

SSCI 135Lg, Numbers and Maps

Units: 4

Term—Day—Time: Spring, 2016, Monday, Wednesday, and Friday, 10:00 – 10:50 a.m.

Location: Taper Hall of Humanities (THH) 118

Instructor: Darren Ruddell, Ph.D.

Office: AHF B57F

Office Hours: Tuesdays, 11:30 a.m. – 12:30 p.m. and
Wednesdays, 9 – 10 a.m.

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Hours of Service: Mondays to Fridays, 9:00 a.m.-5:00 p.m.

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Course Description

This course explores all the ways in which maps are 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 and the overarching intent 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 ways things are located and 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 Objectives

Students who excel in SSCI 135 will be able to:

- Demonstrate the ability to use numbers to construct maps to describe and interpret the complexity and sophistication of the modern world.
- Demonstrate the ability to 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.
- Demonstrate the ability to explore the logical structures embedded in various kinds of maps and learn how distinguish between their assumptions and implications.

Prerequisite(s): None

Co-Requisite (s): None

Concurrent Enrollment: None

Recommended Preparation: None

Course Notes

In addition to the lectures, there are a series of laboratory experiences that 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. These assignments are linked to the lectures and class discussions, but do not duplicate the lecture experience. You must register for one laboratory session in addition to registering for the class itself. Your weekly laboratory assignments will be graded and returned, and the final exam will include material from the class and laboratory component.

No make-up dates will be offered for missed quizzes or exams, so mark the appropriate dates on your calendars! If you have a legitimate conflict, speak with a course instructor as soon as possible so we can make alternative arrangements.

Technological Proficiency and Hardware/Software Required

The modeling software and geospatial data required for course assignments will be accessed using computing resources provided by the Spatial Sciences Institute.

Required Readings

Arlinghaus, S. L., and J. J. Kerski 2014. *Spatial Mathematics: Theory and Practice through Mapping*. Boca Raton, FL, CRC Press. (Available for purchase in the USC bookstore)

Garfield, S. 2013. *On the Map: A Mind-Expanding Exploration of the Way the World Looks*. New York, NY, Gotham Books. (Available for purchase in the USC bookstore)

Recommended Readings

de Smith, M., P. A. Longley, and M. F. Goodchild 2006. *Geospatial Analysis: A Comprehensive Guide*. (Available at <http://www.spatialanalysisonline.com/>)

MacEachern, A. M. 1995. *How Maps Work*. New York, Guilford Press

Monmonier, M., and H. de Blij 2010. *How to Lie with Maps* (Second Edition). Chicago, IL, University of Chicago Press

Unwin, D. J. 2010. *Numbers Aren't Nasty: A Workbook of Spatial Concepts*. (Available at http://www.teachspatial.org/sites/teachspatial.org/files/Unwin_WorkbookOfSpatialConcepts.pdf)

Description and Assessment of Assignments

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

Exercises (48%): Each student will complete twelve exercises (hands-on assignments) to build familiarity and confidence with geospatial tools while strengthening comprehension of concepts introduced in lecture and lab sessions. Exercises are due to Blackboard by 3 p.m. the same day as your lab session.

Midterm Exam (12%): The midterm exam in this class covers material from the first six weeks of the semester, including lecture, labs, and readings. The midterm exam is scheduled for 10:00 to 10:50 a.m. on Friday, February 26th, 2016.

Final Project (10%): The final project for this course is to complete a location-based services exercise whereby you will site a new business – informed by spatial analysis – and write up the results of your investigation in a project report. The requisite skills will be developed over the course of the semester using an assortment of geospatial tools. Project reports are limited to 10 pages (with 12 point font, 1 inch margins, single-spacing for text) and will include two or more maps, tables, and other diagrams as well as a list of references. The final project is due to Blackboard no later than 10 a.m. on Wednesday, 4/27.

Final Exam (30%): The final exam in this class covers material from all parts of the class, including lecture, labs, and readings, spread across the entire semester. This exam is scheduled for 8:00 to 10:00 a.m. on Monday, 9th May, 2016.

Grading Breakdown

Assignment	Number	% of Grade
Exercises	12	48
Midterm Exam	1	12
Final Project	1	10
Final Exam	1	30
TOTAL	15	100

Assignment Submission Policy

Assignments will be submitted for grading via Blackboard using the due dates specified in the Course Schedule below.

