SSCI 301L – MAPS AND SPATIAL REASONING

Course: SSCI 301L – Maps and Spatial Reasoning

    Sections: 35712R (Lecture); 35713R (Lab)

    Lecture: Monday & Wednesday 2-3:20pm

    Lab: Wednesday 12-1:50pm

    Location: AHF (Allan Hancock Foundation) B57A

    Website: www.blackboard.usc.edu

Instructor: Dr. Darren Ruddell

    Office: AHF Building B57G

    Email: druddell@usc.edu

    Website: http://spatial.usc.edu

    Skype: darren.ruddell

    Twitter: @GIST_Prof

    Office Hours: Thursday11:30am-12:30pm and by appointment. I am happy to meet in person or asynchronously via email. I am also available via Skype or Adobe Connect most days provided we schedule the meeting in advance. Please take advantage of office hours – it is a great resource.

1. Introduction

Maps have long played a role in the production and use of geographic information. They support many different kinds and levels of spatial reasoning ranging from simple queries (route finding, proximity analysis) to more advanced forms of spatial analysis and modeling. There has been a recent explosion in geographic information (GI) technologies the past two decades which include quick visualization tools (Google, Bing Maps) to sophisticated GISystems (ArcGIS, Idrisi) and many kinds of GPS-enabled sensors. These tools have attracted large numbers of users: for example, social workers use GIS to track where clients live and where more social services are needed, planners use GIS to analyze the transformation of city spaces as urban areas develop, 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 transformation across space, environmental scientists use GIS to track how natural disasters and groundwater flows interact with human-environment systems, and emergency responders use GIS to track where earthquake or hurricane survivors need assistance.

Taken as a whole, this course provides a broad understanding (theoretical and technical) for later work with geographic information, regardless of background. It covers 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, profoundly impact the way we understand the world, and help us to prepare plans and

designs that would dramatically improve the quality of life for those whose life experiences and prospects are shaped by spatial processes if implemented.

2. Course Objectives

Students who excel in SSCI 301L will be able to:

- Explain how and why public, private, and not-for-profit organizations produce and use geographic data, including topographic maps, remotely sensed imagery, and thematic maps to portray census and various types of community, social, and natural resource information;

- Describe the goals and contents of key geographic applications such as Bing maps, Google Earth, MapQuest, OpenStreetMap, and the U.S. National Map;

- Explain how modern geographic analysis and visualization tools can be used to advance our knowledge and understanding of human and environmental activities and events from a variety of disciplinary perspectives.

3. Course Organization

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 hardware and software systems 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 in implementing these tools to explore various problems within the framework of the scientific method. The lecture and lab sessions are designed to complement each other to provide you with sound theoretical reasoning and the technical skills to investigate various physical and/or social processes. Your weekly laboratory assignments will be graded and returned, and the mid-term and final exams will have a laboratory component to them. **It is required that you register for both the lecture and laboratory session for this course.**

Please note that all course materials and correspondence will be posted on the course Blackboard site. As a registered student you will find this course available for you to access at 10am Pacific Time on the first day of classes.

4. Course Assessment

| Laboratory Assignments | 40% | Midterm Examination | 15% |
| Research Paper | 15% | Final Examination | 30% |

Please note that no make-up opportunities will be offered for missed tests or exams. If you have a known conflict, speak with me as soon as possible so we can make alternative arrangements.

5. Textbooks

Required Texts:

Harvey, F (2008) *A Primer of GIS: Fundamental Geographic and Cartographic Concepts.* New York, Guilford Press.

Monmonier, M (1996) *How to Lie with Maps* (Second Edition). Chicago, University of Chicago Press.

Related Texts:

Kimerling, A J, Buckley, A R, Muehrcke, P C, and Muehrcke, J O. (2010) *Map Use and Analysis* (Sixth
        Edition) Redlands, California: ESRI Press.

Campbell, J (2001) Map Use and Analysis (Fourth Edition). Boston: McGraw Hill.

Pearce, M and Dwyer, O (2009) *Exploring Human Geography with Maps* (Second Edition). New York:
        W H Freeman.

Letham, L and Letham, A (2008) *GPS Made Easy* (5th Edition). Seattle: Mountaineers Books.

Clark, K C (2010) *Getting Started with Geographic Information Systems* (Fifth Edition). Upper
        Saddle River, New Jersey: Pearson Education

Harmon, K (2003) *You are Here: Personal Geographies and Other Maps of the Imagination*. Princeton, New
        Jersey, Princeton University Press

Johnson, S (2007) *The Ghost Map: The Story of London's Most Terrifying Epidemic – and How It Changed
        Science, Cities, and the Modern World*. New York: Riverhead Trade.

6. Academic Accommodations

Any student requesting academic accommodations based on a disability is required to register with
Disability Services and Programs (DSP) each semester. A letter of verification for approved
accommodations can be obtained from DSP and it should be delivered to me early in the semester.
DSP is located in STU 301 and is open from 8:30am to 5:00pm, Monday through Friday (213-740-
0776; study@usc.edu).

