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 2019
Lectures: TBD
Labs: see schedule

Location: TBD (Lecture); AHF 145A (Labs)

Instructor: Elisabeth Sedano, JD, PhD
Office: AHF B57C
Regular Office Hours: TBD Also available by appointment via email.
Contact Info: sedano@usc.edu, 213-740-9582
https://www.bluejeans.com/sedano

Lab Instructors: TBD

Library Help: Andy Rutkowski
Office: VKC 36B
Office Hours: Tuesdays, 10 a.m.-12 p.m. and Thursdays, 4:30-5:30 p.m. 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: ctsung@usc.edu, 213-821-4415 (office)

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 the past two decades has enabled the development of quick visualization tools (Google, Bing Maps), sophisticated GISystems (ArcGIS, 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 transformation 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 covers 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 would 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, learning 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 that underlie geographic modeling and the creation of maps;
- Demonstrate the understanding of data representation methods by creating meaningful maps; and
- Apply modern mapping and GIS technologies to problem solving within diverse fields of study.

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 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, and the mid-terms and final project will have a laboratory component to them. **It is required that you register for both the lecture and one laboratory session for this course.**

Please note that all course materials and correspondence will be posted on the course Blackboard website. As a registered student you will find this course available for you to access at 10 a.m. PT on the first day of classes**.**

Technological Proficiency and Hardware/Software Required

This class incorporates in-class activities that at times may be completed on a smart phone, tablet, or laptop. 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. Twitter accounts are also required for this class. This can be a new account, dedicated specifically to the course, or your own already established account. If you need assistance setting up the account, or learning how to tweet, please see the instructor for assistance. Tweets can be completed on a computer; a smart phone is not needed. The modeling 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. 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.

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.* Redlands, CA: Esri Press.
- Smith, David, Nathan Strout, Christian Harder, Steven Moore, Tim Ormsby, and Thomas Blastrom. 2017. *Understanding GIS: An ArcGIS Pro Project Workbook*. Redlands, CA: Esri Press.

The following readings will be posted to Blackboard:

- Bearman, Nick, Nick Jones, Isabel André, Herculano Alberto Cachinho and Michael DeMers. 2016. "The future role of GIS education in creating critical spatial thinkers." *Journal of Geography in Higher Education* 40(3): 394-408.
- 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. (chapters 4 and 8).
- 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)
- Hjellström, Björn. 1994. *Be Expert with Map & Compass*. New York: Collier Books. (selected sections)
- Kyrgier, John and Denis Wood. 2016. *Making Maps: A Visual Guide to Map Design for GIS*. New York: Guilford Press. (selected chapters)
- Longley, Paul A., Michael F. Goodchild, David J. Maguire, and David W. Rhind. 2015. *Geographic Information Systems and Science*. 4th ed., New York: John Wiley and Sons. (chapter 7)
- 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)
- Van Oort P.A.J. (Pepijn). 2005. *Spatial Data Quality: From Description to Application.* Doctoral dissertation, Netherlands Geodetic Commission, Delft.
- 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 and Social Media Interactions (10%): A grade for the semester will be assigned based on your engagement in class and social media (Twitter) interactions. Students are expected to complete and discuss assigned reading, engage in lecture, 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 Twitter. Although we will sometimes use Twitter in the classroom, the bulk of your Twitter activity will take place outside of class. You will be required to tweet a minimum of one (1) time per week. There are a few simple guidelines for tweeting: 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; and 4) they must include the hashtag #SSCI301 to ensure that tweets are incorporated into the class discussion. Any tweets

that do not contain this hashtag will not be counted towards weekly activity. If you tweet the requisite number of times (a minimum of one tweet per week = 15 total tweets), and participate in class you will receive full credit. If not, then you will receive partial credit commensurate with the number of weeks in which you tweeted the required number of times.

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 assignments over the course of the semester, and one week will include a field assignment within greater Los Angeles.

Mid-Term Exams (30%): The mid-term exams will consist of multiple choice, short answer, and simple problem questions. Students will be expected to take the exams at the indicated times.

Final Project (15%): 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 on a topic of interest utilizing spatial analysis and geospatial technologies. The four deliverables for this project are: 1) a project proposal; 2) an individual mid-project summary; 3) a final report that is limited to 10 pages (12-point font, 1 inch margins, single-spacing) that includes one or more maps of the students of making and a list of references; and 4) an oral presentation in class.

Final Exam (15%): The final exam will consist of multiple choice, short answer, and simple problem questions. Students will be expected to take the exam at the indicated time.

Grading Breakdown

Assessment	Number	Points Each	Total Points
Class Participation and Social Media Interaction	30		10
Laboratory Assignments	10	3	30
Mid-Term Exams	2	15	30
Final Project	1	15	15
Final Exam	1	15	15
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
Week 1 1/9 1/11	**Introduction to the Course** Introduction to the class and discussion of goals, assignments, projects, technology, and the value of spatial thinking **Maps and Spatial Reasoning** A discussion of key concepts underlying spatial sciences, the scientific method, and spatial reasoning	Kimerling, Introduction; Hubbard, Ch 1; Monmonier, Ch 1; Krygier and Wood, Ch 4 (optional)	1 tweet/Due by 1/12 No lab
Week 2* 1/17 *Monday 1/16 is a university holiday 1/19	**History of GIS** A discussion on the history, uses, and innovations of cartography and GIS; Introduction to the GTCM; Introduction to lab activity **Types of Maps & Digital Representation of Data** Discussion of methods and issues relating to representing the physical world in digital and print maps	Harvey, Ch 4; Kimerling, Ch 9	1 tweet/Due by 1/20 No lab
Week 3 1/24 1/26	**Maps, Knowledge, & Power** Discussion of mapping issues and the power inherent in creating maps and its historical consequences; Introduction to lab activity **Geodesy; Geoids, Spheroids, and Coordinate Systems** Overview of concepts and terms relating to coordinate systems	Harley, Ch 2; Monmonier, Ch 7, 8, and 10 (10 is optional); Kimerling, Ch 1 & 4	1 tweet/Due by 1/27 Lab Report 1: Exploring maps/Due one week after lab

