

USC Dornsife

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

SSCI 301, Maps and Spatial Reasoning

Syllabus

Units: 4

Term Day Time*: Fall 2020

Lecture: Tuesday and Thursday, 9:30-10:50 am

Labs: See schedule.

Note: This class will be offered in a hybrid format. Lectures will be offered in person and streamed for remote access. All lab/discussion sections will be offered online. Students must enroll in the lecture and one lab/discussion section.

Location: TBD

Instructor: Laura C Loyola, PhD

Office: AHF B55A

Regular Office Hours: Wed 10-11 am and Thurs 12-1 pm PT. Also available most days and times by appointment via email.

Contact Info: loyola@usc.edu, 213-740-5612;
323-457-3504 (remote office)

Lab Instructor: TBD

Office: AHF B55

Regular Office Hours: Also available by appointment via email.

Contact Info:

Library Help: Andy Rutkowski

Office: VKC 36B

Office Hours: Tue 10 am-12 pm and Thu 4:30-5:30 pm PT

Contact Info: arutkows@usc.edu, 213-740-6390;
<http://bit.ly/andyhangout>

IT Help: Richard Tsung

Office: AHF 145D

Office Hours: By appointment

Contact Info: spatial_support@usc.edu, 213-821-4415

Course Scope and Purpose

Maps have long played a role in the production and use of geographic information. They support many different kinds and levels of spatial reasoning, from simple queries (route finding, proximity analysis) to more advanced forms of spatial analysis and modeling. An explosion in geographic information (GI) technologies over the past two decades has enabled the development of quick visualization tools (Google Maps), sophisticated GISystems (GIS) such as ArcGIS and TerrSet, and many kinds of GPS-enabled sensors. Users can be found across society: social workers use GIS to track where clients live and where more social services are needed, urban planners use GIS to analyze the transformation of city spaces, landscape architects use GIS to design and track the status of their individual project sites, anthropologists use GIS to map the changing cultural patterns of a neighborhood, historians use GIS to map historical transformations across space, environmental scientists use GIS to track how natural disasters and groundwater flows interact with human-environment systems, and emergency responders use GIS to track where earthquake or hurricane survivors need assistance – to name a few.

Taken as a whole, this course provides a broad understanding (theoretical and technical) for later work with geographic information, regardless of background and/or academic interests. It introduces the geographic information technologies and spatial skills needed to map, model, and predict how physical and social phenomena develop and change. In these ways, the spatial sciences can significantly affect the way research is conducted, profoundly impact the way we understand the world, and help us to prepare plans and designs that will dramatically improve the quality of life for those whose life experiences and prospects are shaped by spatial processes.

This course is designed to serve several different student audiences given its role as a required course in the B.S. in GeoDesign, B.S. in Global Geodesign, B.S. in Environmental Studies, and the GIS and Sustainability Science, Human Security and Geospatial Intelligence, and Spatial Sciences Minors. Each student is encouraged to utilize the laboratory experience and self-directed capstone research project to explore geospatial resources and computational techniques, such as data modeling, spatial analysis, and data visualization, with their own academic and professional goals in mind.

Learning Outcomes

On completion of this course, students should be able to:

- Explain how modern geographic analysis and visualization tools can be used across a variety of disciplines;
- Describe the main types of maps and discuss the issues pertaining to geographic information and the creation of maps;
- Discuss data representation methods and implications for selecting certain methods
- Create quantitative and qualitative maps that communicate the products of spatial data analysis; and

- Apply modern mapping and GIS technologies to problem solving within diverse fields of study.

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

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

This is a four-credit course comprised of lectures (two per week) and lab (one per week). The lecture sessions will discuss various aspects of cartography, spatial reasoning, and the hardware and software systems used to investigate these processes. The weekly lab meetings are designed to introduce you to the tools of scientific inquiry and to give you practical experience in implementing these tools to explore various problems within the framework of the scientific method. The lecture and lab sessions are designed to complement each other to provide you with sound theoretical reasoning and the technical skills to investigate various physical and/or social processes. Your weekly laboratory assignments will be graded and returned via Blackboard, and the exams will all have a laboratory component to them. **It is required that you register for both the lecture and one laboratory session for this course.**

Technological and Communication Requirements

This class incorporates in-class activities that at times may be completed on a smart phone, tablet, or laptop computer. If a student does not have access to any of these, please speak with the instructor at the start of the semester to establish a workaround. GIS software and the geospatial data required for course assignments will be accessed using computing resources provided by the Spatial Sciences Institute. No previous experience is required.

