SSCI 301L (35646R), Maps and Spatial Reasoning

Syllabus

Units: 4

Term: Spring 2025
Lecture: Tuesdays and Thursdays, 2:00-3:20 p.m. PT
Labs: Tuesdays, 4:00-5:50 p.m., or Thursdays, 12:00-1:50 p.m.

Locations: DMC101 (Lecture), ZHS360 (Tuesday Lab) or THH208 (Thursday Lab)

Instructor: Bita Minaravesh, PhD
Office: AHF B55D
Regular Office Hours: Mondays, 12:00 - 1:00 p.m., Thursdays, 12:00 – 1:00 p.m.
Contact Info: minarave@usc.edu

Lab Instructor: TBD
Office: AHF B57A
Office Hours: TBD
Contact Info: TBD

Library Help: Andy Rutkowski
Office: LIPA B40-A
Office Hours: Thursdays 10 a.m.-12 p.m. PT or by appointment
Contact Info: arutkows@usc.edu

IT Help: Spatial Support
Office: AHF B56B
Office: By appointment via email
Contact Info: spatial_support@usc.edu, 213-740-4415

Course Description

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 surface 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 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 across a broad swath of disciplines, 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. degrees in Geodesign, Global Geodesign, Human Security and Intelligence, and the minors in GIS and Sustainability Science, Human Security and Geospatial Intelligence, and Spatial Sciences as well as students in engineering, health, the natural and social sciences, and the humanities with interests in how things vary and evolve over space and time. Each student is encouraged to utilize the laboratory experience to explore geospatial resources and computational techniques for running basic spatial analyses and data visualizations, with their own academic and professional goals in mind.

Learning Objectives

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

- Describe the main types of spatial data, methods for their creation, and relevant factors for choosing amongst them;
- Describe the main types of maps, issues pertaining to geographic information and the creation of maps;
- Explain how modern geographic analysis and visualization tools can be used across a variety of disciplines;

- Apply modern mapping and GIS technologies to problem solving within diverse fields of study;
- Explain basic spatial analysis and modeling methodologies and choose appropriate methods for answering various spatial questions; and
- Create quantitative and qualitative maps that communicate the products of spatial data analysis and modeling.

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.

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

Course Structure

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 approaches and accompanying computational 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 computational 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 Brightspace website. Your assignments will be graded and returned via Brightspace. 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 and Communication Requirements

ArcGIS Pro and ArcGIS Online are provided virtually via the SSI Server (i.e., a virtual machine); hence, students do not need to install it on their own computer. Instead, every student must have the following technology requirements:

- A computer with a fast internet connection
- A functional webcam and a microphone
- An up–to-date web browser to access the SSI server

If a student does not have access to any of these, please speak with the instructor at the start of the semester. And see the USC ITS Student Toolkit here:
https://keepteaching.usc.edu/students/student-toolkit/

A limited number of computers with all the necessary software is available in the SSI Suite (AHF B55) during regular business hours, Monday through Friday 9 am to 5 pm. To reserve a computer, please use this link https://calendly.com/usc-ssi/the-ssi-suite-ahf-b55-student-computers-1.
These computers are available to any student in an SSCI or GSEC course and can be used as a resource if you experience difficulties in accessing the SSI server or using the GIS software on your personal computer.

SSI Server and Tech Support – This course utilizes the SSI Server, which is a virtual desktop that allows access to different types of professional software. If students are unable to connect to the server or experience technical issues, they should send an email (via their USC account) to SSI Tech Support at spatial_support@usc.edu, making sure to copy (cc) the instructor and lab assistant on the email. Assignment specific questions should be directed to the instructor or lab assistant.

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

Communications – All materials to be handed in will be submitted via Brightspace. It is each student's responsibility to stay informed about what is going on in our course. In addition to email about time-sensitive topics, any important announcements will be posted on the Announcement page in Brightspace.

Be sure to check these each time you log onto Brightspace. I will send via email through Brightspace any notices that are time sensitive. Please be sure that you read as soon as possible all email sent from Brightspace or from me. Do not ignore course email until the day before assignments are due. Also, double check to be sure that email sent from the USC Brightspace account does not go into your junk mail!

I will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 72 hours delay. In the rare case when I expect to be off-line for more than 72 hours, I will post an announcement on the Brightspace site.

Required Readings and Supplementary Materials

The required textbook for this course is:

- 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.

