SSCI 582 (35894), Spatial Databases

Units: 4  
Term: Spring 2016  
Time: Tuesdays and Thursdays, 12:00 - 1:50 p.m. PT  
Location: AHF 145D

Instructor: Jennifer N. Swift, PhD  
Office: AHF B57D  
Office Hours: Tuesdays and Thursdays 2-4 p.m. PT; also available most other days by appointment via email  
Contact Info: jswift@usc.edu, 213-740-5841  
BlueJeans: https://bluejeans.com/3809089594

GIS Librarian Help: Katharin Peter  
Office: VKC B40a  
Office Hours: By appointment  
Contact Info: kpeter@usc.edu, 213-740-1700

IT Help: Richard Tsung  
Office: AHF B57B  
Hours of Service: Mondays to Fridays 9 a.m.–5 p.m. PT  
Contact Info: gistsupport@usc.edu, 213-821-4415
Course Description
Geographic information systems (GIS) are fundamentally information systems, typically built on database management technologies. Although GIS offer specialist facilities for storing and manipulating spatial data, much of the functionality provided by GIS is shared with conventional database software and its ubiquitous Structured Query Language (SQL). Thus, understanding database principles is the foundation for mastering the technical aspects of GIS.

This course provides a high-level tour of the theoretical underpinnings of databases containing both spatial and tabular data, as these are integrated in GIS. However, the core objective of the course is a practical one: to understand the fundamental principles in the design and implementation of well-conceived spatial databases, especially Esri geodatabases, and be able to manipulate them both inside and outside of GIS.

The Final Project involves building a geodatabase for a practical GIS application. This project has two main components: (1) a formal report (~2,000 words, excluding figures, tables, references, and map) that documents your project professionally – this must include a graphical geodatabase design, tabular data dictionary, sample data and queries; and (2) a succinct (~15-minutes) oral presentation of the project, as at a professional conference.

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

- Discuss the complexity of the geographic world and techniques for modeling it in a computer.
- Explain the strengths and limitations of various database and non-database structures for spatial data, particularly those supported by Esri’s ArcGIS platform.
- Use SQL fragments and/or statements as appropriate to interrogate spatial databases to accomplish data loading, maintenance, map production, and analysis.
- Define a geographical realm of interest, model that realm diagrammatically and narratively, implement the model in a geodatabase.

Prerequisite(s): None
Co-Requisite(s): None
Concurrent Enrollment: None
Recommended Preparation: SSCI 581
Course Structure
This residential course will unfold on a weekly basis. Each week will be focused on a particular aspect of spatial databases, delivered through lectures, class discussions, readings, self-check activities and hands-on computer lab assignments. Students are encouraged to bring questions and problems to class, to be explored in a congenial setting. The aim is to encourage deep-learning by active participation.

Technological Proficiency and Hardware/Software Required
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 classes 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 related to various course topics. 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 do in a classroom or lab setting. Your instructor will check the discussion threads periodically and offer occasional comments. Please send your course instructor an email directly if you have a question or concern that requires immediate attention.

GIST server and tech support – This course will utilize the SSI GIST Server to provide you with your own virtual desktop. You can access the GIST Server using VMware. If you are unable to connect to the server or experience any type of technical issues, send an email using your USC account to GIST Tech Support at gistsupport@dornsife.usc.edu, making sure to copy (cc) me on the email. GIST Tech Support is available Mondays through Fridays, from 10 a.m. to 5 p.m. PT.

Every student should be proficient with the MS Office suite (Excel, PowerPoint, and Word), all of which are available on the GIST Server. Documents in other software formats will not be accepted. In addition, students’ personal computer systems must meet several technology requirements:

- An up-to-date computer with a fast Internet connection.
- A functional Web camera together with a microphone or headset for live sessions.
- A modern Web browser (Firefox, IE or Chrome is recommended) to run ArcGIS which is provided online via the GIST Server; you do not need to install ArcGIS on your own computer.
Required Readings and Supplementary Materials

There are two required texts for this course, available from the USC Bookstore or online outlets such as Amazon. Note also that the first text is available free through the USC Libraries as an e-Book.


