SSCI 587 – GPS/GIS Field Techniques (Section 35761)
Course Syllabus – Spring Semester 2014

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Office Hours: Tuesday and Thursday, 11:30am – 12:30pm (Pacific Standard Time)
I am always available asynchronously via e-mail. I am also available for synchronous chats via phone or Skype or IM text, audio or video most days and times *by prior arrangement* via e-mail. Or we can meet in my Adobe Connect room. Just get in touch.

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 five major topics:

Data Needs and Types – We start by focusing on the data problem (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 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 focus our attention on the ways in which the Esri and Trimble software platforms 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 ArcGIS – 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 around $300 for the week-long field trip to the Philip K. Wrigley Marine Science Center on Catalina Island.

Learning Outcomes

When you have completed this course, you will 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
- Master the basic elements of Trimble's GPS field mapping and Esri's ArcGIS spatial analysis and mapping software platforms so you can acquire, organize, store, analyze, model, visualize, and share your own spatial data.

Course Formats

This 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. The challenge for us is to replicate such an academic experience 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.

We have several technologies that will facilitate our course work and our interactions, despite our dispersed locations. These include:

BlackBoard – All course materials and correspondence will be posted on the course BlackBoard site. As a registered student you'll find this course will show up in your available courses no later than 12:00 noon, PST on the first day of classes. It is here that the day-to-day flow of the course will be recorded.

Discussion boards – On the BlackBoard site, we will post a number of discussion threads relevant to various sections of the course. This forum is very important in terms of providing support to each other while working on class exercises to share hints and helpful tips, as you would in a classroom laboratory. **These threads represent a forum for student-to-student discussion and collaboration. I check the discussion threads periodically and offer occasional comments. Please send me an email directly if you have a question or concern that requires my immediate attention.**

Live meetings and presentations - At USC, we use a browser-based service called Adobe Connect to create synchronous, interactive sessions. With voice and webcam capabilities Adobe Connect can be used to share presentations and even our desktops between two or more people.

Individual meetings - While Adobe Connect can be used for one-on-one meetings, we generally find it's easier to use the free VOIP and chat technology, Skype (http://www.skype.com) for individual chats.

GIST Server and Tech Support – This course will utilize the SSI GIST Server which is a virtual desktop. You can access the GIST Server at: https://gistonline.usc.edu If you are unable to connect to the server or experience any type of technical issues, send an email to GIST Tech Support at: gistsupport@dornsife.usc.edu and make sure to copy (cc) me on the email. GIST Tech Support is available Monday through Friday, 10am-5pm PT.

Assessment

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

Resume Assignment – 1 for a total of 2 points. We require all current students to post and maintain a public resume, short biography and recent photo on our shared GIST Student Community Blackboard site. With your permission, your photo and resume will be posted to the Spatial Sciences Institute website and your resume will be included in the GIST Resume Book. The latter is compiled annually and along with our web presence used to promote our programs and more importantly, your skills, experience, and professional aspirations.

Reading Assignments – 5 for a total of 10 points. Each student is required to complete five reading assignments for this class. The reading assignments will focus on the theory portion of the course as presented in the weekly readings. The objective of the readings 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. If you complete more than five reading assignments, I will select your five highest scores towards your course grade.

GPS Tutorials – 3 for a total of 9 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 the assignments, you will submit a Word document containing digital output and/or brief text answers from parts of the exercises, such as a map. Late assignments will be docked one grade and no grade will be given for assignments turned in more than one week late.

GIS Tutorials – 3 for a total of 9 points. The "hands-on" GIS 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 the assignments, you will submit a Word document containing digital output and/or brief text answers from parts of the exercises, such as a map. You are free to choose any three of the five assignments but you must complete and submit them for grading in the weeks specified at the end of this syllabus. Late assignments will be docked one grade and no grade will be given for assignments turned in more than one week late.

Discussion Forums – 3 for a total of 6 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. Late postings will be docked one grade and no grade will be given for messages and/or replies posted more than one week late.

Exercises – 3 for a total of 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. Late exercises will be docked one grade and no grade will be given for exercises turned in more than one week late.

Catalina Field Component – 3 for a total of 25 points. For this part of the class, you will be divided into a series of 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 their results and what did and did not work for them) along with a poster presentation summarizing their projects and the accompanying results. The posters must be submitted for grading (in electronic form) before leaving the island.

Research Reports – 2 for a total of 30 points. The first report (10 points) 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 (20 points) will take one or other of two forms depending on your student status. Students enrolled in the M.S. in Geographic Information Science & Technology 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.

Requirements

Textbooks – There are three required texts for this course. They are available from the USC Bookstore or online outlets such as Amazon. We encourage you to purchase these books right away since you will need these materials from the opening day of class. Please note that the Wilson and Fotheringham book is available through USC Libraries as an e-Book, but it is recommended that you purchase this book as it contains information vital to *SSCI 581: Concepts for Spatial Thinking* as well as other GIST courses.

- Bolstad, Paul, 2012. *GIS Fundamentals: A First Text on Geographic Information Systems,* 4th edition. White Bear Lake, MN, Elder Press (available at http://www.AtlasBooks.com).
- Wilson, John P. and A. Stewart Fotheringham (editors), 2008, *The Handbook of Geographic Information Science.* Oxford, Blackwell.
- Price, Maribeth, 2014, *Mastering ArcGIS* 6th edition. New York, McGraw-Hill.

