

## **SSCI 135g, Maps in the Digital World**

### *Syllabus*

**Units:** 4

**Term Day Time:** Fall 2022, Monday, Wednesday, and Friday  
10:00 – 11:20 a.m.

**Location:** CPA 256

**Instructor:** Leilei Duan, Ph.D.

**Office:** AHF B55A

**Office Hours:** Monday and Wednesday 3 - 4 p.m. PT, and  
by appointment via email.

**Contact Info:** [leileidu@usc.edu](mailto:leileidu@usc.edu), 213-740-6532 (office), see  
contact page on Blackboard for Zoom Room

**Library Help:** Andy Rutkowski

**Office:** LIPA B40-A

**Office Hours:** Thu 10am - 12 pm or by appointment

**Contact Info:** [arutkows@usc.edu](mailto:arutkows@usc.edu)

**IT Help:** Dornsife Technology Services

**Office:** SHS 260

**Contact Info:** [spatial\\_support@usc.edu](mailto:spatial_support@usc.edu), 213-740-2775

## **Course Scope and Purpose**

This course explores all the ways in which maps are being used to compile, build, and share knowledge of the world around us. The first maps appeared long ago and today maps are used extensively across the physical, life, and social sciences as well as the humanities. Numbers and quantitative data feature prominently in the preparation of most maps. The overarching intent of this course is to examine some of the ways in which formal reasoning, abstract representation, and empirical analysis are used to construct the maps that you see and use in a given field of study and in everyday life. The topics covered in this course will range from geodetic principles (the way location is measured on the Earth's surface) to the various ways in which information is captured and represented on maps, the role of scale and map projections, and the ways in which various hierarchies and classifications can be combined and used with empirical analysis to add meaning to maps

This course is a Quantitative Reasoning General Education course. Maps are used to engage you in the analysis and manipulation of data and information related to quantifiable objects, symbolic elements, and logic to help navigate the complexity and sophistication of the modern world. The lectures and accompanying homework assignments will focus on the role of maps in modern life and how numbers are used to construct maps of the world around us. The assignments and final project will increase your capacity to evaluate chains of formal reasoning (the use of formal logic and mathematics), abstract representation (the use of symbolic and diagrammatic representations), and empirical analysis (the use of statistical inference) in building and interpreting various kinds of maps.

### ***Learning Outcomes***

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

- Describe and interpret the complexity and sophistication of the modern world.
- Use a set of formal tools, including logical and statistical inference, probability and mathematical analysis, to pose and evaluate hypotheses, claims, questions, or problems with a variety of maps.
- Distinguish between their assumptions and implications for the logical structures embedded in various kinds of maps.
- Identify both useful and specific applications of the various kinds of maps they study because maps are now a pervasive part of our everyday lives and by the end of the course.

**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](mailto: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)

**COVID-19 policy** -- Students are expected to comply with all aspects of USC's COVID-19 policy including, but not limited to, vaccination, indoor mask mandate, and daily TrojanCheck. Failure to do so may result in removal from the class and referral to Student Judicial Affairs and Community Standards. Students are recommended to keep safe physical distancing, whenever possible, to prevent any possible transmission. Please contact your instructor if you have any safety concerns.

**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.

## **Technological and Communication Requirements**

ArcGIS is provided online via the SSI Server; hence, you do not need to install it on your own computer. Instead, every student must have the following technology requirements:

- A computer with a fast Internet connection.

- A functional webcam and a microphone for use whenever a presentation or meeting is scheduled.

- An up-to-date web browser to access the Server

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://keep-teaching.usc.edu/students/student-toolkit/>

*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 SSI Tech Support at [spatial\\_support@usc.edu](mailto:spatial_support@usc.edu), making sure to copy (cc) me on the email.

*Communications* – All materials to be handed in will be submitted via Blackboard. 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 Blackboard. Be sure to check these each time you log onto Blackboard.

I will send via email through Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all email sent from Blackboard 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 blackboard account does not go into your junk mail!

While I am usually on-line all day and will probably respond to emails from students very quickly, 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 Blackboard site.

## Required Readings and Supplementary Materials

The required textbook for this course is:

- Arlinghaus, Sandra L and Joseph Kerski. 2014. *Spatial Mathematics: Theory and Practice through Mapping*. Boca Raton, FL: CRC Press.