Supplementary readings will be assigned from various sources including but not limited to:

- Basiri, A., Haklay, M., Foody, G. & Mooney P. 2019. Crowdsourced geospatial data quality: challenges and future directions. *International Journal of Geographical Information Science*, 33:8, 1588-1593
- Bebbington, A. J., Bebbington, D. H., Sauls, L. A., Rogan, J., Agrawal, S., Gamboa, C., Imhof, A., Johnson, K., Rosa, H., Royo, A., Toumbourou, T., & Verdum, R. 2018. Resource extraction and infrastructure threaten forest cover and community rights. *Proceedings of the National Academy of Sciences*, 115(52), 13164–13173.
- Biehl, A., Ermagun, A., Stathopoulos, A. 2018. Community mobility MAUP-ing: A sociospatial investigation of bikeshare demand in Chicago. *Journal of Transport Geography*, 66, 80-90.
- Bolstad, P., Manson, S. 2022. *GIS fundamentals: A first text on geographic information systems* (7th ed.). XanEdu (Ch. 2 and 5).
- Bruckner, M. 2012. *The Geographic Revolution in Early America: Maps, Literacy, and National Identity.* The University of North Carolina Press.
- Cetl, Vlado, Tomáž Kliment, and Tomislav Jogen. 2017. A comparison of address geocoding techniques: Case study of the City of Zagreb, Croatia. *Survey Review*, 50, 359.
- Cook, I. 2004. Follow the Thing: Papaya. *Antipode*, 36: 642-664.
- Delmelle, E.M., Desjardins, M.R., Jung, P., Owusu, C., Lan, Y., Hohl, A., Dony, C. 2022. Uncertainty in geospatial health: challenges and opportunities ahead. *Annals of Epidemiology*, 65, 15-30.
- Havinga, I., Bogaart, P. W., Hein, L., & Tuia, D. 2020. Defining and spatially modelling cultural ecosystem services using crowdsourced data. *Ecosystem Services*, *43*.
- Hogdson, J.C., Baylis, S.M., Mott, R., Herrod, A., Clarke, R.H. 2016. Precision wildlife monitoring using unmanned aerial vehicles. *Scientific Reports*, 6, 22574.
- Hodza, P. 2014. Appreciative GIS and strength-based community change. *Transactions in GIS*, 18(2), 270-285.
- Hubbard, P., Kitchin, R., Bartley, B., Fuller, D. 2002. *Thinking geographically: Space, theory and contemporary human geography*. Continuum (Ch. 1).

- Kratimenos, P. 2022. North isn't necessarily up: map projections, the politics of cartography and their relevance to archaeology. *Archaeology International,* 25(1), 78-88.
- Lee, J.-G., Kang M. 2015. Geospatial big data: Challenges and opportunities. *Big Data Research*, 2(2), 74-81.
- Logan, J.R. 2012. Making a place for space: Spatial thinking in social science. *Annual Review in Sociology*, 38, 507-524.
- Monmonier, M. S. 2018. *How to lie with maps* (Third edition.). The University of Chicago Press.
- Riva, F., Nielsen, S.E. 2020. Six key steps for functional landscape analyses of habitat change. *Landscape Ecol* 35, 1495–1504.
- Schuurman, N. 2004. *GIS: A Short Introduction*. Blackwell (Ch. 1).
- Wilson, M.W. 2017. *New lines: Critical GIS and the trouble of the map*. University of Minnesota Press (Ch. 1).
- Zeiler, M., Murphy, J. 2010. *Modeling our world: The Esri guide to geodatabase concepts*. Esri Press.

Description and Valuation of Assessments

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

Laboratory Assignments (40%): This course includes a laboratory meeting each week to develop technical competency with geospatial software platforms and analytic tools. Lab assignments are linked to the lectures and class discussions, but do not duplicate the lecture experience. Students must register for one lab session in addition to registering for the class itself. There will be a total of ten laboratory reports due over the course of the semester.

Homework Assignments (20%): Over the course of the semester you will complete five at-home assignments independent of the lab activities. These assignments will give you opportunities to independently practice spatial thinking. You will have a week to complete these assignments.

Quizzes (10%): Throughout the semester there will be five unannounced in-class quizzes to reinforce the content. There will be no make-up work for unexcused missed classes.

Midterm Exam (10%): The mid-term exam will consist of short answer questions. Students are expected to take the exam at the indicated time in class.

Final Exam (20%): The final exam will consist of short answer questions. Students must be present during the final exam period.

Assignment Submission Policy

Unless otherwise noted, assignments must be submitted via Brightspace by the due dates specified in the Course Schedule below and on the assignment instructions.

Strict penalties apply for late assignments as follows:

- All assignments will be penalized 2 points up to seven days late. No points will be given for submissions more than seven days late.

- Additionally, no written work will be accepted for grading after 5 p.m. PT on the last day of classes.

SSI Policy on the Creation of Original Work and Use of Generative AI

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. Students may not have another person or entity complete any substantive portion of an assignment or reuse work prepared for courses without obtaining written permission from the instructor(s). Developing strong competencies in research, writing, and the technical execution of geospatial technologies are foundational to SSI academic programs that are designed to prepare you for success in the workplace. Therefore, using generative AI tools – unless explicitly specified otherwise – is strictly prohibited in this course, will be identified as plagiarism, and will be reported to the Office of Academic Integrity.

Grading Breakdown

Assessment	Number	Points Each	Total Points
Laboratory Assignments	10	4	40
Midterm Exams	1	10	10
Quizzes	5	2	10
Homework Assignments	5	4	20
Final Exam	1	20	20
Total	14	-	100

Grading Scale

Assignments in this and other SSCI courses, are graded on the letter grade scale where A is exemplary, B is very good, C is satisfactory, D is unsatisfactory, and F needs improvement. The grading scale follows:

A	> 93 points		B-	80-82 points		D+	67-69 points
A-	90-92 points		C+	77-79 points		D	63-66 points
B+	87-89 points		C	73-76 points		D-	60-62 points
B	83-86 points		C-	70-72 points		F	<60 points

Grading Timeline

My goal is to provide grading and feedback on each course assignment no later than one week after the assignment was submitted.

