GEOG 582 – Spatial Databases, Course Syllabus Spring 2011

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Office Hours: I am always available via email. Also, available for chats via phone or Skype or IM text, 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

GIS are fundamentally *INFORMATION* systems. Although GIS provide specialist facilities for storing and manipulating spatial data, much of the functionality offered by GIS software is shared with conventional database software. Indeed, most GI systems have at their core a conventional database management system (DBMS) around which spatial functionality has been wrapped. Understanding database theory is *the* foundation to understanding the technical aspects of GIS.

This course stresses the need to understand the theories that underpin the design of databases. However, the core objective of the course is a practical one – upon completion students should understand the fundamental principles in the design and implementation of well conceived geodatabases. Consequently, this course has a strong practical element. GEOG 582 includes a small set of hands-on practical exercises in which you will undertake designing, implementing and querying some simple databases, both non-spatial and spatial.

This course will provide students with the practical skills to design, implement, and interrogate relational databases together with the requisite knowledge to critically assess both current database models and developments of those models for geospatial data. Themes covered include:

- **Basic Database System Concepts –** What is an information system? What are databases? What do they do? Why are they necessary – generally and specifically for GIS?.
- **Database Models –** Relational model, Georelational model, Geodatabase model.
- **Data modeling and Database Design –** Methods and techniques for database design, entity-attribute-relationship modeling, normalization
- **Other Topics –** spatial data standards, metadata, spatial indexes, data warehouses and data mining, legal issues.

Learning Outcomes

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

- Design well formed simple database models, using appropriate design techniques, and be able to implement such designs using relational database software;
- Use SQL to establish and interrogate databases;
- Use ArcGIS to create and populate simple geodatabases.
- Critically assess the limitations of conventional database structures as a means of storing spatial data
- Critically assess current advances in database design for geographical applications.

Course Structure

The course will be presented via Blackboard. There will be a number of assigned readings, short papers (6), hands-on tutorials (3), blog postings or discussions (4) and a final project. The course will generally unfold on a weekly or bi-weekly basis through a posted Assignment document that provides instructions on readings and work to be completed within the given time period. When possible, assignments will be posted in advance, but usually they will be posted on or just before the relevant Monday.

Textbooks

The main theoretical concepts will be provided through a directed reading of:

- *Spatial Database Systems: Design, Implementation and Project Management*, by AKW Yeung and GB Hall, 2007, Springer. DOI: 10.1007/1-4020-5392-4_1
- Good News! You do not need to purchase this book - it is available to all USC students through the library e-books system as downloadable PDFs. To get to the site, you must first log into the USC library and then you can search for the DOI indicated above. This will take you to the book's page on the SpringerLink site.

For each chapter of this book assigned, I will produce some additional Reading Notes to help you work through this material.

A highly recommended, optional text is:

- *Modeling our World: The ESRI Guide to Geodatabase Concepts,* Second Edition, by Michael Zeiler, 2010, ESRI Press, Redlands CA

This book provides substantial guidance that will be helpful as you implement and work with geodatabases in ArcGIS.

Assessment

There will be four kinds of assessments:

- Short Papers (6 for a total of 30%): These papers are intended to give you the opportunity to apply and discuss key themes in the readings. Each of these assignments will be one of several types including short critiques of assigned readings, discussions of how the week's concepts apply to a specific practical problem, summary of some related

library and/or web research, etc. One of these will require individual PowerPoint presentation. These will be graded on a A/B/C scale where A is excellent, B is acceptable, C is unacceptable. All students in this program should know that C level work is insufficient for credit at the graduate level.

- Tutorials (3 for a total of 30%): A set of three hands-on exercises will give students practical experience with SQL and the design and implementation of a small geodatabase. At the completion of each tutorial, you will submit a report.

