SSCI 587 (Section 35761), Spatial Data Acquisition

Units: 4

Term: Spring, 2015 (online)

Location: Online

Instructor: Darren Ruddell, Ph.D.
Office: AHF B57F
Office Hours: Tuesdays and Thursdays, 9:00-10:00 a.m. PT
Contact Info: druddell@usc.edu, 213-740-0521 (office),
darren.ruddell (Skype).

IT Help: Richard Tsung
Hours of Service: Mondays to Fridays, 9:00 a.m.-5:00 p.m. PT
Contact Info: ctsung@usc.edu, 213-821-4415 (office)
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 six or seven major topics:

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 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 $320 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. The thesis prospectus tackled as a part of SSCI 587 will also afford you the opportunity to work with a Writing Instructor 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.
This course will utilize faculty members from the USC Writing Program in selected assignments. The writing faculty offer integrated support to GIST students during the thesis writing period of their studies, starting from 587 all the way through 594A, and defense. Writing faculty work individually with students, meeting several times a semester to discuss strategies for better writing, to examine the strength of ideas, and to ensure the integrity of analysis and discussion. While students are responsible for editing their own work, writing instructors will guide students through particular areas of difficulty, working on both global issues—idea generation, clarity of hypothesis, focus, specificity of study—as well as surface-level issues, including paragraphing, sentence structure, grammar, and mechanics.

Learning Objectives
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 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

Course Formats
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.

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 will find this course will show up in your available courses no later than 12:00 noon, PT 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. These threads are 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. 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** – We will 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 is easier to use the free VOIP and chat technology, Skype ([http://www.skype.com](http://www.skype.com)) for individual chats.

**GIST server and tech support** – This course will utilize the GIST Server which is a virtual desktop. You can access the GIST Server at [https://gistonline.usc.edu/](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, 9:00 a.m.-5:00 p.m. PT.

**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.

ArcGIS is provided online via the GIST Server and we will provide laptops with ArcGIS and Trimble software and a variety of GPS and related data capture devices for the Catalina field component. You must satisfy the following 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.
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 the Blackboard Assessment link. I will also create Blackboard 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 email through Blackboard any notices that are time sensitive. Please be sure that you read all email correspondence from sent through Blackboard as soon as possible. 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 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 48 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.

That said, 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.

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.

Required Readings and Supplementary Materials
The weekly readings will be accessed via the USC Library’s electronic collections and/or provided by the instructor via Blackboard.

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

Resume Assignment (2%): 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. Unless you opt out, your photo and biographical profile 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 (10%): 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 reading 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 use your five highest scores to calculate your course grade.

GPS Tutorials (6%): 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.

GIS Tutorials (12%): 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.

Discussion Forums (6%): 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 (9%): 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.

Catalina Field Component (25%): 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 (30%): 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 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.

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 at the top of the next page summarizes the SSCI 587 course assignments and their point distribution.
Grading Breakdown

<table>
<thead>
<tr>
<th>Assignments</th>
<th>Number</th>
<th>Points Per Assignment</th>
<th>Total Points</th>
<th>% of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resume Assignment</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Reading Assignments</td>
<td>5</td>
<td>2</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>GPS Tutorials</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>GIS Tutorials</td>
<td>4</td>
<td>3</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Discussion Forums</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Exercises</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Catalina Field Component:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Presentation</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Second Presentation</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Poster</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Research Reports:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Report</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Second Report</td>
<td>1</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Totals</td>
<td>23</td>
<td>-</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

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. Late work will be assessed a penalty of 10% per day and zero grades will be assigned for work that is more than one week late.

