

USC Dornsife

Dana and David Dornsife
College of Letters, Arts and Sciences
Spatial Sciences Institute

SSCI 135g, Maps in the Digital World

Syllabus

Units: 4

Term — Day — Time: Spring, 2019, Lectures: Mondays, Wednesdays, and Fridays 10:00-11:20 a.m.

Location: Grace Ford Salvatori Hall (GFS) 228

Instructor: Su Jin Lee, Ph.D., GISP

Office: AHF B55K

Office Hours: Tuesdays 2:00-3:00 p.m. and Thursdays 1:00-2:00 p.m. Also available most days and times by appointment via email.

Contact Info: sujinlee@usc.edu, 213-740-2845 (office)

Library Help: Andy Rutkowski

Office: VKC B36B

Office Hours: Tuesdays 10:00 a.m.-12:00 p.m. and Thursdays 4:30-5:30 p.m.

Contact Info: arutkows@usc.edu, 213-740-6390 (office), <http://bit.ly/andyhangout>

IT Help: Richard Tsung

Office: AHF B57E

Office Hours: By appointment

Contact Info: ctsung@usc.edu, 213-821-4415 (office)

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

Course Structure

The course will be organized around the following 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.
- MacEachern, Alan M. 1995. *How Maps Work*. New York: Guilford Press.
- Monmonier, Mark. 2018. *How to Lie with Maps*, 3rd 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

Description and Assessment of Assignments

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

Homework – 4 worth a total of 48 points. In addition to lectures and in-class discussions, there are a series of homework 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. Weekly homework assignments will be graded and returned, and the mid-term and final exams will have a homework component to them. In other words, the homework component is an important and integral part of the course as a whole.

The letter "P" listed at the end of selected homework topics indicates assignments that include components contributing to your final project:

- Homework #1: Routes, Coordinates, Precision and Accuracy
- Homework #2: Measuring the Circumference of the Earth
- Homework #3: Measuring Positions on the Earth's Surface
- Homework #4: Transformations and Raster/Vector Analysis (P)
- Homework #5: Role of Color and Image Interpretation
- Homework #6: Role of Scale and Dot Density Maps

- Homework #7: Classification and Normalization of Data (P)
- Homework #8: Role of Traditional and Hexagonal Hierarchies (P)
- Homework #9: Examining the Distribution of Tornado Data
- Homework #10: Calculating Mean Centers and Standard Derivational Ellipses
- Homework #11: Comparing Map Projections (P)
- Homework #12: Network Analysis (P) Final Project

Mid-term Examination – 1 worth 12 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 30 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
Homework	12	4	48
Mid-term Examination	1	12	12
Final Project	1	10	10
Final Examination	1	30	30
Total	15	-	100 points

Assignment Submission Policy

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

Strict penalties apply for late assignments as follows:

- All assignments will be penalized 2 points up to FOUR days late. No points will be given for submissions more than FOUR days late. Note that all assignments worth 2 points will receive 0 points if submitted late.
- Additionally, no written work will be accepted for grading after 5 pm PT on the last day of classes.

Course Schedule

	Topic	Readings and Assignments	Deliverables/Due Dates
Module 1: Guiding Principles			
Week 1 1/7	Introduction		
1/9	Mental Maps		
1/11	Maps in the Social Sciences		
Module 2: Geometry of the Sphere			
Week 2 1/14	Earth Coordinate Systems	Arlinghaus & Kerski, Chapter 1 Homework #1	
1/16	Earth Coordinate Systems		
1/18	Introduction to Homework #1		
Week 3 1/21	Earth Systems; Precision of Latitude and Longitude		
Module 3: Location, Trigonometry, and Measurement of the Sphere			
1/23	Location and measurement; Triangulation; Shape of the Earth	Arlinghaus & Kerski, Chapter 2 Homework #2 Homework #3	Homework #1: Wednesday, 1/23
1/25	Measuring the Earth; Other common coordinate systems; Introduction to Homework #2		
Week 4 1/28	From antiquity to today; Intro to Homework #3		
Module 4: Transformations: Analysis and Raster/Vector Formats			
1/30	Transformation	Arlinghaus & Kerski, Chapter 3 Homework #4	
2/1	Partitions: Point–line–area transformations		
Week 5 2/4	Raster and vector mapping: Know your file formats		Homework #2: Monday, 2/4
2/6	Scope, purpose and choice of final project		
2/8	Introduction to Homework #4		Homework #3: Friday, 2/8
Module 5: Replication of Results: Color and Number			
Week 6 2/11	Color straws, voxels & ramps	Arlinghaus & Kerski, Chapter 4 Homework #5	
2/13	Image Transformations		
2/15	Introduction to Homework #5		Homework #4: Friday, 2/15

	Topic	Readings and Assignments	Deliverables/Due Dates
Module 6: Scale			
Week 7 2/18	Scale and scale change	Arlinghaus & Kerski, Chapter 5 Homework #6	
2/20	Dot density maps		
2/22	Introduction to Homework #6		Homework #5: Friday, 2/22
Week 8 2/25	Mid-term Examination		Mid-term Examination: Monday, 2/25
Module 7: Partitioning of Data: Classification and Analysis			
2/27	Choice of Data Ranges	Arlinghaus & Kerski, Chapter 6 Homework #7	
3/1	Normalizing Data		
Week 9 3/4	Isolines and contours		
3/6	Introduction to Homework #7		Homework #6: Wednesday, 3/6
Module 8: Visualizing Hierarchies			
3/8	Traditional Hierarchies		
3/11*	*3/11-3/15 is <i>Spring Recess</i>		
Week 10 3/18	Hexagonal Hierarchies	Arlinghaus & Kerski, Chapter 7 Homework #8	
3/20	Introduction to Homework #8		Homework #7: Wednesday, 3/20
Module 9: Distribution of Data			
3/22	Ann Arbor Tornado Siren Project	Arlinghaus & Kerski, Chapter 8 Homework #9 Homework #10	
Week 11 3/25	Mean Center and Standard Deviational Ellipse		
3/27	Introduction to Homework #9		Homework #8: Wednesday, 3/27
3/29	Introduction to Homework #10		
Module 10: Map Projections			
Week 12 4/1	Looking at Projections	Arlinghaus & Kerski, Chapter 9 Homework #11 Homework #12	
4/3	Sampling Projection Distortion		
4/5	More Projections		

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 13 4/8	Modern Projections		
4/10	Introduction to Homework #11		Homework #9: Wednesday, 4/10
4/12	Introduction to Homework #12		Homework #10: Friday, 4/12
Module 11: Past, Present, and Future Approaches			
Week 14 4/15	From classics to the modern	Arlinghaus & Kerski, Chapter 10	
4/17	A non-Euclidean future?		Homework #11: Wednesday, 4/17
4/19	Final Project		Homework #12: Friday, 4/19
Week 15 4/22	Class Review		
4/24 *Friday, 4/26 is last day of class	Wrap Up		Final Project Report: No later than 5:00 pm PT on Friday, 4/26
Exam Week 5/1-5/8	Final Examination	Final Project Presentation	Final Examination: Wednesday, 5/2

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.