

## SSCI 135g, Maps in the Digital World

### *Syllabus*

**Units:** 4

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

**Location:** GFS 204

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

**Office:** AHF B55J

**Office Hours:** Monday 12:00 – 1:00 p.m. PT and Wednesday 1:00 – 2:00 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:** VKC 36B

**Office Hours:** Thu 10 a.m.-12 p.m.

**Contact Info:** [arutkows@usc.edu](mailto:arutkows@usc.edu), see contact page on Blackboard for Zoom Room

**IT Help:** Richard Tsung

**Office:** AHF 145D

**Office Hours:** By appointment

**Contact Info:** [spatial\\_support@usc.edu](mailto:spatial_support@usc.edu), 213-821-4415

## **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).

## **Technological and Communication Requirements**

Students will be introduced to geospatial technologies by utilizing Esri services and products. This course will use ArcGIS Online (AGOL) to examine spatial data, and to perform final project analysis. The modeling software and geospatial data required for course assignments will be accessed using computing resources provided by the Spatial Sciences Institute.

*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 sent via Blackboard, any important announcements will be posted on the Announcement page in Blackboard. Be sure to check these each time you log onto Blackboard.

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!

I am regularly on-line all day and will respond to emails from students 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.

## **Course Structure**

The course will be organized around seven modules and the accompanying lecture and classroom exercise (homework) topics.

## **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>(10 - 14 Jan)</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* – no class, university holiday	Arlinghaus & Kerski, Chapter 1  HA # 2	
<b>(17 - 21 Jan)</b>	WED – Earth Coordinate Systems		HA # 1 - Due 1/19 at 10 AM PT
	FRI – Introduction to Homework #2		
<b>Module 3: Location, Trigonometry, and Measurement of the Sphere</b>			

<b>Week</b>	<b>Topic</b>	<b>Readings and Assignments</b>	<b>Deliverables/Due Dates</b>
<b>Week 3</b>	MON – Earth Systems; Precision of Latitude and Longitude	Arlinghaus & Kerski, Chapter 2  HA #3	
<b>(24 - 28 Jan)</b>	WED – Location/ Measurement and Shape of the Earth		HA #2 - Due 1/26 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>(31 Jan - 4 Feb)</b>	WED – Partitions: Point–Line–Area Transformations		HA #3 - Due 2/2 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  HA #5	
<b>(7 - 11 Feb)</b>	WED - Cartography and Geovisualization – Part 2		HA #4 - Due 2/9 at 10 AM PT
	FRI – Cartography and Geovisualization – Homework Assignment #5		
<b>Module 5: Replication of Results: Color and Number</b>			
<b>Week 6</b>	MON - Color Straws, Voxels & Ramps	Arlinghaus & Kerski, Part of Chapter 5	
<b>(14 - 18 Feb)</b>	WED – Scale and Scale change		HA #5 - Due 2/16 at 10 AM PT
	FRI – Dot Density – Part 1		
<b>Module 6: Partitioning of Data: Classification and Analysis</b>			
<b>Week 7*</b>	MON* - no class, university holiday	Arlinghaus & Kerski, Chapter 6  HA #6	
<b>(21 – 25 Feb)</b>	WED – Dot Density – Part 2 & Homework Assignment #6		
	FRI – Mid-term Review		

<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 – Mid-term Exam		
<b>(28 Feb – 4 Mar)</b>	WED – Isolines / Contour Lines and Final Project	Arlinghaus & Kerski, Chapter 7	HA #6 – Due 3/2 at 10 AM PT
	FRI – Traditional Hierarchies & Intro to Homework Assignment # 7	HA # 7	
<b>Module 8: Map Projections (2 weeks – Week 9 and 10)</b>			
<b>Week 9</b>	MON – Looking at Projections		
<b>(7 – 11 Mar)</b>	WED – Sampling Projection Distortion & Intro to Homework Assignment #8	Arlinghaus & Kerski, Chapter 9	HA #7 – Due 3/9 at 10 AM PT
	FRI – Projections 1	HA # 8	
<b>Week 10</b>	MON – Case Studies		
<b>(21 - 25 Mar)</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>(28 Mar – 1 Apr)</b>	WED – Introduction to Homework #9		HA #8 – Due 3/29 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>(4 – 8 Apr)</b>	WED – Introduction to Homework #10	Arlinghaus & Kerski, Chapter 10	HA #9 – Due 4/6 at 10 AM PT
	FRI – More Cartography	HA # 10	
<b>Week 13</b>	MON – From Classics to Modern		
<b>(11 – 15 Apr)</b>	WED – A non-Euclidean Future?	Readings are posted on Blackboard	HA #10 – Due 4/13 at 10 AM PT
	FRI – Case Studies		

<i>Finishing the Drill</i>			
<b>Week 14</b>	MON – Class Discussions	Readings are posted on Blackboard	
<b>(18 – 22 Apr)</b>	WED - Class Discussions		
	FRI - Class Discussions		
<b>Week 15</b>	MON – Project Presentation		
<b>(26 – 29 Apr)</b>	WED – Project Presentation		
	FRI – Wrap Up & Final Exam Review		Final Project Report: No later than 5:00 pm PT on Friday, 4/29
<b>Final Exam</b>	<b>Closed book exam (5/9 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](http://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](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 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](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 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.

*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.

### ***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.