

SSCI 301, Maps and Spatial Reasoning

Syllabus

Units: 4

Term Day Time: Spring 2022

Lecture: Tuesdays and Thursdays, 2-3:20 pm PT

Labs: See schedule

Location: KDC 236

Instructor: Elisabeth Sedano, JD, PhD

Office: AHF B57C

Regular Office Hours: Mondays, 12-1 pm, and Thursdays, 1-2 pm PT. Also available by appointment via email.

Contact Info: sedano@usc.edu

Lab Instructor: TBD

Library Help: Andy Rutkowski

Office: VKC 36B

Office Hours: Tuesday 10 am-12 pm

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 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 for running basic spatial analyses 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 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

The GIS software and geospatial data required for course assignments will be accessed using computing resources provided by the Spatial Sciences Institute. Instead, every student must have the following technology requirements:

- A computer with a fast Internet connection.
- A functional webcam and a microphone for use in the event that the student needs to attend class online
- An up-to-date web browser to access the SSI Server, in the event that the student accesses our software and data online

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/>

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. (for ArcGIS Pro 2.6), Redlands, CA: Esri Press.

The following readings will be posted to Blackboard:

- Biehl, Alec, Alireza Ermagun, and 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.
- 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)
- 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). 2006. *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:

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. Laboratory assignments related to the final project (see Schedule below) are separate lab deliverables and scored as part of the lab.

Midterm Exam (15%): The mid-term 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.

Final Project (25%): 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
Laboratory Assignments	10	4	40
Midterm Exam	1	15	15
Final Project	1	25	25
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.

Weekly Schedule

	Topic	Readings and Assignments	Deliverables/Due Dates
Module 1: Spatial Thinking and GIS			
Week 1* 1/11 1/13	<p>Introduction to the Course and GIS Introduction to the class and discussion of goals, assignments, projects, technology, and the value of spatial thinking</p> <p>Introduction to GIS Current uses of Geographic Information Systems and how GIS is applied in our current world</p>	Kimerling, Introduction; Hubbard et al. Ch. 1	No labs
Week 2* 1/18 1/20 *Monday, 1/17 is a university holiday	<p>Spatial Reasoning A discussion of key concepts underlying spatial sciences, the scientific method, and spatial reasoning</p> <p>Spatial Data Models An introduction to vector, raster and other data models plus data and file structures</p>	Harley, 2001	Lab Report 1 – Introduction to mapping and SSI technologies: Due one week after lab
Week 3 1/25 1/27	<p>Scale Discuss concepts of scale in physical and social processes as well as in cartography</p> <p>Administration of Space Discussion of land tenure, methods for managing and regulating land use, traditional knowledge and place names</p>	Kimerling, Ch. 1; Kimerling, Ch. 3; Snyder, 2011	Lab Report 2 – UGIS Lessons 1 - 2: Due one week after lab

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 4 2/1	The Power of Maps The power inherent in creating spatial information and mapping them, the historical consequences	Kimerling, Ch. 4; Zeiler & Murphy, 2010	Lab Report 3 – UGIS Lessons 3 - 4: Due one week after lab
Module 2: Spatial Data Handling			
2/3	Geodesy, Datums, and Geographic Coordinate Systems Overview of the concepts and terms from the geoid and spheroids to coordinate systems		
Week 5 2/8	Map Projections Explanation of map projections and distortions that arise in 2D mapping of a 3D planet	Kimerling, Ch. 2, Biehl et al., 2018; Kimerling, Ch. 11	Lab Report 4 – Map Production: UGIS Lessons 5 -6: Due one week after lab
2/10	Projected Coordinate Systems (PCS) Discussion and explanation of projected coordinate systems		
Week 6 2/15	Spatial Data Management introduction to the geospatial database and best practices for organizing and storing spatial data	Harvey, Ch. 8, Kimerling, Ch. 10; van Oort, 2006	Lab Report 5 – UGIS Lessons 7 - 9: Due one week after lab
2/17	Global Navigation Satellite Systems Overview of technologies and uses of GNSS and GPS		
Week 7 2/22	Remote Sensing Overview of remote sensing technologies and uses from satellite data to UAV	Cetl et al., 2017	Lab Report 6 – Working with remotely sensed data: Due one week after lab
2/24 *Monday, 2/21 is a university holiday	Spatial Data Quality and Privacy Concerns Discussion on evaluating and maintaining spatial data quality; Overview of government and private sector data and issues related to data collection and analysis		

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 8 3/1	Geocoding; Midterm Review Exploration of the problems associated with place names and street addresses		No Lab Meetings
3/3	Midterm		
Module 3: Turning Spatial Data into Actionable Information			
Week 9 3/8	Final Project Discussion; Fieldwork Intro Discuss expectations, rubric, and past examples of capstone project; Intro to group fieldwork project	Kimerling, Ch. 6; Kimerling, Ch. 7-9 (DEM section only of Ch. 9); Esri Map Book selections	Lab Report 7 – Geocoding: Due one week after lab
3/10	Spatial Analysis of Vector Data Introduction to proximity, network, and cluster analyses		
Week 10 3/22	Project Proposal Workshop Students share drafts of project proposals and provide peer review		Lab Report 8: Integration of field data collected data with other data/Due one week after lab
3/24	Librarian Visit USC Librarian visits the class to discuss websites for accessing spatial data		Project Proposal: due 3/26
Week 11 3/29	Cartography and Graphic Elements Discussion of map design principles, symbology, and cartographic technique. The use of graphics to communicate, stylize, and problem solve	Kimerling, Ch. 15, 16-17 (selected sections)	Lab Report 9 – Project related spatial analysis: Update due one week after lab
3/31	Digital Representation of Data and Types of Maps Discussion of methods and issues relating to representing the physical world in digital and print maps		

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 12 4/5 4/7	Spatial Analysis of Fields and Raster Data Introduction to terrain analyses and interpolation methodologies Intro to Spatial Modeling Introduction to the use of spatial modeling techniques	Hodgson et al., 2016 Kimerling, Ch. 22	Lab – Work on Final Project Draft Report (part of Final Project grade): Due Monday 4/11
Module 4: Looking Forward with Geospatial Data and Technologies			
Week 13 4/12 4/14	Project Peer Review In class peer-review of final project, including review of topic, data, and methods Big Data and Real-Time Data Discussion of technologies and methods for sharing and working with large datasets and real-time data	Goodchild, 2007, Reynard, 2018	Lab Report 10 – Project related spatial data visualization: Update due one week after lab
Week 14 4/19 4/21	Crowdsourcing Spatial Data Discussion of technologies and cultural changes leading to data creation and mapping by non-professionals Critical GIS Consideration of what it means to engage with GIS and spatial data in an ethical, meaningful way	Kimerling, Ch. 5	No Lab Meetings Self-Directed Work on Projects
Week 15 4/26 4/28	Final Project Presentations Students present their final projects in class Final Project Presentations Students present their final projects in class		Final Project Written Reports: Due by 4/29 5:00pm
Final Examination – Thursday, May 5, 2022, 2-4 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
eetix.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.symplcity.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) 442-3340 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 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.