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 4 1/31 2/2	**Projections** Discussion and explanation of map projections and their importance; projection activity **PCS; Scale** Projected Coordinate Systems; Discuss concepts of scale in physical and social processes as well as in cartography	Kimerling, Ch 2 & 3	1 tweet/Due by 2/3 Lab Report 2: Census data and political boundaries/Due one week after lab
Week 5 2/7 2/9	**Midterm #1 – Closed Book** **Final Project Discussion** Discuss expectations, rubric and past examples of capstone project		1 tweet/Due by 2/10 Lab Report 3: UGIS Lessons 1 – 2/Due one week after lab
Week 6 2/14 2/16	**Cartography and Graphic Elements** Discussion of map design principles, symbology, and cartographic technique. The use of graphics to communicate, stylize, and problem solve **Data Resources** Explore and discuss spatial data sources for spatial analysis, the "New World" of data, research methods	Kimerling, Ch 6 – 8; Krygier and Wood Ch 7 (for reference for lab);	1 tweet/Due by 2/17 Lab Report 4: UGIS Lessons 3 – 4/Due one week after lab
Week 7* 2/22 *Monday 2/21 is a university holiday 2/24	**Spatial Data Quality** Discussion on evaluating and maintaining spatial data quality; Introduction to lab activity **Global Navigation Satellite Systems** Overview of technologies and uses of GNSS and GPS	Kimerling, Ch 11; Van Oort, Ch 1 & 2; Harvey, Ch 8	1 tweet/Due by 2/25 Lab Report 5: Map Production: Result of UGIS Lessons 5 – 6/ Due one week after lab *Monday labs do not meet Note: Self-work UGIS Lessons 7 – 9 DUE Week 10

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 8 2/27 3/2	**Geospatial Data Collection and Field Data Correction Methods** Discussion of geospatial data collection workflows and primary data collection; distribute GPS units for field work **Spatial Databases** An introduction to spatial databases – utility, design, and maintenance; Introduction to data correction	Zeiler and Murphy, Ch 1	1 tweet/Due by 3/3 Lab Report 6: Evaluating Core Geospatial Datasets/Due one week after lab
Week 9 3/7 3/9	**Orienteering** Discussion and exercise with traditional methods for wayfinding; review data processing for lab **Geocoding** Exploration of the problems associated with place-names, street addresses and other human systems and how to define real-world locations.	Hjellström (selected sections); McIntosh-Tolle; Longley, Ch 7	1 tweet/Due by 3/10 *Monday labs DO meet Lab: do not meet during scheduled times; conduct team fieldwork – data collection with Trimble handheld – parks
***3/13-3/17 is Spring Recess**	*Spring Recess*		
Week 10 3/21 3/23	**Project Proposal** In class peer-review of final project proposal, including proposed data **Midterm #2 – Closed Book**		1 tweet/Due 3/24 Lab Report 7: Data correction and processing from fieldwork; mapping of data/Due one week after lab **Self-work: UGIS Lessons 7 – 9/Due 3/24**

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 11 3/28 3/30	**Remote Sensing** Overview of remote sensing technologies and uses; Introduction to lab activity **Remote Sensing in Practice** Overview of the professional uses of remote sensing	Kimerling pp. 240 – 243, Ch 10	1 tweet/Due 3/31 Lab Report 8: Geocoding exercise/Due one week after lab
Week 12 4/4 4/6	**Web and Mobile GIS** Overview of technologies and popular online platforms for mapping; related social and economic issues **Crowdsourcing Spatial Data** Discussion of technologies and cultural changes leading to data creation and mapping by non-professionals; fitness for use and quality management	Goodchild	1 tweet/Due 4/7 Lab Report 9: Visualization of remotely sensed data using Google Earth Pro/Due one week after lab
Week 13 4/11 4/13	**Volunteered Geographic Information** Case studies of technologies and uses of crowd-sourced data: MapCreator and OSM introduction **Locational Privacy and Administration of Spaces** Overview of government and private sector data and issues related to data collection and analysis; discussion of Traditional Knowledge and place names	Kimerling, Ch 5; Monmonier, Ch 6	1 tweet/Due by 4/14 Lab Report: Work on Final Project/Lab Report (progress report, part of Final Project grade) due one week after lab
Week 14 4/18 4/20	**Overview of Spatial Statistics; the Future of GIS** Introduction to the use of spatial statistics in spatial analysis **Course Review**	Bearman et al.	1 tweet/Due by 4/21 Lab Report 10: Creating VGI/Due one week after lab

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 15 4/25 4/27* Friday, 4/28 is the last day of class	**Final Project Presentations** Students present their final projects in class **Final Project Presentations** Students present their final projects in class		1 tweet/Due by 4/28 No lab – computer lab room open during scheduled lab for work on final projects Final Project Written Reports/Due by 4/28
Final Exam	**Closed Book** **Time and Location: TBD**		

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

Student Counseling Services (SCS) – (213) 740-7711 – 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
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) 740-4900 – 24/7 on call
engemannshc.usc.edu/rsvp
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
equity.usc.edu, 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.

Bias Assessment Response and Support – (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support
Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation 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.

Student Support and Advocacy – (213) 821-4710
studentaffairs.usc.edu/ssa
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
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
Non-emergency assistance or information.