SSCI 587 (Section 35715), Spatial Data Acquisition

Syllabus

Units: 4

Term — Day — Time: Spring 2017, Online

Location: Online

Instructor: Su Jin Lee, Ph.D., GISP
Office: AHF B55K
Office Hours: Wed. 12-1 p.m. PT, and Fri. 1-2 p.m. PT, and by appointment

Contact Info: sujinlee@usc.edu, 213-740-2845
http://bluejeans.com/5165650654

GIS Library Help: Katharin Peter
Office: VKC B40A
Office Hours: By appointment
Contact Info: kpeter@usc.edu, 213-740-1700

IT Help: Richard Tsung
Office: AHF 146
Office Hours: By appointment
Contact Info: spatial_support@usc.edu, 213-821-4415

Course Scope and Purpose

This course is a required course for both the GIST M.S. and Graduate Certificate programs and provides students with the requisite knowledge and practical skills to source and evaluate, against recognized quality standards, data for use in GIS-based projects and assess the quality of information output from those projects. We will cover several topics, such as:

Data Needs and Types – We start by focusing on the data challenge, defining data needs, and the role of conceptualization, entitation, and quantification in scientific research and management, and an introduction to some of the ways in which spatial and attribute data can be gathered and used to serve specific needs.

Remotely Sensed Data – We discuss the various ways in which data can be captured and collected remotely using various platforms. We focus on Global Navigation Satellite Systems (GNSS) as well as other aerial and satellite systems as valuable sources of spatial data.

Data Capture and Estimation – We discuss the various ways legacy digital data can be sourced, evaluated and used in specific projects, as well as ways to interpolate attribute values at unsampled locations and/or times (i.e. grid cells or specific locations) and features (i.e. regions, polygons, lines, points, etc.).

Data Quality – We discuss data standards and how they are used to promote and/or preserve data quality. We also examine the various types and sources of error that we may encounter as a part of the data stream that might be used for a specific project. Here we consider the various ways in which we can check for errors and cope with uncertainty when using GIS to help inform the decisions and actions we may take to achieve one or more specific outcomes in the real world.

GIS and GPS Skills – We explore the ways in which the Esri and Trimble software ecosystems can be used to support spatial data acquisition, analysis, and visualization. This part of the course includes two sets of tutorials – the first focused on GPS and the second on GIS – and a field project on Catalina Island where students design, conduct, and present the results of their own GPS-based data collection projects. Please note that in addition to the regular tuition cost, there is a room and board fee of approximately $360 for the week-long field trip to the Philip K. Wrigley Marine Science Center on Catalina Island.

Master's Thesis Prospectus – GIST M.S. and GIST Graduate Certificate students planning to transition to the GIST M.S. Program will utilize the concepts and ideas gleaned from *SSCI 581: Concepts for Spatial Thinking* and this course to prepare an abstract, extended abstract and prospectus for their master's thesis projects. The thesis represents the capstone project for the GIST M.S. degree and various project elements will be interspersed throughout the required and elective courses leading to *SSCI 594ab: Master's Thesis.*

This course will utilize faculty members from the USC Writing Program in selected assignments because we know that successful spatial scientists need great communication as well as cutting-edge spatial skills to prosper in today's fast-moving and rapidly evolving world.

Learning Objectives

On completion of this course, students should be able to:

- ➤ Design and implement a strategy for capturing or sourcing geospatial data and any accompanying metadata;
- ➤ Assess the impact of national and international data standards on the sourcing and availability of geospatial data;
- ➤ Critically evaluate the potential impacts of data quality on spatial analysis and decision making;
- ➤ Specify fitness for purpose (i.e. use) criteria and apply them to the evaluation of geospatial data for specific applications; and
- ➤ Master the basic elements of Trimble's GPS field mapping and Esri's ArcGIS spatial analysis and mapping ecosystems so you can acquire, organize, store, analyze, model, visualize, and share your own spatial data.

Prerequisite(s): None
Co-Requisite (s): None
Concurrent Enrollment: None
Recommended Preparation: SSCI 581: Concepts for Spatial Thinking

Course Structure

This is a graduate level course, so you should expect this class to be both academically robust and intellectually challenging. As graduate students, you are expected to engage with the information you are learning and to explore the heady cauldron of ideas, opinion, and analysis that describe our collective effort to thoroughly interrogate the subject at hand. Learning arises from active engagement with the knowledge found in our reading materials and with one another. As in any graduate-level class, the instructor's role is that of a guide who keeps you on this path of discovery and you will find that you will learn much from your fellow classmates. This is especially the case within the milieu of "online learning".

