SSCI 587 – Spatial Data Acquisition (Section 35761D)
Course Syllabus – Fall Semester 2014

Instructor: Dr. Darren Ruddell
Location: Los Angeles, California
E-mail: druddell@usc.edu
Website: http://spatial.usc.edu/
Adobe Connect: http://usccollege.adobeconnect.com/druddell
Skype: darren.ruddell
Twitter: @SSI_Prof

Office Hours: Tuesday and Thursday, 11:30 a.m.-12:30 p.m. PT
I am always available asynchronously via email. I am also available for synchronous chats via phone, audio or video most days and times by prior arrangement via email. 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 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: Thesis Research. 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.

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 ecosystems 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 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) 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/ 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.

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 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 – 2 for a total of 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 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 – 4 for a total of 12 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.

**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.

**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. 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 – 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 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.
Assignments | Number | Points Per Assignment | Total Points |
--- | --- | --- | ---
Catalina Field Excursion:  
First Presentation | 1 | 5 | 5  
Second Presentation | 1 | 10 | 10  
Poster | 1 | 10 | 10  
Discussion Forums | 3 | 2 | 6  
Exercises | 3 | 3 | 9  
GIS Tutorials | 4 | 3 | 12  
GPS Tutorials | 2 | 3 | 6  
Reading Assignments | 5 | 2 | 10  
Resume Assignment | 1 | 2 | 2  
Research Reports:  
First Report | 1 | 10 | 10  
Second Report | 1 | 20 | 20  

Totals | 23 | - | 100

Grades in this and other GIST courses will use the standard USC grading criteria, as follows:

- A $\geq$ 93 points
- B- 80-82 points
- D+ 67-69 points
- A- 90-93 points
- C+ 77-79 points
- D 63-66 points
- B+ 87-89 points
- C 73-76 points
- D- 60-62 points
- B 83-86 points
- C- 70-72 points
- F < 60 points

And finally, it is important to note from the outset that: (1) late postings and assignments will be docked one grade and no grade will be given for postings or assignments turned in more than one week late; and (2) no written work will be accepted for grading after 5:00 p.m. PT on the last day of classes.

**Requirements**

**Textbooks** – There are three required texts for this course. The first two were also required for SSCI 581: Concepts for Spatial Thinking and are available from the USC Bookstore or online outlets such as Amazon. The Wilson and Fotheringham book was also used in SSCI 581 and is available through USC Libraries as an e-Book.

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:


Technology – 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 course. Students should expect to spend 10-15 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**

- **8/25:** Fall semester classes begin.
- **9/1:** Labor Day, university holiday
- **9/12:** 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
- **11/14:** Last day to drop a class with a grade of “W”
- **11/26-29:** Thanksgiving recess
- **12/5:** Fall semester classes end
### Tentative Schedule (35761 D)

<table>
<thead>
<tr>
<th>Week #</th>
<th>Week Begins</th>
<th>Theme</th>
<th>Week's Readings</th>
<th>Assignments Due Monday Following</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reading</td>
<td>Reading Assign.</td>
</tr>
<tr>
<td>1</td>
<td>8/25</td>
<td>Introduction</td>
<td>Wilson 1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9/2</td>
<td>Data needs and types</td>
<td>Notes</td>
<td>R1</td>
</tr>
<tr>
<td>3</td>
<td>9/8</td>
<td>Maps, data entry, editing, and output</td>
<td>Bolstad 4</td>
<td>R2</td>
</tr>
<tr>
<td>4</td>
<td>9/15</td>
<td>Global navigation satellite systems</td>
<td>Bolstad 5</td>
<td>R3</td>
</tr>
<tr>
<td>5</td>
<td>9/22</td>
<td>Catalina</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>9/29</td>
<td>Aerial and satellite images</td>
<td>Bolstad 6,</td>
<td>R4</td>
</tr>
<tr>
<td>7</td>
<td>10/6</td>
<td>Continued…</td>
<td>Wilson 3</td>
<td>R5</td>
</tr>
<tr>
<td>8</td>
<td>10/13</td>
<td>Queries, map overlay and geoprocessing</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10/20</td>
<td>Editing and topology</td>
<td>Notes</td>
<td>R6</td>
</tr>
<tr>
<td>10</td>
<td>10/27</td>
<td>Digital data</td>
<td>Bolstad 7</td>
<td>R7</td>
</tr>
<tr>
<td>11</td>
<td>11/3</td>
<td>Continued…</td>
<td>Wilson 2, 4</td>
<td>R8</td>
</tr>
<tr>
<td>12</td>
<td>11/10</td>
<td>Spatial estimation</td>
<td>Bolstad 12</td>
<td>Price 13</td>
</tr>
<tr>
<td>13</td>
<td>11/17</td>
<td>Data standards and data quality</td>
<td>Bolstad 14</td>
<td>R9</td>
</tr>
<tr>
<td>14</td>
<td>11/24</td>
<td>Types and sources of error</td>
<td>Notes</td>
<td>Wilson 12</td>
</tr>
<tr>
<td>15</td>
<td>12/1</td>
<td>Data quality management and control</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>12/5</td>
<td></td>
<td>End of Semester; All of your work must be submitted by 5:00 p.m. on this date</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

GIST GRADUATE PROGRAMS © 2014