7. Academic Integrity

Academic integrity is a foundational principle of our community and ensuring the highest standards of
academic integrity is the collective responsibility of faculty, students, and administrators. There is a
process in place to deal with such incidents as cheating, unauthorized collaboration and plagiarism.
The Trojan Integrity Guide can be found at http://www.usc.edu/student-
affairs/SJACS/forms/tio.pdf and the Undergraduate Guide for Avoiding Plagiarism can be found at
http://www.usc.edu/student-affairs/SJACS/forms/tig.pdf.

8. Important Administrative Dates

8/26:   Fall semester classes begin
9/2:   Labor Day, university holiday
9/13:   Last day to register and add classes, change enrollment option to Pass/No Pass or Audit,
           or to drop a class without a mark of "W" and receive a 100% refund
11/15:   Last day to drop a class with a mark of "W"
11/27-30: Thanksgiving recess, university holiday
12/6:   Fall semester classes end
12/7-10:   Study days
12/19:   Final examination (8-10:00am)

9. Course Outline

The course will be organized around the following four modules and the accompanying lecture and laboratory topics.

Module 1: Core Concepts

8/26: Introduction to Course
8/28: Maps and Spatial Reasoning

Read Harvey (Chapter 1, pp.3-33)

9/2: University Holiday
9/4: Geographic Representation and Choices for Cartographic Representation

Read Harvey (Chapter 2, pp. 34-52)

Module 2: Map Principles

9/9: From a Round to a Flat Surface: Projections
9/11: Additional Choices in Map Making

Read Harvey (Chapter 3, pp. 53-72)

9/16: Making Projections: Earth Models and Datums
9/18: Types of Projections and Their Characteristics

Read Harvey (Chapter 4, pp. 75-101)

9/23: Projections throughout History
9/25: How to Set Locational and Coordinate Systems

Read Harvey (Chapter 5, pp. 102-126)

Module 3: Spatial Analysis and Reasoning

9/30: Databases
10/2: Geographic Information Systems

Read Harvey (Chapter 6, pp. 127-138)

10/7: Geographic Positioning Systems
10/9: GPS in the Field

Read Harvey (Chapter 7, pp. 139-159)

10/14: Remote Sensing
10/16: Remote Sensing in Practice

Read Harvey (Chapter 8, pp. 160-173)

10/21: Positions, Networks, Fields, and Geographic Information
10/23: Examples of Geographic Information Representation Transformations

Read Harvey (Chapter 9, pp. 174-189)

10/28: Mid-term Exam
10/30: Cartographic Representation

Read Harvey (Chapter 10, pp. 193-220)

11/4: Maps, Power, and Empowerment
11/6: Culture and the Use and Misuse of Geographic Information

Read Monmonier (whole book) plus Harvey (Chapter 11, pp. 221-250)

11/11: Government Mapping Agencies and the Administration of Spaces
11/13: Crowd Sourcing and Volunteered Geographic Information

Read Harvey (Chapter 12, pp. 253-250)

11/18: Geographic Information and Spatial Analysis
11/20: Examples of Spatial Analysis

Read Harvey (Chapter 13, pp. 253-270)

11/25: Geostatistics
11/27: Thanksgiving Holiday

Read Harvey (Chapter 14, pp. 271-289)

Module 4: Future Challenges and Opportunities

12/2: Future of Spatial Thinking as an Analytical Tool
12/4: Course Review

Read Harvey (Chapters 15, pp. 290-299)

10. Laboratory Topics & Protocols

The laboratory sessions will be organized around the following lab topics. The dates shown to the left of the individual topics indicate the week in which a given lab starts.

Role of Spatial Perspectives in characterizing Selected Human Activities
9/2: Demographic Mapping: Your Community, Your Region
9/9: Food Expenditure Analysis
9/16: Evaluating a Business Site Location
9/23: Population Drift: Mean Center Analysis 1790-2010

Role of Spatial Perspectives in Showing How Nature Helps to Shape Humanity
9/30: Haiti, January 2010 Earthquake Analysis
10/7: Groundwater as a Shared Resource
10/14: Historical Tornado Patterns and Trends
10/21: Extreme Temperature Patterns and Trends
10/28: Hurricane Katrina: Understanding Physical and Social Vulnerability

Role of Spatial perspectives in Showing how Humanity Influences Nature
11/4: Timber Harvesting Plans
11/11: Floods and Toxic Spills in Hungary and Beyond
11/18: Forest planning for Sensitive Wildlife Species
12/2: Sustainability and Science: The Ecology of Everyday Decisions

Each lab session will start on the hour and will begin with a brief introduction to the topic of investigation. These introductions will take no longer than 10 minutes and students arriving more than 10 minutes after the scheduled start times for their laboratory sessions will be turned away and assigned a zero grade for that particular lab assignment. Some self-guided work tasks using one or more geospatial datasets will then follow for approximately an hour after which time we will have a 15 minute roundtable discussion of the tasks completed, what it means, and how these tasks might have been varied and/or enhanced if performed by professionals in a real world setting. The lab session will conclude with each student submitting a final lab report for grading. No lab reports will be accepted for grading if handed in outside of the regularly scheduled lab session.