All course materials will be organized through Blackboard. The main theoretical concepts will be provided through course notes and assigned readings. Hands-on practical exercises will use various software products accessible over the Internet. Assignments will give students an opportunity to internalize and apply the concepts and theory learned from readings. Some assignments require student interaction; all will benefit from it.

Workload **–** This is a four credit, one semester graduate-level course. Students should expect to spend 10-15 hours per week completing the work in this course.

Technological and Communication Requirements

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

ArcGIS is provided online via the SSI Server; hence, you do not need to install it on your own computer. In addition, we will provide laptops with Esri and Trimble software and a variety of GPS and related data capture devices for the Catalina field component. Instead, every student must have the following technology requirements:

- A computer with a fast Internet connection
- An up-to-date web browser to access the SSI server

SSI Server and Tech Support – This course utilizes the SSI Server which is a virtual desktop giving access to many different professional software. If you are unable to connect to the server or experience any type of technical issues, send an email using your USC account to SSI Tech Support at spatial_support@usc.edu, making sure to copy (cc) me on the email.

Communications **–** This is a distance learning course, so most of our interactions will be asynchronous (not at the same time). 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, any important announcements will be posted on the Announcement page in Blackboard. Be sure to check these each time you log onto Blackboard.

In addition, I will send via email through Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all e-mail sent from Blackboard or from me. Check now to make sure that mail sent from both the USC Blackboard accounts and my private domain (sujinlee@usc.edu) does not go into your junk mail.

While I am usually online and will probably respond to emails from students relatively 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 offline for more than 72 hours, I will post an announcement on the Blackboard site.

Discussion and collaborative work – On the Blackboard site, you will discuss your learned concepts and theory with your classmates and work with them to complete course assignments, exercises, and projects as the need arises. Through discussion and collaborative work, students can provide support to each other while working on your assignments, sharing hints and helpful tips.

Required Readings and Supplementary Materials

The required textbooks for this course are:

- Bolstad, Paul. 2012. *GIS Fundamentals: A First Text on Geographic Information Systems,* 4th edition. White Bear Lake, MN, Elder Press. While you may purchase this book if you wish to own a bound copy, it is available at http://www.AtlasBooks.com.

- Wilson, John P, and A. Stewart Fotheringham (editors). 2008. *The Handbook of Geographic Information Science.* Oxford, Blackwell. While you may purchase this book if you wish to own a bound copy, it is available online through the USC Libraries. Sign on to the USC Libraries and search for this title.

- Law, Michael, and Amy Collins. 2016. *Getting to Know ArcGIS Pro (1st edition).* Redlands, CA: Esri Press.

You will recognize that all three books are also required for *SSCI 581: Concepts for Spatial Thinking*. These textbooks will be supplemented with Course Notes and a mixture of readings from academic journals, professional reports, and authoritative websites.

Readings – The following journal articles will be posted to Blackboard under Weekly Assignments:

- Chrisman, Nicholas R. 1984. The Role of Quality Information in the Long-Term Functioning of A Geographic Information System. *Cartographica* 21: 79-87.

- Johnson, Chris E, and Christopher C Barton. 2004. Where in the World Are My Field Plots? Using GPS Effectively in Environmental Field Studies. *Frontiers in Ecology and the Environment* 2: 475-482.

- Walter, Brittany S, and John J. Schultz. 2013. Mapping Simulated Scenes with Skeletal Remains using Differential GPS in Open Environments: An Assessment of Accuracy and Practicality. *Forensic Science International* 228: e-33-e46.

- Patino, Jorge E, and Juan C. Duque. 2013. A Review of Regional Science Applications of Satellite Remote Sensing in Urban Settings. *Computers, Environment and Urban Systems* 37: 1-17.

- Goodchild, Michael F. 2011. Scale in GIS: An Overview. *Geomorphology* 130: 5-9.

- Goldberg, Daniel W, and Myles G. Cockburn. 2010. Improving Geocoding Accuracy with Candidate Selection Criteria. *Transactions in GIS* 14: 149-176.

- Fisher, Peter, Alexis Comber, and Richard Wadsworth. 2010. What's in a Name? Semantics, Standards, and Data Quality. In *Spatial Data Quality: From Process to Decisions,* edited by Rodolphe Devillers and Helen Goodchild, 3-16. Boca Raton, FL, CRC Press.

- De Genst, William, Frank Canters, and Hubert Gulinck. 2001. Uncertainty Modeling in Buffer Operations Applied to Connectivity Analysis. *Transactions in GIS* 5: 305-326.

- Li, Peng, Chuang Shi, Zhenhong Li, Jan-Peter Muller, Jane Drummond, Xiuyang Li, Tao Li, Yingbing Li, and Jingnan Liu. 2013. Evaluation of ASTER GDEM using GPS Benchmarks and SRTM in China. *International Journal of Remote Sensing* 34: 1744-1771.

