

# 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:** Spring 2020

Lecture: Monday and Wednesday, 2-3:20 pm

Labs: See schedule

**Location:** WPH 102 (Lecture); AHF 145A (Lab)

**Instructor:** Elisabeth Sedano, JD, PhD

**Office:** AHF B57C

**Regular Office Hours:** Monday and Wednesday 1-2 pm PT.

Also available by appointment via email.

**Contact Info:** [sedano@usc.edu](mailto:sedano@usc.edu), 213-740-9582,

[www.bluejeans.com/sedano](http://www.bluejeans.com/sedano)

**Lab Instructor:** TBD

**Library Help:** Andy Rutkowski

**Office:** VKC 36B

**Office Hours:** Tuesday 10 am-12 pm and Thursday 4:30-5:30 pm PT

**Contact Info:** [arutkows@usc.edu](mailto:arutkows@usc.edu), 213-740-6390

<http://bit.ly/andyhangout>

**IT Help:** Richard Tsung

**Office:** AHF B57E

**Office Hours:** By appointment

**Contact Info:** [spatial\\_support@usc.edu](mailto: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 technologies over the past two decades has enabled the development of quick visualization tools such as Google Maps, sophisticated geographic information systems (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

## 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 implementing them within the framework of the scientific method. The lecture and lab sessions complement each other to provide you with sound theoretical reasoning and the technical skills to investigate various physical and/or social processes. **It is required that you register for both the lecture and one laboratory session for this course.**

Course materials and assignments 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.

## 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. The GIS software and 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](mailto:spatial_support@usc.edu), **making sure to copy (cc) the professor and your lab instructor on the email.**

## 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*, 8<sup>th</sup> 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*, 4<sup>th</sup> 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, Tomá̇z Kliment, and Tomislav Jogen. 2017. A Comparison of Address Geocoding Techniques – Case Study of the City of Zagreb, Croatia. *Survey Review*, 50:359.
- 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)
- McIntosh-Tolle, Lindsay. *How to Use a Compass*. REI. Available at <https://www.rei.com/learn/expert-advice/navigation-basics.html>.
- Monmonier, Mark. 1996. *How to Lie with Maps* (Second Edition). Chicago: University of Chicago Press. (selected chapters)
- Reynard, Darcy. 2018. Five Classes of Geospatial Data and the Barriers to Using Them. *Geography Compass*. (January). <https://doi.org/10.1111/gec3.12364>
- 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

### **Weekly Assignments**

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

Class Engagement (10%): A grade for the semester will be assigned based on your engagement in class discussions and in-class assignments. Students are expected to engage in lecture by responding to questions to the group, complete in-class assignments, and discuss course

content and share relevant thoughts and ideas in class and in online discussions on Blackboard Discussion Forums. There are a few simple guidelines for posts on the Discussion board: 1) they must be relevant to the class (i.e., a response to a reading, a link to a related article, a map or image, a question, etc.); 2) they must be substantive; 3) they must be respectful. A grade for participation will be shared in the Blackboard grading center beginning in the fifth week of class, and the grade will be updated 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 a field assignment within the greater Los Angeles area.

Midterm Exams (20%): 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 (20%): 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 data and analytical methods. The four deliverables for this project are: 1) a project proposal; 2) a draft report; 3) a final written report; and 4) an oral presentation in class.