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 – To be posted to Blackboard under Course Documents:

- Chrisman, N.R. (1984) The role of quality information in the long-term functioning of a geographic information system. *Cartographica* 21: 79-87.
- Johnson, C.E. and Barton, C.C. (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, B.S. and Schultz, J.J. (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
- Goodchild, M.F. (2011) Scale in GIS: An overview. *Geomorphology* 130: 5-9
- Frank, A.U. (2010) Scale is introduced in spatial datasets by observation processes. In Devillers, R. and Goodchild, H. (eds) *Spatial Data Quality: From Process to Decisions*. Boca Raton, FL, CRC Press: 17-30.
- Fisher, P.F., Comber, A., and Wadsworth, R. (2010) What's in a name? Semantics, standards, and data quality. In Devillers, R. and Goodchild, H. (eds) *Spatial Data Quality: From Process to Decisions*. Boca Raton, FL, CRC Press: 3-16.
- Goldberg, D.W. and Cockburn, M.G. (2010) Improving geocoding accuracy with candidate selection criteria. *Transactions in GIS* 14: 149-176.
- De Genst, W., Canters, F., and Gulinck, H. (2001) Uncertainty modeling in buffer operations applied to connectivity analysis. *Transactions in GIS* 5: 305-326.
- Li, P., Shi, C., Li, Z., Muller, J.-P., Drummond, J., Li, X., Li, T., Li, Y., and Liu, J. (2013) Evaluation of ASTER GDEM using GPS benchmarks and SRTM in China. *International Journal of Remote Sensing* 34: 1744–1771
- Onsrud, H.J. (2010) Liability for spatial data quality. In Devillers, R. and Goodchild, H. (eds) *Spatial Data Quality: From Process to Decisions*. Boca Raton, FL, CRC Press: 187-196.

Technology – There are several technology requirements:

- Every student must have a computer with a fast Internet connection.
- Every student MUST have a functional webcam and a microphone for use whenever a presentation or meeting is scheduled.
- We will provide laptops with the ArcGIS and Trimble Office software and a variety of GPS and other kinds of data capture devices for the Catalina field component.

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. I will also create Blackboard (BB) discussion forums throughout the semester that we will use for the aforementioned assignments and so we can discuss issues and comments on the course assignments, exercises, and projects as the need arises.

In addition, I will send via e-mail 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 (druddell@usc.edu) does not go into your junk mail.

While I am usually on-line and will probably respond to e-mails from students relatively quickly, I will endeavor to respond to all e-mail within 24 hours of receipt, aiming for no more than 48 hours delay. In the rare case when I expect to be off-line for more than 60 hours, I will post an announcement on the BlackBoard site.

That said, it is each student's responsibility to stay informed about what is going on in our course. In addition to e-mail 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.

Workload – This is a four credit, one semester course. Students should expect to spend 10-12 hours per week completing the work in this course.

Students with Disabilities

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. Please be sure the letter is delivered to an instructor as early in the semester as possible. DSP is located in STU 301 and is open from 8:30 a.m. to 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles.

Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A (see http://scampus.usc.edu/wp-content/uploads/2011/07/university_governance.pdf for additional details). Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at http://www.usc.edu/student-affairs/SJACS/.

Important Administrative Dates

1/13:	Spring semester classes begin.
1/20:	Martin Luther King's Birthday, university holiday
1/31:	Last day to register & add classes, change enrollment option to Pass/No Pass or Audit, purchase or waive tuition refund insurance or drop a class without a mark of "W," except for Monday-only classes and receive a 100% refund
2/4:	Last day to drop a class without a grade of "W"
2/17:	Presidents' Day, university holiday
3/17-22:	Spring Recess
4/11:	Last day to drop a class with a grade of "W"
5/2:	Classes End
5/16:	Commencement

Tentative Schedule

Week #	Week Begins	Theme	Week's Readings	Assignments Due Monday Following			
			Reading	Reading Assign.	GIS Assign.	GPS Assign.	Exercises and Reports
1	1/13	Introduction	Wilson 1	R1			Resume
2	1/20	Data needs and types	Notes	R2			
3	1/27	Maps, data entry, editing, and output	Bolstad 4	R3			Exercise 1
4	2/3	Global navigation satellite systems	Bolstad 5	R4		GPS 1	
5	2/10	Aerial and satellite images	Bolstad 6	R5			
6	2/17	Continued…	Wilson 3	R6			Report 1
7	2/24	Catalina Field Trip	Notes				
8	3/3	Continued…	Wilson 2, 4	R7			Exercise 2
9	3/10	Spatial estimation	Bolstad 12	R8		GPS 2	
	3/17	Spring Break					
10	3/24	Queries, map overlay and geoprocessing	Notes		Price 5, 7		Exercise 3
11	3/31	Digital data	Bolstad 7				
12	4/7	Editing and topology	Notes		Price 12, 13		
13	4/14	Data standards and data quality	Bolstad 14	R9			
14	4/21	Types and sources of error	Notes Wilson 12			GPS 3	Report 2
15	4/28	Data quality management and control	Notes	R10	Price 15		
	5/7	Final Report due date					