The supplementary readings are:

- de Smith, Michael J., Michael F. Goodchild and Paul A. Longley. 2018. *Geospatial Analysis: A Comprehensive Guide to Principles, Techniques and Software Tools*, 6th Edition. Winchelsea, UK: The Winchelsea Press. Available in both print and a (free!) web version at [www.spatialanalysisonline.com](http://www.spatialanalysisonline.com).
- MacEachern, Alan M. 1995. *How Maps Work*. New York: Guilford Press.
- Mason, Betsy and Miller, Greg. 2018. *All Over the Map: A Cartographic Odyssey*. Washington, DC: National Geographic.
- Monmonier, Mark. 2018. *How to Lie with Maps*, 3<sup>rd</sup> Edition. Chicago, IL: University of Chicago Press.
- Unwin, David J. 2010. "Numbers Aren't Nasty: A Workbook of Spatial Concepts." *Spatial Literacy in Teaching*, Chapter 3. Available at [http://teachspatial.org/wp-content/uploads/Unwin-Spatial-Workbook\\_Chapter3\\_0.pdf](http://teachspatial.org/wp-content/uploads/Unwin-Spatial-Workbook_Chapter3_0.pdf)

## Description and Assessment of Assignments

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

*Home Assignments – 10 worth a total of 50 points.* In addition to lectures and in-class discussions, there are a series of home assignments that are designed to introduce the tools of quantitative reasoning and provide practical experience in implementing these tools to explore various problems within the framework of the scientific method. These assignments are linked to the lectures and class discussions, but do not duplicate the classroom experience. Home assignments will be graded and returned, and the mid-term and final exams will have a home assignment component to them. In other words, the home assignments are an important and integral part of the course as a whole. Some of the home assignment options available – and there may be more – include:

- Mental Maps
- Routes, Coordinates, Precision and Accuracy
- Measuring the Circumference of the Earth
- Measuring Positions on the Earth’s Surface
- Transformations and Raster/Vector Analysis
- Role of Color and Image Interpretation
- Role of Scale and Dot Density Maps
- Classification and Normalization of Data
- Role of Traditional and Hexagonal Hierarchies
- Examining the Distribution of Tornado Data
- Calculating Mean Centers and Standard Derivational Ellipses
- Comparing Map Projections
- Network Analysis

*Note that more than 10 home assignments may be required. If this is the case, only the 10 highest scores will be counted toward your final grade.*

*Mid-term Examination – 1 worth 13 points.* The mid-term examination will consist of multiple-choice, short answer, and essay questions. Students will be expected to take the exam at the indicated time.

*Final Project – 1 worth 10 points.* The final project is an individual capstone report for this course. Students will be expected to draw upon course lectures, discussions, readings, and outside sources to organize and deliver a self-directed study on a topic of interest. The report is limited to 10 pages (with 12-point font, 1-inch margins, single-spacing for text) and will include one or more maps, tables, and other diagrams as well as a list of references.

*Final Examination – 1 worth 25 points.* The final examination will consist of multiple-choice, short answer, and essay questions. Students will be expected to take the exam at the indicated time.

### **Grading Breakdown**

Assessment	Number	Points Each	Total Points
Home Assignments (HA)	10	5	50

Mid-term Examination	1	14	14
Final Project	1	14	14
Final Examination	1	22	22
Total	13	-	100 points

## Course Schedule

Week	Topic	Readings and Assignments	Deliverables/Due Dates
<b>Module 1: Guiding Principles</b>			
<b>Week 1</b>	MON – Welcome/Introduction		
<b>(22 – 26 Aug)</b>	WED – Mental Maps	HA # 1	
	FRI – Maps in the Social Sciences		
<b>Module 2: Geometry of the Sphere</b>			
<b>Week 2</b>	MON – Earth Coordinate Systems	Arlinghaus & Kerski, Chapter 1  HA # 2	
<b>(29 Aug – 2 Sept)</b>	WED – Introduction to Homework #2		HA # 1 - Due 8/31 at 10 AM PT
	FRI – Earth Systems; Precision of Latitude and Longitude		
<b>Module 3: Location, Trigonometry, and Measurement of the Sphere</b>			
Week	Topic	Readings and Assignments	Deliverables/Due Dates
<b>Week 3*</b>	MON* – no class, university holiday	Arlinghaus & Kerski, Chapter 2	
<b>(5 – 9 Sept)</b>	WED – Location/ Measurement and Shape of the Earth	HA #3	HA #2 - Due 9/7 at 10 AM PT
	FRI – Measuring the Earth and Other Common Coordinate Systems and Introduction to Homework #3		
<b>Week 4</b>	MON – Trigonometry	Arlinghaus & Kerski, Chapter 3  HA # 4	
<b>(12 – 16 Sept)</b>	WED – Partitions: Point–Line–Area Transformations		HA #3 - Due 9/14 at 10 AM PT
	FRI – Raster and Vector Mapping & Homework Assignment #4		
<b>Module 4: Transformations: Analysis and Raster/Vector Formats</b>			

<b>Week 5</b>	MON – Cartography and Geovisualization – Part 1	Arlinghaus & Kerski, Chapter 4	
<b>(19 – 23 Sept)</b>	WED - Cartography and Geovisualization – Part 2		HA #4 - Due 9/21 at 10 AM PT
	FRI – Cartography and Geovisualization – Homework Assignment #5		HA # 5

