Spatial Sciences Program
University of Southern California
Dr. Jennifer N. Swift

SSCI 382L: PRINCIPLES OF GEOGRAPHIC INFORMATION SCIENCE

Spring Semester 2014

1. Introduction

The spatial sciences focus on the various ways in which geography can be used to acquire, represent, organize, analyze, model and visualize information. These views of the world are supported by Geographic Information Systems (GIS) and the related geospatial technologies (GPS, remote sensing systems, etc.) which, in turn, rely on the underlying geographic information science concepts and methods. This much is known from *GEOG 301L: Maps and Spatial Reasoning* and this particular course (the second in a three-course sequence) seeks to elucidate how these systems and the underlying science provides a gateway to the natural and social sciences and problem-solving in general.

That said, a large part of the course is focused on various kinds of spatial analysis since they constitute the crux of GIS, providing the means of adding value to geographic data and for turning these data into useful information. Numerous examples will be used throughout the course to illustrate how spatial analysis helps us in situations when our eyes might deceive us and/or to reveal things that might otherwise be invisible. The combination of class and laboratory sessions will show how effective spatial analysis requires an informed and intelligent user in addition to the appropriate computer hardware and software tools.

2. Course Objectives

Students who excel in GEOG 382L will be able to:

- Recognize geographic data and what is special about it and why it is important;
- Discuss the kinds of decisions made with geographic information, how scientists, managers and policy makers use GIS, and why they find it helpful;
- Discuss what constitutes a Geographic Information System and how they would know one if they saw it; and
- 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 Outline

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

Module 1: Introduction

1/13: Introduction to Course
1/15: Geographic Information Science

Read Longley et al., Chapters 1 & 2 (pp. 1-71)

Module 2: Principles

1/22: Representing Geography & Nature of Geographic Data

Read Longley et al., Chapters 3 & 4 (pp. 73-121)

1/29: Georeferencing, Geotagging & Mashups
Read Longley et al., Chapter 5 (pp. 123-145)

2/3: Sources of Geographic Uncertainty
2/5: Geographic Uncertainty in Practice

Read Longley et al., Chapter 6 (pp. 147-177)

Module 3: Building Blocks

2/10: GIS Software
2/12: Geographic Data Modeling

Read Longley, et al. Chapters 7 & 8 (pp. 181-228)

2/19: GIS Data Collection in Practice & Acquiring Data in the Field

Read Longley et al., Chapter 9 (pp. 229-249)

2/24: Role of Database Management Systems in GIS
2/26: Creating and Maintaining Geographic Databases

Read Longley, et al. Chapter 10 (pp. 251-274)

Module 4: Visualization, Analysis, and Modeling

3/3: Distributing Data and Software (GIServices)
3/5: The Mobile User

Read Longley et al., Chapter 11 (pp. 275-294)

3/10: Cartography and Map Production
3/12: Mid-term Exam (02:00 – 3:20 PM)

Read Longley et al., Chapter 12 (pp. 297-322)

3/24: Geovisualization, Spatial Query and User Interaction
3/26: The Art of Geocoding

Read Longley et al., Chapter 13 (pp. 323-349)

3/31: Measurements
4/2: Spatial Analysis

Read Longley et al., Chapter 14 (pp. 351-379)

4/7: Area-based Analyses
4/9: Optimization

Read Longley et al., Chapter 15 (pp. 381-401)

4/14: Spatial Modeling with GIS
4/16: Uncertainty, Error, Accuracy and Validity

Read Longley et al., Chapter 16 (pp. 403-423)

4/21: Managing GIS
4/23: GIS Operational Challenges

Read Longley, et al. Chapters 17 & 18 (pp. 427-476)

Module 5: Management and Policy

4/28: GIS Partnerships
4/30: Future of Geographic Information Science

Read Longley, et al. Chapters 19 & 20 (pp. 477-525)

4. Important Dates

1/10: Last day to register and settle without a late fee
1/13: Spring semester classes begin
1/20: Martin Luther King's Birthday, university holiday
1/31: Last day to register and add classes
1/31: Last day to change enrollment option to Pass/No Pass or Audit
1/31: Last day to drop a class without a mark of "W", except for Monday-only classes, and receive a 100% refund
2/17: President's Day, university holiday
3/12: Mid-term Examination (02:00 – 3:20 PM)
4/11: Last day to drop a class with a mark of W
3/17-3/22: Spring recess
5/2: Spring semester classes end
5/3-5/6: Study days
5/12: Final Examination (02:00 – 3:20 PM)

In addition to the lectures, there are a series of laboratory assignments 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, but do not duplicate the lecture materials. You must register for one laboratory session in addition to registering for the lectures. Your weekly laboratory assignments will be graded and returned, and the mid-term and final exams will have a laboratory component to them. In other words, laboratory sessions are important.

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

5. 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.

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 8:30 am to 5:00 pm, Monday through Friday (213-740-0776; study@usc.edu).

7. Course Personnel

Instructor:

Dr. Jennifer Swift
AHF B57D
213-740-5841
jswift@usc.edu

Lecture: Monday and Wednesdays 2:00 – 3:20
Lab: Wednesdays 12:00 – 1:50 PM
Office Hrs: Wednesdays 10:00am – 12:00 PM* and by appointment
(*tentative, pending open B57A Hrs)

8. Grading Scheme

Laboratory Assignments	26%	Mid-term Examination	14%
Spatial Analysis Projects	30%	Final Examination	30%

9. Textbooks

Required Texts:

Longley P A, Goodchild M F, Maguire D J, and Rhind D W 2011 *Geographic Information Systems and Science* (Third Edition). New York, John Wiley and Sons

Law M, and Collins A 2014 *Getting to Know ArcGIS Desktop*. (Third Edition). Redlands, CA, Esri Press.

Recommended Texts:

Clemmer G 2010 *The GIS 20: Essential Skills*. Redlands, CA, Esri Press

Wade T and Sommer S 2006 *A to Z GIS*. Redlands, CA, Esri Press

10. Laboratory Topics & Protocols

The labs will be organized around the following lab topics. The dates shown to the left of the individual topics indicate the Monday or Tuesday on which these labs start.

Each of the lab sessions will start on the hour with a brief introduction from the Instructor. 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 the Instructor will convene a 15 minute roundtable discussion of what you have done, what it means, and how these tasks might have been varied and/or enhanced if performed by professionals in a real world setting. The final 30 minutes of the lab sessions will be available for each of you to prepare and submit your final lab report for grading. No lab reports will be accepted for grading if handed in outside of the regularly scheduled lab session and students must purchase and use their own copies of the lab manual.

Proposed Laboratory Topics:

1/15: Introduction to GIS & Geographic Information Science

1/22: Getting Started with Maps and Data: Interacting with Maps & Data

1/29: Getting Started with Maps and Data: Coordinate Systems and Projections, Georeferncing, Exploring Online resources

2/5: Measuring Uncertainty & Group Project #1

2/12: Displaying Data: Symbolizing and Classifying Features

2/19: Presenting Data: Labeling Features, Making Maps for Presentation & Group Project #2

2/26: Creating and Editing Data: Building Geodatabases, Creating & Editing Features and Attributes

3/5: Data Collection, from the Field to the Lab, Independent Project #1

3/26: Creating and Editing Data: Geocoding Addresses
4/2: Getting Information about Features: Querying, Joining and Relating Data & Independent Project #2
4/9: Analyzing Feature Relationships: Preparing Data for Analysis
4/16: Analyzing Vector & Raster Data & Independent Project #3
4/23: Exploring Spatial Patterns in Your Data
4/30: The Power of Teams, Group Project #3