Additional Policies

Students are expected to attend and participate in every class session and to complete and upload all assignments before the deadlines detailed in the Course Schedule. No late work is accepted.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Homework	Deliverables/Due Dates
Week 1 1/11	Introduction to Class and Special Properties of Maps	Arlinghaus & Kerski, Ch. 1	No deliverables
Week 2 1/20	Geometry of the Sphere A discussion of Earth coordinate systems, representation models, and longitude/latitude	Garfield, Ch. 1 Exercise 1	Exercise 1 is due to Blackboard by 3 p.m. the same day as your lab session
Week 3 1/25	Location, Trigonometry and Measurement of the Sphere Exploration and discussion of systems for measuring the surface of the Earth	Arlinghaus & Kerski, Ch. 2 Exercise 2	Exercise 2 is due to Blackboard by 3 p.m. the same day as your lab session
Week 4 2/1	Map History A discussion of the ancient explorers and the use of mathematics in calculating the size and shape of the world	Garfield Ch. 2-3 Exercise 3	Exercise 3 is due to Blackboard by 3 p.m. the same day as your lab session
Week 5 2/8	Transformations: Analysis and Representation Data Models A discussion on transformation procedures when converting raster and vector data models	Arlinghaus & Kerski, Ch. 3 Exercise 4	Exercise 4 is due to Blackboard by 3 p.m. the same day as your lab session
Week 6 2/17	Replication of Results: Color and Number Introduction to cartography – utilizing colors and numbers to express spatial relationships	Arlinghaus & Kerski, Ch. 4 Exercise 5	Exercise 5 is due to Blackboard by 3 p.m. the same day as your lab session
Week 7 2/22	Midterm Exam; Scale An introduction to scale	Arlinghaus & Kerski, Ch. 5 Exercise 6	Exercise 6 is due to Blackboard by 3 p.m. the

			same day as your lab session
Week 8 2/29	Scale in Scientific Inquiry A discussion of the role and complexity of scale in scientific inquiry and visual representation	Exercise 7	Exercise 7 is due to Blackboard by 3 p.m. the same day as your lab session
Week 9 3/7	Applied Maps: A Public Health Perspective A discussion on John Snow's cholera map – how mapping helps understand public health problems	Garfield Ch. 12-13 Exercise 8	Exercise 8 is due to Blackboard by 3 p.m. the same day as your lab session
Week 10 3/21	Partitioning of Data: Classification and Analysis An exploration of partitioning data: impacts, assumptions, and fitness of use	Arlinghaus & Kerski, Ch. 6	No deliverables
Week 11 3/28	Visualizing Hierarchies An exploration of visual representations and the use of hierarchy in cartographic design	Arlinghaus & Kerski, Ch. 7 Exercise 9	Exercise 9 is due to Blackboard by 3 p.m. the same day as your lab session
Week 12 4/4	Distribution of Data Discussion of selected concepts in displaying data	Arlinghaus & Kerski, Ch. 8 Exercise 10	Exercise 10 is due to Blackboard by 3 p.m. the same day as your lab session
Week 13 4/11	Map Projections Discussion of maps and their underlying projections, distortions, and fitness of use	Arlinghaus & Kerski, Ch. 9 Exercise 11	Exercise 11 is due to Blackboard by 3 p.m. the same day as your lab session
Week 14 4/18	GPS and the Rise of Location Analytics Discussion of the wide adoption of location-based services and analytics	Garfield Ch. 20 Exercise 12	Exercise 12 is due to Blackboard by 3 p.m. the same day as your lab session
Week 15 4/25	Integrating Past, Present, and Future Approaches An exploration of classic and modern mapping techniques and technologies	Arlinghaus & Kerski, Ch. 10	Submit Final Project on Blackboard no later than 10 a.m. on Wednesday, 4/27
FINAL 5/9	Final Exam		8:00-10:00 a.m. Monday, 9 May

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 Section 11, *Behavior Violating University Standards* <http://studentaffairs.usc.edu/scampus/>. 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>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage <http://sarc.usc.edu> describes reporting options and other resources.

Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.