web GIS API'S		
Module 4 | Web GIS Applications for Mobile Devices			
Week 9 10/17	User Experience/User Interface (UX/UI) Design	Project 4 RRD4 Fu (2022), Ch. 4 Huang (2019) Ricker & Roth (2018) Roth (2015)	Project 3 Report: Monday, 10/17 RRD4 Forum Posts: See Prompt Project 4 Workflow: Monday, 10/24 RRD4 Synchronous Discussion: Wednesday, 10/26
Week 10 10/24	Building Web GIS applications for mobile devices		
Module 5 | Web GIS Application Development in the Cloud			
Week 11 10/31	Cloud-Based Infrastructure	Project 5 Fu (2022), Ch. 8, 9	Project 4 Report: Monday, 10/31
Week 12 11/7	Developing Web GIS Applications in the Cloud		

Week	Topic	Assignments	Deliverables: Due Dates
Week 13 11/14	Future challenges for Web and Mobile GIS Programmers	Amazon (2022) Arribas-Bel et al. (2018) Gibbons (2019) Nittel et al. (2016)	Project 5 Workflow: Monday, 11/14 Project 5 Report: Monday, 11/28 Resume Assignment 2: Wednesday, 11/30 All assignments must be submitted no later than 5:00 PM PT on 12/2
Week 14* 11/21* *11/23-11/24 is a university holiday	Project 5 Workflow Reviews		
Week 15 11/28 Friday, 12/2 is the last day of class, 12/3-12/6 study days	Resume Workshop & Comprehensive Exam Review		
Final Exams 12/7-12/14	Comprehensive Exam		Monday, December 12, 11:00 AM – 1:00 PM 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" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on Research and Scholarship Misconduct.

Students and Disability Accommodations

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu

Support Systems

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.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
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 for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
eeotix.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 for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
osas.usc.edu
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

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, Equity, and Inclusion - (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.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
ombuds.usc.edu
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

*Occupational Therapy Faculty Practice - (323) 442-33*40 or otfp@med.usc.edu
chan.usc.edu/otfp
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

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.