SSI Server and Tech Support – This course utilizes the SSI Server, which is a virtual desktop giving access to many different professional software programs. If you are unable to connect to the server or experience any type of technical issues, send an email using your USC account to Tech Support at spatial_support@usc.edu, making sure to copy (cc) your instructor on the email. Questions pertaining to specific assignments should be directed to your lab instructor.

Communications – All course materials and correspondence will be posted on the course Blackboard website. Your assignments will be graded and returned via Blackboard. As a registered student you will find this course available for you to access at 10 am PT on the first day of classes. In addition to email about time-sensitive topics, announcements will be posted on the Blackboard Announcement page. It is each student's responsibility to stay informed as to course activities and updates. All students are in charge of ensuring that email sent from the USC Blackboard account is not directed to junk mail.

The instructor will endeavor to respond to email within 24 hours of receipt, aiming for no more than a 72-hour delay. An announcement will be posted in the rare instance when an instructor is offline for 72 hours or more.

Required Readings and Supplementary Materials

The required textbooks for this course are:

- Kimerling, A. Jon, Aileen R. Buckley, Phillip C. Muehrcke, and Juliana O. Muehrcke. 2016. *Map Use: Reading, Analysis, Interpretation*, 8th Ed., Redlands, CA: Esri Press.
- Smith, David, Nathan Strout, Christian Harder, Steven Moore, Tim Ormsby, and Thomas Blastrom. 2018. *Understanding GIS: An ArcGIS Pro Project Workbook*, 4th Ed., Redlands, CA: Esri Press.

The following readings will be posted to Blackboard:

- Biehl, Alec, Alireza Ermagun, Amanda Stathopoulos. Community Mobility MAUP-ing: A Socio-spatial Investigation of Bikeshare Demand in Chicago. *Journal of Transport Geography*. 66: 80-90.
- Cetl, Vlado, Tomáš Kliment, and Tomislav Jogen. 2017. "A Comparison of Address Geocoding Techniques – Case Study of the City of Zagreb, Croatia." *Survey Review*, 50:359.
- Esri. 2003. *ArcGIS: Working With Geodatabase Topology*, An Esri White Paper. Redlands, CA: Esri.
- Goodchild, Michael. 2007. "Citizens as Sensors: The World of Volunteered Geography." *GeoJournal* 69(4): 211-221.
- Harley, John Brian. 2001. *The New Nature of Maps: Essays in the History of Cartography*. Baltimore, MD: The Johns Hopkins University Press. (chapter 2)
- Harvey, Francis. 2016. *A Primer of GIS: Fundamental Geographic and Cartographic Concepts* (Second Edition). New York: Guilford Press. (chapter 8).
- Hogdson, Jarrod C. Shane M. Baylis, Rowan Mott, Ashley Herrod, and Rohan H. Clarke. 2016. Precision Wildlife Monitoring Using Unmanned Aerial Vehicles. *Scientific Reports*. 6: 22574. [doi:10.1038/srep22574](https://doi.org/10.1038/srep22574)

- Hubbard, Phil, Rob Kitchin, Brendan Bartley, and Duncan Fuller. 2002 (reprint 2005). *Thinking Geographically: Space, Theory and Contemporary Human Geography*. New York: Continuum. (chapter 1)
- Logan, John R. 2012. Making a Place for Space: Spatial Thinking in Social Science. *Annual Review of Sociology*. 38 (August). [doi:10.1146/annurev-soc-071811-145531](https://doi.org/10.1146/annurev-soc-071811-145531)
- Reynard, Darcy. 2018. Five Classes of Geospatial Data and the Barriers to Using Them. *Geography Compass*. (January). <https://doi.org/10.1111/gec3.12364>
- Snyder, John P. 2011. "Emergence of Map Projections" (Excerpt from *Flattening the Earth: Two Thousand Years of Map Projections*) in *The Map Reader: Theories of Mapping Practice and Cartographic Representation*, 1st Edition. Edited by Martin Dodge, Rob Kitchin and Chris Perkins. John Wiley & Sons.
- Van Oort, P.A.J. (Pepijn). 2005. *Spatial Data Quality: From Description to Application*. Doctoral dissertation, Netherlands Geodetic Commission, Delft. (selected chapters)
- Zeiler, Michael and Jonathan Murphy. 2010. *Modeling Our World: The Esri Guide to Geodatabase Concepts*. Redlands, CA: Esri Press.