**Module 5: Replication of Results: Color and Number**

<b>Week 6</b>	MON - Color Straws, Voxels & Ramps	Arlinghaus & Kerski, Part of Chapter 5	
<b>(26 – 30 Sept)</b>	WED – Scale and Scale change		HA #5 - Due 9/28 at 10 AM PT
	FRI – Dot Density – Part 1		

**Module 6: Partitioning of Data: Classification and Analysis**

<b>Week 7</b>	MON - Dot Density – Part 2 & Homework Assignment #6	Arlinghaus & Kerski, Chapter 6	
<b>(3 – 7 Oct)</b>	WED – Mid-term Review		
	FRI – Mid-term Exam		HA # 6

<b>Week</b>	<b>Topic</b>	<b>Readings and Assignments</b>	<b>Deliverables/Due Dates</b>
<b>Module 7: Visualizing Hierarchies</b>			
<b>Week 8*</b>	MON – Isolines / Contour Lines and Final Project		
<b>(10 – 14 Oct)</b>	WED – Traditional Hierarchies & Intro to Homework Assignment # 7	Arlinghaus & Kerski, Chapter 7	HA #6 – Due 10/12 at 10 AM PT
	FRI* – no class, university holiday	HA # 7	
<b>Module 8: Map Projections (2 weeks – Week 9 and 10)</b>			
<b>Week 9</b>	MON – Looking at Projections	Arlinghaus & Kerski, Chapter 9	
<b>(17 - 21 Oct)</b>	WED – Sampling Projection Distortion & Intro to Homework Assignment #8		HA #7 – Due 10/19 at 10 AM PT

	FRI – Projections 1		
		HA # 8	
<b>Week 10</b>	MON – Case Studies		
<b>(24 - 28 Oct)</b>	WED – Case Studies		
	FRI – Modern Projections 2		
<b>Module 9: Distribution of Data / More Cartography</b>			
<b>Week 11</b>	MON – Modern Projections 3	Arlinghaus & Kerski, Chapter 8	
<b>(31 Oct – 4 Nov)</b>	WED – Introduction to Homework #9		HA #8 – Due 11/2 at 10 AM PT
	FRI – Projection Class Discussions	HA # 9	
<b>Module 10: Past, Present, and Future Approaches</b>			
<b>Week 12*</b>	MON – Ann Arbor Tornado Siren Project		
<b>(7 – 11 Nov)</b>	WED – Introduction to Homework #10	Arlinghaus & Kerski, Chapter 10	HA #9 – Due 11/9 at 10 AM PT
	FRI* – no class, university holiday	HA # 10	
<b>Week 13</b>	MON – More Cartography		
<b>(14 - 18 Nov)</b>	WED – From Classics to Modern	Readings are posted on Blackboard	HA #10 – Due 11/16 at 10 AM PT
	FRI – A non-Euclidean Future?		
<b>Finishing the Drill</b>			
<b>Week 14*</b>	MON – Class Discussions		
<b>(21 – 25 Nov)</b>	WED* - no class, university holiday	Readings are posted on Blackboard	
	FRI* - no class, university holiday		
<b>Week 15</b>	MON – Project Presentation		
<b>(28 Nov – 2 Dec)</b>	WED – Project Presentation		
	FRI – Wrap Up & Final Exam Review		
<b>Final Exam</b>	<b>Closed book exam (12/12 8:00 – 10:00 a.m.)</b>		

## Assignment Submission and other Policies

Assignments must be submitted via Blackboard by the due dates specified in the Course Schedule. Attention to on-time assignment submission is essential. The instructors will aim to return feedback before the next assignment is due.

Strict penalties apply for late assignments as follows:

- Assignments up to four-day late will receive 2-point deduction. No assignments submitted after four days later than deadlines will be accepted or graded.
- Additionally, no written work will be accepted for grading after 5 pm PT on the last day of classes.
- **Absences from class sessions** must be requested by sending an email to the instructor. Excused absences from class sessions will be granted only for valid reasons; please notify me of the reason for your absence in your email.

## 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 <https://policy.usc.edu/files/2020/07/SCampus-Part-B-1.pdf>. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, [policy.usc.edu/scientific-misconduct](https://policy.usc.edu/scientific-misconduct).

### **Support Systems**

*Counseling and Mental Health* – (213) 740-9355 – 24/7 on call  
[engemannshc.usc.edu/counseling](https://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](https://www.suicidepreventionlifeline.org)

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

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

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment* – (213) 740-5086 or (213) 821-8298  
[usc-advocate.symplicity.com/care\\_report](https://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 Campus Support and Intervention – (213) 821-4710*

[campussupport.usc.edu](http://campussupport.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)

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](http://dps.usc.edu)

Non-emergency assistance or information.  
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.

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