There are several supplementary readings, also supplied by the instructor on Blackboard.


In addition, one Esri tutorial and four Esri Web Campus (http://training.esri.com) courses, for a total of five, are supplied with this course.

- Getting Started with Geodatabase
- Getting Started with Geodatabase Topology
- Working with Geodatabase Domains and Subtypes
- Multidimensional Scientific Data Tools
- Transforming Data using Extract, Transform, and Load (ETL) Processes
Description and Assessment of Assignments

Performance in this course is determined on the basis of several assessment tools. Students update their student resume, prepare a set of research assignments and review blogs on database theory, and complete a set of practical Esri Web training courses during the first 10 weeks of class; thus prepared, they undertake the Final Project during the final weeks of the semester.

Student Resume (2%): 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.

Theory – Reading Assignments (16%): Students complete reading and writing assignments throughout the class. These assignments cover essential theoretical material and perspectives, intended to help integrate practical aspects of Esri geodatabases (below).

Discussion Forums (4%): These structured discussions and blogs will focus on combinations of theory and practice. You will post new message and replies to messages posted by your classmates (i.e. two per forum) at specified times throughout the class.

Self-Check Assignments (15%): These classroom assignments will typically consist of questions that focus on combinations of theory and practice. The questions will serve as a guide in your reading and as a basis for class discussions and spatial database tutorials. The goal is to have informed class activity, and to use class time to focus on applying, analyzing and evaluating the material with the aid of fellow students and with your instructor’s guidance.

Practice - Tutorial Assignments (43%): Students work four hands-on tutorials with databases and ArcGIS on the GIST Server, and concurrently complete one online Esri Tutorial and four Esri Virtual Campus modules on geodatabases, during the first 10 weeks of the class.

Final Project (20%): Students work in small teams (2-5 max) on projects determined in consultation with the instructor to develop and populate a practical geodatabase design with sample data. Team projects are emphasized to share the intellectual discovery process that inevitably accompanies geodatabase development, as well as to accomplish more substantial work in the time available, i.e. collecting the spatial and non-spatial data, importing those data into a suitably designed geodatabase, producing and interpreting maps, etc. During the final weeks of the class, students will be mostly doing work on Final Projects; the instructor may also participate. During this period, students maintain a Journal or Wiki on Blackboard discussing their progress and challenges during this period.
Grading Breakdown

<table>
<thead>
<tr>
<th>Assignments</th>
<th>Number of Assignments</th>
<th>Points Per Assignment</th>
<th>% of Grade</th>
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</thead>
<tbody>
<tr>
<td>Student Resume</td>
<td>1</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Reading Assignments</td>
<td>4</td>
<td>4</td>
<td>16</td>
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<tr>
<td>Discussion Forums</td>
<td>4</td>
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<tr>
<td>Self-Check Assignments</td>
<td>15</td>
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<td>15</td>
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<tr>
<td>Esri trainings</td>
<td>5</td>
<td>3</td>
<td>15</td>
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<tr>
<td>Tutorial Assignments</td>
<td>4</td>
<td>7</td>
<td>28</td>
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<tr>
<td>Final Project, components</td>
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<tr>
<td>- Final Project Proposal</td>
<td>1</td>
<td>2</td>
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<tr>
<td>- GeoDB design</td>
<td>1</td>
<td>5</td>
<td>5</td>
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<tr>
<td>- GeoDB implementation</td>
<td>1</td>
<td>5</td>
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<tr>
<td>- GeoDB report, video</td>
<td>1</td>
<td>5</td>
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<tr>
<td>- Oral presentation</td>
<td>1</td>
<td>3</td>
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<tr>
<td><strong>Totals</strong></td>
<td><strong>38</strong></td>
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<td><strong>100</strong></td>
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Assignment Submission Policy