Description and Assessment of Assignments

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

In-Class Work (6%): A grade for the semester will be assigned based on your engagement in class, discussion posts and/or in-class active learning activities. Students are expected to complete and discuss assigned reading, engage in lecture material, share and discuss course assignments, complete and discuss in-class assignments, among other forms of active engagement in the course. Students will be required to also engage with and share course concepts via the Discussion Board. Students will earn full credit by engaging consistently throughout the entirety of the semester.

Wiki (5%): The class will collectively populate a course Wiki on Blackboard with web pages set up on relevant topics. The Wiki will be a place for students to share research and build a study guide of key concepts. Students will earn full credit by adding meaningful content throughout the semester.

Laboratory Assignments (30%): This course includes a laboratory meeting each week to develop technical competency with geospatial software platforms and analytic tools. There will be a total of ten laboratory reports due over the course of the semester, and one week will include an outdoor (open-air) field assignment within the greater Los Angeles area, or geographic area of your choosing. The weekly laboratory sessions will run just one hour of the allotted time, as shown in the Schedule of Classes and will entail discussions of the previous and the next week's lab assignments.

Absences from lab (discussion) sessions must be requested by sending an email to the laboratory instructor for your lab section *prior to the lab discussion session you need to miss*. Excused absences from lab discussion sections will be granted only for valid reasons; please notify us of the reason for your absence in your email.

Mid-Term Exam (15%): The mid-term exams may be mixed format and may consist of multiple choice, short answer, and simple problem questions. Students are expected to take the exams at the indicated times.

Final Project (22%): The final project is the capstone assignment for this course. Students will be expected to draw upon course lectures, discussions, lab assignments, readings, and outside sources to organize and deliver a self-directed study utilizing spatial analysis and geospatial technologies. The four deliverables for this project are: 1) a project proposal; 2) a mid-project report; 3) a final written report; and 4) an oral presentation in class.

Final Exam (22%): The final exam may be mixed format and may consist of multiple choice, short answer, and simple problem questions. Students are expected to take the exam at the indicated time.

Grading Breakdown

Assessment	Number	Points Each	Total Points
In-Class Work		6	6
Wiki		5	5
Laboratory Assignments	10	3	30
Mid-term Exam	1	15	15
Final Project	1	22	22
Final Exam	1	22	22
Total		-	100 points

Assignment Submission Policy

Students are expected to attend and participate in every class and lab session and to complete and upload all assignments before the deadlines detailed in the Course Schedule. All assignments will be submitted for grading via Blackboard. Late work will be assessed a penalty of 10% per day and zero grades will be assigned for work that is more than seven days late. Additionally, no work will be accepted for grading after 5 p.m. PT on the last day of classes.

Schedule

	Topic	Readings and Assignments	Deliverables/Due Dates
Module 1: Spatial Thinking and GIS			

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 1 8/18 8/20	<p>Introduction to the Course and GIS Introduction to the class and discussion of goals, assignments, projects, technology. Current uses of Geographic Information Systems and how GIS is applied in our current world</p> <p>Spatial Reasoning A discussion of key concepts underlying spatial sciences, the scientific method, and spatial reasoning</p>	Kimerling, Introduction; Hubbard, Ch. 1; Logan (pp.1-11, 14-15)	No labs
Module 2: Geodesy and Formalizing Space Locations			
Week 2 8/25 8/27	<p>An Introduction to Geodesy Overview of the concepts and terms from the geoid and spheroids to coordinate systems</p> <p>Map Projections Map projections and the difference between PCS, mapping issues</p>	Kimerling, Ch. 1 and 3	Lab Report 1: Introduction to mapping and SSI technologies /Due one week after lab
Week 3 9/1 9/3	<p>Projected Coordinate Systems (PCS) Discussion and explanation of projected coordinate systems and their importance.</p> <p>Administration of Space and the Power of Maps Discussion of traditional knowledge and place names, current ways space is administered and the power inherent in creating maps and its historical consequences</p>	Kimerling, Ch. 4; Synder; Kimerling, Ch. 5; Harley 2001;	Lab Report 2: UGIS Lessons 1 – 2/Due one week after lab
Week 4 9/8* *Monday, 9/7 is university holiday	<p>Final Project Discussion Discuss expectations, rubric and past examples of capstone project;</p>		Lab Report 3: UGIS Lessons 3 – 4/Due one week after lab