- Onsrud, Harlan J. 2010. Liability for Spatial Data Quality. In *Spatial Data Quality: From Process to Decisions,* edited by Rodolphe Devillers and Helen Goodchild, 187-196. Boca Raton, FL, CRC Press.

Description and Assessment of Assignments

Weekly Assignments

There are several different kinds of assignments with at least one due weekly. These are described in the Weekly Folders on Blackboard. Due dates are shown in the summary that follows.

Resume Assignment – 1 worth 2 points. We require all current students to post and maintain a public resume, short biography and recent photo on our shared SSI Student Community Blackboard site. Please prepare your resume in the SSI template which will be provided to you. Unless you opt out, your resume will be included in the Spatial Sciences Institute Graduate Programs Resume Book. This resume book is compiled annually and, along with our web presence, is used to promote our programs, and more importantly, your skills, experience, and professional aspirations.

Reading Assignments – 5 worth 10 points. Each student is required to complete five reading assignments for this class out of ten. The reading assignments will focus on the theory portion of the course as presented in the weekly readings. The objective is to help you evaluate and integrate the information you have acquired from the course readings. Some of these will involve discussions and collaborative work and some will be individual efforts. The first reading assignment is required and from there, you are free to choose any four of the nine subsequent assignments. However, you must complete and submit them for grading in the weeks specified in the Schedule at the end of this syllabus. If you complete more than five reading assignments, I will use your five highest scores to calculate your course grade.

GPS Tutorials – 2 worth 6 points. The "hands-on" GPS assignments will require you to work through various GPS skill development activities. To demonstrate that you have completed the steps comprising each of these assignments, you will submit a Word document containing digital output and/or brief text answers from parts of the exercises, such as a map.

ArcGIS Tutorials – 4 worth 12 points. The "hands-on" ArcGIS assignments will require you to walk through various GIS skill development activities that build on those completed in *SSCI 581: Concepts for Spatial Thinking.* To demonstrate that you have completed the steps comprising each of these assignments, you will submit a Word document containing digital output and/or brief text answers from parts of the exercises.

Discussion Forums – 2 worth 4 points. These will focus on varying combinations of theory and practice and anticipate that you will post a minimum of three new messages (i.e. one per forum) and six replies (i.e. two per forum) to messages posted by your classmates at designated times throughout the semester.

Exercises – 3 worth 9 points. To demonstrate your understanding of the basic concepts and skills learned in the class, you will complete three exercises that will integrate key concepts and ideas and take some independent thought. The final two exercises will take one or other

of two forms depending on your student status. Students enrolled in the GIST M.S. Program will start work on their thesis prospectus and the remainder of the students will tackle a pair of exercises focused on fundamental geospatial information management challenges.

Summative Assignment – 1 worth 4 points. A final summative written assignment to be completed during the final examination period is required. In this assignment, you will reflect on the course learning outcomes and explain how the assigned work completed during the semester address these.

Catalina Field Component

For this part of the class, you will be divided into small teams and each team will deliver two oral presentations (one at the start of the week on what they plan to do and one at the end of the week summarizing your results and what did and did not work for them) along with a poster summarizing your project and the accompanying results. The posters must be submitted for grading (in electronic form) before leaving the island.

First Presentation – 5 points. A no more than 15-minutes oral presentation for your proposal.

Second Presentation – 10 points. A no more than 20-minutes oral presentation to present your results and findings.

Poster – 8 points. No presentation is required, but a summary of your project and visualization of your results should be presented in your poster.

Research Reports

The first report will provide you with an opportunity to describe the data capture options and challenges for a project of your choice from a list of projects spanning a variety of application domains. The second report will take one or other of two forms depending on your student status. Students enrolled in the GIST M.S. Program will prepare a prospectus for a thesis project and outline some of the methods and geospatial data sources that could be used in such a project. The remainder of the students would be afforded the opportunity to integrate all that they have learned in the semester in a specific application that I will designate when the guidelines for the final reports are distributed.

First Report - 10 points. The first report itself which must not exceed 6 single-spaced pages excluding figures, maps, tables and references.

Second Report - 20 points. The second report 2 depends upon your standing in the GIST program. Students enrolled in the MS or students pursuing the Graduate Certificate that may migrate to a Master's degree fall into Group 1. All other students fall into Group 2.