Final Exam (20%): 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
Class Engagement	Ongoing		10
Laboratory Assignments	10	3	30
Midterm Exams	2	10	20
Final Project	1	20	20
Final Exam	1	20	20
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
<b>Module 1: Spatial Thinking and GIS</b>			
<b>Week 1</b> 1/13  1/15	<p><b>Introduction to the Course</b>            Introduction to the class and discussion of goals, assignments, projects, technology, and the value of spatial thinking</p> <p><b>What is GIS?</b>            Current uses of Geographic Information Systems and how GIS is applied in our current world; survey results</p>	Kimerling, Introduction; Hubbard et al. Ch. 1	No labs
<b>Week 2</b> 1/22*  *Monday, 1/20 is a university holiday	<p><b>Spatial Reasoning</b>            A discussion of key concepts underlying spatial sciences, the scientific method, and spatial reasoning</p>	Monmonier, Ch. 1; Logan (pp.1-11, 14-15)	Lab Report 1: Introduction to mapping and SSI technologies /Due one week after lab
<b>Module 2: Geodesy and Geolocation</b>			
<b>Week 3</b> 1/27  1/29	<p><b>An Introduction to Geodesy</b>            Overview of the concepts and terms from the geoid and spheroids to coordinate systems</p> <p><b>Map Projections</b>            Map projections and the difference between PCS, mapping issues</p>	Kimerling, Ch. 1; Kimerling, Ch. 3	Lab Report 2: UGIS Lessons 1 – 2/Due one week after lab
<b>Week 4</b> 2/3  2/5	<p><b>Projected Coordinate Systems (PCS)</b>            Discussion and explanation of projected coordinate systems and their importance.</p> <p><b>Orienteering</b>            Discussion of directional systems and exercise with compass</p>	Kimerling, Ch. 4; Kimerling, Ch. 13	Lab Report 3: UGIS Lessons 3 – 4/Due one week after lab

	<b>Topic</b>	<b>Readings and Assignments</b>	<b>Deliverables/Due Dates</b>
<b>Week 5</b> 2/10	<b>Global Navigation Satellite Systems</b> Overview of technologies and uses of GNSS and GPS		
2/12	<b>Final Project Discussion; Midterm Review</b> Discuss expectations, rubric and past examples of capstone project; Open session for questions and review prior to Midterm #1	Harvey, Ch. 8	Lab Report 4: Map Production: UGIS Lessons 5 – 6/ Due one week after lab
<b>Week 6</b> 2/19*	<b>Midterm #1 – Closed Book</b>		Lab Report 5: UGIS Lessons 7 – 8 /Due one week after lab
*Monday, 2/17 is a university holiday			
<b>Module 3: Maps and Cartographic Elements</b>			
<b>Week 7</b> 2/24	<b>Cartography and Graphic Elements</b> Discussion of map design principles, symbology, and cartographic technique. The use of graphics to communicate, stylize, and problem solve		
2/26	<b>Digital Representation of Data and Types of Maps</b> Discussion of methods and issues relating to representing the physical world in digital and print maps	Kimerling, Ch. 6; Kimerling, Ch. 7-9 (DEM section only of Ch. 9); Esri Map Book selections	Lab Report 6: UGIS Lesson 9: printed and online map publication /Due one week after lab
<b>Week 8</b> 3/2	<b>Scale</b> Discuss concepts of scale in physical and social processes as well as in cartography	Kimerling, Ch. 2; Biehl et al., 2018	No Regular Lab Meetings
<b>Module 4: Modern Geospatial Workflow</b>			
3/4	<b>Geospatial Data Collection</b> Discussion of geospatial data collection workflows and primary data collection; accuracy and precision	Kimerling, Ch. 11	Self-Directed Fieldwork