Learning Experience Evaluations

Please note Learning Experience Evaluations for the course take place at the end of the semester and are facilitated by the University. These evaluations provide an important review of student experiences in the course.

Schedule

Modules

1	Maps and Geographic Literacy
2	Geodata
3	Georeferencing & Geocoding
4	Geo-enrichment & Knowledge Discovery
5	Applications

	Date	Topics	Readings	Deliverables/Due Dates and Times
1	**Week 1** 1/14	Why Maps?		*No Labs*
	1/16	Nuts and Bolts	Kimerling et al. (2016, Introduction) Schuurman (2004, Ch. 1)	
	Week 2 1/21	Cartography 1	Kimerling et al. (2016, Ch. 6)	*No Labs*
	1/23	Cartography 2	Kimerling et al. (2016, Ch 7)	
	Week 3 1/28	Thinking Spatially	Hubbard et al. (2002, Ch. 1) Logan (2012) Cook (2004)	*Lab Report 1 Due 11:59 p.m. the night before your next lab meeting.*
	1/30	Turning Space into Place	Kimerling et al. (2016 Ch. 5) Brückner (Ch 3., 2006)	HW 1 Due 1/30, 11:59 p.m.
2	**Week 4** 2/4	Spatial Data: Elements & Sources		*Lab Report 2 Due 11:59 p.m. the night before your next lab meeting.*
	2/6	Tables & Geodatabases	Zeiler & Murphy (2010)	
	Week 5 2/11	Guest lecture: Open Source Data		*Lab Report 3 Due 11:59 p.m. the night before your next lab meeting.*
	2/13	Crowdsourcing Spatial Data	Havinga et al. (2020) Basri et al. (2019)	
3	**Week 6** 2/18	The Lay of the Land	Kimerling et. al (2016, Ch. 1)	*Lab Report 4 Due 11:59 p.m. the night before your next lab meeting.*
	2/20	Scale	Kimerling et al. (2016, Ch. 2) Biehl et al. (2018)	HW 2 Due 2/20, 11:59 p.m.
	Week 7 2/25	*Midterm*		*No labs.*
	2/27	Flat Spheres	Kimerling et al. (2016, Ch. 3) Kratimenos (2022)	

	Week 8 3/4	Projected Coordinate Systems	Kimerling et al. (2016, Ch. 4)	*Lab Report 5 Due 11:59 p.m. the night before your next lab meeting.*
	3/6	GNSS	Bolstad and Manson (2022, Ch. 5)	
	Week 9 3/11	Remote Sensing	Kimerling et al. (2016, Ch. 10) Hodgson et al. (2016)	*Lab Report 6 Due 11:59 p.m. the night before your next lab meeting.*
	3/13	Geocoding	Cetl et al. (2017) Delmelle et al. (2022)	
Spring Recess			
4	Week 10 3/25	Spatial Modeling		*Lab Report 7 Due 11:59 p.m. the night before your next lab meeting.* HW 3 Due 3/27, 11:59 p.m.
	3/27	Data Collection		
	Week 11 4/1	Spatial Analysis 1 (Vector)	Kimerling et al. (2016, Ch. 15)	*Lab Report 8 Due 11:59 p.m. the night before your next lab meeting.*
	4/3	Spatial Analysis 2 (Raster)	Kimerling et al. (2016, Ch. 16 (slope, aspect, curvature, profiles, visibility analysis)	
5	Week 12 4/8	People & Place	Burnett (2020)	*Lab Report 9 Due 11:59 p.m. the night before your next lab meeting.* HW 4 Due 4/10, 11:59 p.m.
	4/10	Environmental Planning	TBD	
	Week 13 4/15	Spatial Justice	Bebbington et al. (2018) Schunder et al. (2020)	*Lab Report 10 Due 11:59 p.m. the night before your next lab meeting.*
	4/17	Geodesign	Zare et al. (2022)	
	Week 14 4/22	HSGI		HW 5 Due 4/24, 11:59 p.m. *No labs.*
	4/24	Sustainability	TBD	
	Week 15 4/29	The Power of Maps	Monmonier (2018)	*No labs.*
	5/1	Future Opportunities/ Final Review		
Final Exam – Thursday, May 7th – 2:00 p.m.- 4:00 p.m. PT			

Statement on Academic Conduct and Support Systems

Academic Integrity

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others (including AI generated) or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

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*

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

988 Suicide and Crisis Lifeline - *988 for both calls and text messages – 24/7 on call*

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - *(213) 740-9355(WELL) – 24/7 on call*

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - *(213) 740-5086*

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*

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 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) 740-0411*

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*

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*

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) 442-1200 – 24/7 on call*

Non-emergency assistance or information.

Office of the Ombuds - *(213) 821-9556 (UPC) / (323-442-0382 (HSC)*

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) 442-2850 or* otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.