	Topic	Readings and Assignments	Deliverables/Due Dates
Module 3: Maps and Cartographic Elements			
9/10	<p>Digital Representation of Data and Types of Maps</p> <p>Discussion of methods and issues relating to representing the physical world in digital and print maps</p>	Kimerling, Ch. 7-9 (DEM section only of Ch. 9); Esri MapBook selections	
<p>Week 5 9/15</p> <p>9/17</p>	<p style="text-align: center;">Scale</p> <p>Discuss concepts of scale in physical and social processes as well as in cartography</p> <p>Cartography and Graphic Elements</p> <p>Discussion of map design principles, symbology, and cartographic technique. The use of graphics to communicate, stylize, and problem solve</p>	Kimerling, Ch. 2; Biehl et al 2018; Kimerling Ch. 6	Lab Report 4: Map Production: UGIS Lessons 5 – 6/ Due one week after lab
Module 4: Geolocation			
<p>Week 6 9/22</p> <p>9/24</p>	<p>Project Proposal Peer Review</p> <p>In class peer-review of final project proposal, including proposed data; review Core Geospatial Datasets for spatial analysis and research methods; Midterm review – open questions</p> <p style="text-align: center;">Orienteering</p> <p>Discussion and exercise with traditional methods for wayfinding</p> <p>Midterm – Open Book; asynchronous</p>	Kimerling, Ch. 13	Lab Report 5: UGIS Lessons 7 – 8 /Due one week after lab
<p>Week 7 9/29</p> <p>10/1</p>	<p>Global Navigation Satellite Systems</p> <p>Overview of technologies and uses of GNSS and GPS</p> <p>Geocoding and Georeferencing</p> <p>Exploration of the problems associated with place-names, street addresses and other human systems and how to define real-world locations</p>	Harvey, Ch. 8: Cetl et al 2017	Lab Report 6: UGIS Lesson 9: printed and online map publication /Due one week after lab

	Topic	Readings and Assignments	Deliverables/Due Dates
Module 4: The Modern Geospatial Workflow			
Week 8 10/6 10/8	<p style="text-align: center;">Geospatial Data Collection</p> Discussion of geospatial data collection workflows and primary data collection; accuracy and precision <p style="text-align: center;">Digital Data Acquisition</p> Guest Speaker: Andy Rutkowski, Data Visualization Specialist – Introduction to spatial data and ethics.	Kimerling, Ch. 11;	Lab Report 7: Data processing and visualization/Due one week after lab
Week 9 10/13 10/15	<p style="text-align: center;">Remote Sensing</p> Overview of remote sensing technologies and uses from satellite data to UAV <p style="text-align: center;">Spatial Data Quality and Privacy Concerns</p> Discussion on evaluating and maintaining spatial data quality; Overview of government and private sector data and issues related to data collection and analysis	Kimerling, Ch. 10; Hodgson et al 2016;van Oort 2005;	Lab Report 8: Working with remotely sensed data/Due one week after lab
Week 10 10/20 10/22	<p style="text-align: center;">Crowdsourcing Spatial Data: Volunteered Geographic Information</p> Discussion of technologies and cultural changes leading to data creation and mapping by non-professionals; fitness for use and quality management of VGI MapCreator and OSM introduction <p style="text-align: center;">Spatial Data Management</p> Discuss how to organize and store spatial data, introduction to the geospatial database	Goodchild 2017; Reynard 2018; Zieler & Murphy 2010;	Lab Report 9: Project related spatial analysis/Update due one week after lab
Week 11 10/27 10/29	<p style="text-align: center;">Spatial Data Analysis</p> Introduction to spatial analysis methodologies <p style="text-align: center;">Spatial Modeling and Visualization</p> Introduction to the use of spatial modeling techniques and advanced visualizations	Kimerling, Ch. 15 (all), Ch. 16 and 17 (selected sections); Kimerling, Ch. 22	Lab Report 10: Project related spatial data visualization/Update due one week after lab

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 12 11/3 11/5	<p>(Early) GIS Day Event In-class special event; Election Day</p> <p>Looking Forward with Geospatial Technologies Discussion of ethics, motivators, and accessibility moving forward with geospatial technologies and data</p>	<p><i>Extra Credit: GIS Day Mapathon 11/5</i></p>	<p>No lab meetings. Open Office Hours for final project work.</p>
Week 13 11/10* 11/12 *11/13 Last day of classes	<p>Final Project Presentations Students present their final projects in class and discussion sessions</p>		<p>Final Project Written Reports/Due by 11/13 5:00pm</p>
Final Exam 11/18-11/25	<p>TBD – Two hours - asynchronous Final exam – CLOSED BOOK</p>		

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

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

uscsa.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 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.