Grading Breakdown

Careful planning and a serious, consistent commitment will be required for you to successfully navigate the various deliverables in this and other GIST courses. The table on the next page summarizes the SSCI 587 course assignments and their point distribution:

Assignments	Number	Points Each	Total Points
Weekly Assignments			
Resume Assignment	1	2	2
Reading Assignments	5	2	10
GPS Tutorials	2	3	6
ArcGIS Tutorials	4	3	12
Discussion Forums	2	2	4
Exercises	3	3	9
Summative Assignment	1	4	4
Catalina Island Excursion			
First Presentation	1	5	5
Second Presentation	1	10	10
Poster	1	8	8
Research Reports:			
First Report	1	10	10
Second Report	1	20	20
Totals	23	-	100 points

Assignment Submission Policy

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

Unless otherwise noted, all Reading Assignments and Tutorials are *due by 11:59 pm Pacific Time (PT) on Mondays*. Project components have different due dates as indicated on the Course Schedule below. Your attention to on-time assignment submission is essential if I am to meet my goal to return comments on your submitted assignments before the next one is due. Sometimes this is impossible, so I will post a notice on anticipated delays if needed.

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.

Schedule

	Topic	Readings and Assignments	Deliverables/Due Dates
Week 1 1/9	Introduction to Class	Wilson & Fotheringham, Ch. 1 Resume Assignment Discussion Forum 1	No deliverables
Week 2 1/17* *Monday, 1/16 is university holiday	Data Needs and Types	Course Notes Reading Assignment 1	Resume Assignment: Tuesday, 1/17 Discussion Forum 1: Tuesday, 1/17
Week 3 1/23	Maps, Data Entry, Editing, and Output	Bolstad, Ch. 4 Reading Assignment 2 ArcGIS Tutorial 1	Reading Assignment 1: Monday, 1/23
Week 4 1/30	Global Navigation Satellite Systems	Bolstad, Ch. 5 Reading Assignment 3 GPS Tutorial 1	Reading Assignment 2: Monday, 1/30 ArcGIS Tutorial 1: Monday, 1/30
Week 5 2/6	Aerial and Satellite Images I	Bolstad, Ch. 6 Reading Assignment 4 Exercise 1	Reading Assignment 3: Monday, 2/6 GPS Tutorial 1: Monday, 2/6
Week 6 2/13	Catalina Field Component	Course notes Proposal Presentation Final Presentation Poster	Reading Assignment 4: Sunday, 2/12 Exercise 1: Sunday, 2/12 First Presentation: Wednesday, 2/15 Second Presentation: Sunday, 2/19 Poster: Sunday, 2/19
Week 7 2/21* *Monday, 2/20 is university holiday	Aerial and Satellite Images II	Wilson & Fotheringham, Ch. 3 Report 1 GPS Tutorial 2 Discussion Forum 2	
Week 8 2/27	Scale	Reading Assignment 5 Exercise 2	Report 1: Monday, 2/27 GPS Tutorial 2: Monday, 2/27 Discussion Forum 2: Monday, 2/27
Week 9 3/6	Geocoding	Course Notes Reading Assignment 6	Reading Assignment 5: Monday, 3/6 Exercise 2: 3/6
3/13* *3/13-3/17 is Spring Recess	*Spring Recess*		
Week 10 3/20	Digital Data	Bolstad, Ch. 7 Exercise 3 ArcGIS Tutorial 2	Reading Assignment 6: Monday, 3/20

Week 11 3/27		Wilson and Fotheringham, Ch. 2 and 4 Reading Assignment 7	Exercise 3: Monday, 3/27 ArcGIS Tutorial 2: Monday, 3/27 Discussion Forum 3: Thursday, 3/30
Week 12 4/3	Data Standards and Data Quality	Bolstad, Ch. 12 Reading Assignment 8	Reading Assignment 7: Monday, 4/3
Week 13 4/10	Data Quality and Management	Bolstad, Ch. 14 Reading Assignment 9 ArcGIS Tutorial 3 Report 2	Reading Assignment 8: Monday, 4/10
Week 14 4/17		Wilson & Fotheringham, Ch. 12 Reading Assignment 10 ArcGIS Tutorial 4	Reading Assignment 9: Monday, 4/17 ArcGIS Tutorial 3: Monday, 4/17
Week 15 4/24* *Friday, 4/28 is last day of class		Completing Report 2	Reading Assignment 10: Monday, 4/24 ArcGIS Tutorial 2: Monday, 4/24 Report 2: No later than 05:00 pm PT on Friday, 4/28
Study Days 4/29-5/2			
Exam Week 5/3-5/10	Summative Assignment	Summative Assignment	Summative Assignment: 5/5

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* https://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.

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://adminopsnet.usc.edu/department/department-public-safety. 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 Relationship and Sexual Violence Prevention Services* http://engemannshc.usc.edu/rsvp/ 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.

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. This includes instructional videos, remote access to university resources, and other key contact information for distance students.