Unless otherwise noted, assignments will be submitted for grading via Blackboard using the due dates specified in the Course Schedule below. And finally, it is important to note from the outset that: (1) you are expected to attend and participate in class and to complete and upload all assignments before the deadlines detailed in the Course Schedule; (2) late postings and assignments will be docked one grade and no grade will be given for postings or assignments turned in more than seven days late; and (3) no written work will be accepted for grading after 5:00 p.m. PT on the last day of classes (see course schedule).

Additional Policies

Communications – All materials to be handed in will be submitted via the Blackboard Assessment link. I will also create multiple 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 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 email jswift@usc.edu (does not go into your junk mail!)

While I am usually online 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 offline for more than 72 hours, I will post an announcement on the Blackboard site. 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 12-15 hours per week completing the work in this course.

**Course Schedule (Tentative)**

<table>
<thead>
<tr>
<th>Week 1 1/11</th>
<th>Topics/Daily Activities</th>
<th>Readings and Assignments</th>
<th>Deliverables Due</th>
</tr>
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<tbody>
<tr>
<td>Getting Started</td>
<td>Longley et al. (2005) <em>Geographical Information Systems and Science</em>. Hoboken, NJ: Wiley - Ch.3, pp. 63-83</td>
<td>Student Resume (SR) Self-Check Assignment 1 Reading Assignment 1: What is a Lake?</td>
<td>Tues 1/12, Introductions Thurs 1/14, Student Resume, Self-Check Assignment 1</td>
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| Week 4  
Self-Check Assignment 4  
Discussion 2  
Tutorial 2 | Tues 2/2, Self-Check Assignment 4  
Thurs 2/4, Tutorial 2 |
|---|---|---|---|
| Week 5  
Self-Check Assignment 5 | Tues 2/9, Discussion 2  
Thurs 2/11, Self-Check Assignment 5 |
| Week 6  
Self-Check Assignment 6  
Discussion 3  
Reading Assignment 2: E-R Diagramming | Tues 2/16, Self-Check Assignment 6  
Thurs 2/18, Discussion 3 |
| Week 7  
2/22 | **Esri Geodatabases (I)**  
Final Project – kick-off | Self-Check Assignment 7  
Esri Certificate 1 (C1): Getting Started with the Geodatabase  
Tutorial 3 | Tues 2/23, Self-Check Assignment 7, Reading Assignment 2  
Thurs 2/25, Certificate 1, Tutorial 3 |
| Week 8  
2/29 | **Database Mechanics**  
Self-Check Assignment 8  
Reading Assignment 3: Normalization  
Discussion 4 | Tues 3/1, Self-Check Assignment 8  
Thurs 3/3, Reading Assignment 3, Discussion 4 |
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<tr>
<td>3/14-20</td>
<td>Spring Recess</td>
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<tr>
<td>Week 13</td>
<td>Working on Final Project – week 6</td>
<td>Self-Check Assignment 14 Final Project</td>
<td>Tues 4/12, Self-Check Assignment 14 Thurs 4/24, Work on Final Project</td>
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</tbody>
</table>
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 [http://studentaffairs.usc.edu/scampus/](http://studentaffairs.usc.edu/scampus/). 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](http://policy.usc.edu/scientific-misconduct).

Discrimination, harassment, and sexual assault are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity [http://equity.usc.edu](http://equity.usc.edu) or to the Department of Public Safety [http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us](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 person. The Center for Women and Men [http://www.usc.edu/student-affairs/cwm/](http://www.usc.edu/student-affairs/cwm/) provides 24/7 confidential support, and the sexual assault resource center webpage [http://sarc.usc.edu](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](http://dornsife.usc.edu/ali), which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs [https://dsp.usc.edu/](https://dsp.usc.edu/) 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](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.