- Blogs or Discussion Postings (4 for a total of 10%): In addition to unstructured discussions about course materials, through these assignments, you will have opportunities to share information with other students in the class. For some of these, you will post a brief summary and discussion about a relevant article from an academic journal that you have found during this course. Other students will be invited to comment on your observations. These will be graded on a credit/no credit scale.

- Final project (30%): To integrate learning of all the material covered in the course, for the final project, students will design and document a geodatabase for an individually chosen project that is the context of discussion in several of the written assignments. In addition to submitting a fully annotated and illustrated document, students will make an on-line public presentation via Adobe Connect that discusses their database design.

Any assignments submitted after the due date and time will be penalized one grade or as otherwise indicated on the assignment handout. Unless I have agreed to an extended delay, assignments over 1 week late will receive no grade.

Student Learning Resources

The primary resources are the text and the associated Reading Notes. These will be supplemented by a mixture of readings from academic journals, professional reports and authoritative websites.

For the tutorials and the final project, we will use SQL Server and ArcGIS 10 plus some other tools. These will be accessible over the Internet via the GIST Server. Instructions on accessing the Server will be provided at the appropriate time in the course.

Requirements

Technology – There are several technology requirements:

- ArcGIS and most other software used in this course are provided on-line via the GIST Server.
- Every student must have a computer with a fast Internet connection (DSL at a minimum). Since we now serve the key software from the Server, you can use either a Mac or a PC.
- Every student MUST have a functional webcam 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). Assignments are to be submitted to me via Blackboard. I will create and monitor BB forums through which we can discuss issues and comments on the course assignments and practicals as the need arises.

For each weekly or biweekly assignment, I will post an announcement on our course Blackboard site that points to the associated readings and assignments. Additionally, I will send via email through Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all email sent from Blackboard or from me. Also double check to be sure that mail sent from both the USC blackboard accounts and my private domain (karenkemp@geokemp.net) does not go into your junk mail!

While I am usually on-line and will probably respond to emails from students very quickly, I will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 36 hours delay. In the rare case when I expect to be off-line for more than 24 hours, I will post an announcement on the Blackboard site.

Your responsibility: 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 10-12 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 8:30 a.m.–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: http://web-app.usc.edu/scampus/wp-content/uploads/2009/08/appendix_a.pdf . 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

- 1/10: Semester classes begin
- 1/28: Last day to register and add classes
- 1/28: Last day to change enrollment option to Pass/No Pass or Audit
- 1/28: Last day to drop a class without a mark of "W" and receive a 100% refund
- 4/8: Last day to drop a class with a mark of W
- 4/29: Semester on-campus classes end
- 5/11: End of term

Tentative Course Schedule

Week	Starts	USC calendar	Theme/Book Chapter	Due Mon.
1	10-Jan		1. Current Status Spatial Information Tech.	
2	17-Jan		2. Concepts/Architecture Database Systems	B1
3	24-Jan	drop 1/28		P1
4	31-Jan		3. Database Models and Data Modelling	P2 (Pres)
5	7-Feb			
6	14-Feb			P3
7	21-Feb		4. Spatial Data and Spatial Database Systems	T1
8	28-Feb			B2
9	7-Mar			P4
	14-Mar	Spring Break		
10	21-Mar		5. Spatial Data Standards and Metadata	T2
11	28-Mar		6. Spatial Data Sharing, Data Warehousing	P5
12	4-Apr	w'd 4/8	7. Legal Issues	B3
13	11-Apr		11. Spatial Data Mining	T3
14	18-Apr		12. Trends of Spatial Database Systems	
15	25-Apr		Project	P6
	2-May			B4
end	11-May			

B = Blog/Discussion, P = Paper, T = Tutorial

In addition to the usual Monday due dates as indicated in this table, the following special due dates have been set:

- Paper 2 Presentations – week of Jan 24 (times TBD individually)
- Final Project Written Report and slides – due Fri. May 6, 8am Pacific Time
- Final Project Presentations – Fri. May 6 and Sat. May 7 (times TBD individually)