	<b>Topic</b>	<b>Readings and Assignments</b>	<b>Deliverables/Due Dates</b>
<b>Week 9</b> 3/9  3/11	<p><b>Remote Sensing</b> Overview of remote sensing technologies and uses from satellite data to UAV</p> <p><b>Spatial Data Quality and Privacy Concerns</b> Discussion on evaluating and maintaining spatial data quality; Overview of government and private sector data and issues related to data collection and analysis</p>	Kimerling, Ch. 10; Hodgson et al., 2016; van Oort, 2005	Lab Report 7: Data processing from fieldwork; mapping of data/Due one week after lab
*3/16-3/22	<b>Spring Recess</b>		
<b>Week 10</b> 3/23  3/25	<p><b>Spatial Data Analysis</b> Introduction to spatial analysis methodologies</p> <p><b>Spatial Data Management</b> Discussion of core geospatial datasets and best practices for organizing and storing spatial data, introduction to the geospatial database</p>	Kimerling, Ch. 15, 16-17 (selected sections); Zeiler & Murphy, 2010;	<p>Lab Report 8: Working with remotely sensed data/Due one week after lab</p> <p>Project Proposal: due 3/27</p>
<b>Week 11</b> 3/30  4/1	<p><b>Spatial Modeling and Visualization</b> Introduction to the use of spatial modeling techniques and advanced visualizations</p> <p><b>Midterm Review</b> Open session for questions and review prior to Midterm #2</p>	Kimerling, Ch. 22	Lab Report 9: Project related spatial analysis/Update due one week after lab
<b>Week 12</b> 4/6	<b>Midterm #2 – Closed Book</b>		
<b>Module 5: Looking Forward With Geospatial Data and Technologies</b>			Lab: Work on final project: Final Project Draft Report (part of Final Project grade)/Due one week after lab
4/8	<p><b>Geocoding and Georeferencing</b> Exploration of the problems associated with place-names, street addresses and other human systems and how to define real-world locations</p>	Cetl et al., 2017	



	<b>Topic</b>	<b>Readings and Assignments</b>	<b>Deliverables/Due Dates</b>
<b>Week 13</b> 4/13  4/15	<p><b>The Future of Geographic Data</b>            USC GIS Librarian visits the class to discuss trends in spatial data management and answer student questions as to project data</p> <p><b>Project Peer Review</b>            In class peer-review of final project, including review of topic, data, and methods</p>	<p>Reynard, 2018</p>	<p>Lab Report 10: Project related spatial data visualization/Update due one week after lab</p>
<b>Week 14</b> 4/20  4/22	<p><b>Crowdsourcing Spatial Data</b>            Discussion of technologies and cultural changes leading to data creation and mapping by non-professionals</p> <p><b>Administration of Space and the Power of Maps</b>            Discussion of traditional knowledge and place names, current ways space is administered and the power inherent in creating maps and its historical consequences</p>	<p>Goodchild, 2007;            Kimerling, Ch. 5;            Harley, 2001</p>	<p>Lab room open at scheduled labs for work on final projects</p>
<b>Week 15</b> 4/27  4/29	<p><b>Final Project Presentations</b>            Students present their final projects in class</p> <p><b>Final Project Presentations</b>            Students present their final projects in class</p>		<p>Lab room open at scheduled labs for work on final projects</p> <p>Final Project Written Reports/Due by 5/1 5:00pm</p>
<b>Final Exams</b> 5/6-5/13	Final exam – Day and Time TBD – <b>CLOSED BOOK</b>		

## Statement on Academic Conduct and Support Systems

### **Academic Conduct**

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

### **Support Systems**

*Student Counseling Services (SCS)* – (213) 740-7711 – 24/7 on call  
[engemannshc.usc.edu/counseling](http://engemannshc.usc.edu/counseling)

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

*National Suicide Prevention Lifeline* – 1 (800) 273-8255 – 24/7 on call  
[www.suicidepreventionlifeline.org](http://www.suicidepreventionlifeline.org)

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

*Relationship and Sexual Violence Prevention Services (RSVP)* – (213) 740-9355(WELL), press “0” after hours – 24/7 on call  
[studenthealth.usc.edu/sexual-assault](http://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](http://equity.usc.edu), [titleix.usc.edu](http://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.

*Reporting Incidents of Bias or Harassment*– (213) 740-5086 or (213) 821-8298  
[usc-advocate.symplicity.com/care\\_report](http://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](http://dsp.usc.edu)

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

*USC Support and Advocacy – (213) 821-4710*

[uscsa.usc.edu](http://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](http://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](http://dps.usc.edu), [emergency.usc.edu](http://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](http://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.