Course Schedule: A Weekly Breakdown

<table>
<thead>
<tr>
<th>Week 1 1/12</th>
<th>Topics/Daily Activities</th>
<th>Readings and Homework</th>
<th>Deliverables/Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brief introductions coupled with a discussion of class goals, projects, technology, and reading assignments.</td>
<td>Resume Assignment&lt;br&gt;Discussion Forum 1</td>
<td></td>
</tr>
<tr>
<td>Week 2 1/20</td>
<td>Data Needs and Types</td>
<td>Course Notes&lt;br&gt;Reading Assignment 1: Chrisman (1984) The role of quality information in the long-term functioning of a geographic information system. Cartographica 21: 79-87</td>
<td>Resume Assignment: Submit resume assignment on Blackboard no later than 5:00 p.m. PT on Tuesday, 1/20. Discussion Forum 1: Submit briefs on Blackboard</td>
</tr>
</tbody>
</table>
| Week 3 1/26 | **Maps, Data Entry, Editing, and Output**  
A discussion of the traditional data production process that start with maps and moves through data entry and editing on the path to output(s). | **Bolstad (2012) GIS Fundamentals: A First Text on Geographic Information Systems, 4th edition.** White Bear Lake, MN, Elder Press: 131-182 (Ch. 4: Maps, Data Entry and Editing)  
**Reading Assignment 1:** Submit reading assignment 1 on Blackboard no later than 5:00 p.m. PT on Monday, 1/26. | **Reading Assignment 1:** Submit reading assignment 1 on Blackboard no later than 5:00 p.m. PT on Monday, 1/26. |
| --- | --- | --- | --- |
| Week 4 2/2 | **Global Navigation Satellite Systems**  
**Exercises 1:** Submit exercise 1 on Blackboard no later than 5:00 p.m. PT on Monday, 2/2. | **Reading Assignment 2:** Submit reading assignment 2 on Blackboard no later than 5:00 p.m. PT on Monday, 2/2.  
**Exercises 1:** Submit exercise 1 on Blackboard no later than 5:00 p.m. PT on Monday, 2/2. |
| Week 5 2/9 | **Aerial and Satellite Images (Part 1)**  
**Reading Assignment 3:** Goodchild (2011) Scale in GIS: An overview. Geomorphology 130: 5-9  
**Discussion Forum 2:** Submit briefs on Blackboard no later than 5:00 p.m. PT on Tuesday, 2/16.  
**Comment on at least one other brief on Blackboard no later than 10:00 a.m. on Friday, 1/23.** | **Reading Assignment 3:** Submit reading assignment 3 on Blackboard no later than 5:00 p.m. PT on Monday, 2/9.  
**GPS Tutorial 1:** Submit GPS Tutorial 1 on Blackboard no later than 5:00 p.m. PT on Monday, 2/9.  
**Discussion Forum 2:** Submit briefs on Blackboard no later than 5:00 p.m. PT on Tuesday, 2/17.  
**Comment on at least one other brief on Blackboard no later than 10:00 a.m. on Friday, 1/23.** |
| Week 6 2/17 | **Aerial and Satellite Images (Part 2)**  
**Report 1:** | **Reading Assignment 4:** Submit reading assignment 4 on Blackboard no later than 5:00 p.m. PT on Tuesday, 2/17.  
**Discussion Forum 2:** Submit briefs on Blackboard no later than 5:00 p.m. PT on Tuesday, 2/16.  
**Comment on at least one other brief on Blackboard no later than 10:00 a.m. on Friday, 1/23.** |
| Week 7 2/23 | Queries  
Understanding queries and how they are used in GIS. | Course Notes  
ArcGIS Tutorial 1: Price (2014)  
Exercise 2  
Discussion Forum 3 | Reading Assignment 5:  
Submit reading assignment 5 on Blackboard no later than 5:00 p.m. PT on Monday, 2/23.  
Report 1: Submit report 1 on Blackboard no later than 5:00 p.m. PT on Monday, 2/23. |
|---|---|---|---|
| Week 8 3/2 | Editing and Topology  
Understanding topological errors and how edit features in GIS. | Course Notes  
Reading Assignment 6: Goldberg & Cockburn (2010)  
*Improving geocoding accuracy with candidate selection criteria. Transactions in GIS* 14: 149-176  
Writing Faculty  
ArcGIS Tutorial 2: Price (2014)  
Exercise 2: Submit exercise 1 on Blackboard no later than 5:00 p.m. PT on Monday, 3/2.  
Discussion Forum 3:  
Submit briefs on Blackboard no later 5:00 p.m. PT on Tuesday, 3/2.  
Comment on at least one other brief on Blackboard no later than 10:00 a.m. on Friday, 3/6. |
| Week 9 3/9 | Digital Data (Part 1)  
Reading Assignment 7: Fisher et al. (2010)  
Exercise 3 | Reading Assignment 6:  
Submit reading assignment 6 on Blackboard no later than 5:00 p.m. PT on Monday, 3/9.  
ArcGIS Tutorial 2: Submit ArcGIS Tutorial 2 on Blackboard no later than 5:00 p.m. PT on Monday, 3/9. |
| Week of 3/16 | Spring Break | | |
| Week 10 3/23 | Catalina Field Component  
Gain hands-on experience with primary data collection utilizing Trimble hardware and software systems while spending the week at the USC Wrigley Institute at Santa Catalina Island. | Course notes  
Proposal Presentation  
Final Presentation  
Poster | Reading Assignment 7:  
Submit reading assignment 7 on Blackboard no later than 8:00 a.m. PT on Monday, 3/23.  
Exercise 3: Submit exercise 3 on Blackboard no later than 8:00 a.m. PT on Monday, 3/23.  
Proposal Presentation:  
Submit Proposal |
| Week 11 3/30 | Digital Data (Part 2)  
| Week 12 4/6 | Spatial Estimation  
**GPS Tutorial 2**  
**Report 2 (Draft)** | Reading Assignment 8: Submit reading assignment 8 on Blackboard no later than 5:00 p.m. PT on Monday, 4/6. |
| Week 13 4/13 | Data Standards and Data Quality  
Discuss the various kinds of data standards that have been implemented and how they are used to simultaneously promote data quality | Bolstad (2012) *GIS Fundamentals: A First Text on Geographic Information Systems*, 4th edition. White Bear Lake, MN, Elder Press: 561-584 (Ch. 14: Data Standards and Quality)  
**Report 2 (Draft)**: Submit Report 2 (Draft) on Blackboard no later than 5:00 p.m. PT on Monday, 4/13. |
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://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions. 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.
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.