GEOG 582 – Spatial Databases
Course Syllabus Fall 2010

Instructor: Professor Karen Kemp
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Email: karenkemp@geokemp.net
Skype: kkkemp

Office Hours: (tentative) Tues. 2-4 pm, Wed. 6-8 pm Pacific Time
Always available asynchronously via email. Also, available for synchronous 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 databases. 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. Organizationaly, this course is divided into several sections covering:

- **Basic Database Theory** – What is an information system? What is a database? Why are they necessary – generally and specifically for GIS? Database models, reference architectures, attribute and spatial data.
- **The Relational Database Model** – Origins of the Relational model, requirements of the Relational Model; SQL.
- **Database Design** – Methods and techniques for database design, entity-attribute-relationship modeling, normalization
- **Object Oriented Databases** - Basic OO concepts, the role of OO in GIS, spatial database management systems.
- **Other Topics** - Enterprise GIS, spatial indexes, time in SDBMS, data warehouses and data mining.
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 GIS data models.
- 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. The main theoretical concepts will be provided through course notes and assigned readings. Hands-on practical exercises will use software available on the GIST Server that can be installed on your personal computer. Assignments will give students an opportunity to internalize and apply the concepts and theory learned from the readings.

Assessment

There will be four kinds of assessments:

- Written assignments (6 for a total of 30%): These assignments 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.

- Practical exercises (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 database. At the completion of each exercise, you will submit a report.

- Blogs (5 for a total of 10%): In addition to unstructured discussions about course materials, we will have several opportunities to share information with one another. For three of these you will present a brief summary and discussion about a relevant article from an academic journal that you have found during this course. For these blogs, we will generally use the blog function provided by Blackboard. 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 spatial database 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 resource is the Course Notes which will be supplemented by a mixture of readings from academic journals, professional reports and authoritative websites.

For practical exercises 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.

Expectations

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.

By Monday each week, I will post an announcement on our course Blackboard site that points to the week’s 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

- 8/23: Fall semester classes begin
- 9/6: Labor Day, university holiday
- 9/10: Last day to register and add classes
- 9/10: Last day to change enrollment option to Pass/No Pass or Audit
- 9/10: Last day to drop a class without a mark of "W" and receive a 100% refund
- 11/12: Last day to drop a class with a mark of W
- 11/25-11/27: Thanksgiving Recess, university holiday
- 12/3: Fall semester on-campus classes end
- 12/15: End of term

Tentative Course Schedule (see next page)
### Tentative Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Starts</th>
<th>Themes</th>
<th>Assignment Topic</th>
<th>Due Mon.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23-Aug</td>
<td>1. Introduction</td>
<td>Blog 1. Introduce yourself</td>
<td></td>
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<tr>
<td>2</td>
<td>30-Aug</td>
<td>2. Database Theory Foundations</td>
<td>1. eLibrary research on apps.</td>
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<td>3</td>
<td>6-Sep</td>
<td>3. Fundamentals of the Relational Model</td>
<td>2. Semantics/Ontology/ Data models</td>
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<td>5</td>
<td>20-Sep</td>
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<tr>
<td>6</td>
<td>27-Sep</td>
<td>5. Object Orientation</td>
<td>Practical 1 SQL / Blog 2. Article</td>
<td>3b (pres)</td>
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<td>7</td>
<td>4-Oct</td>
<td>6. ArcGIS Geodatabases, spatial indexes, versioning, and other topics</td>
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<td>8</td>
<td>11-Oct</td>
<td>7. Final Project</td>
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<td>9</td>
<td>18-Oct</td>
<td>8. Spatial indexes, OGC, versions, KML</td>
<td>Practical 2 Geodatabase / Blog 3. Article</td>
<td>4</td>
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<td>10</td>
<td>25-Oct</td>
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<td>12</td>
<td>8-Nov</td>
<td>10. Final Project</td>
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<td>13</td>
<td>15-Nov</td>
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<td>14</td>
<td>22-Nov</td>
<td>11. Final Project</td>
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<td>15</td>
<td>29-Nov</td>
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<td>6-Dec</td>
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<td>End</td>
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In addition to the usual Monday due dates as indicated in this table, the following special due dates have been set:

- Assignment 3 Presentations – Sun. Sept 26 and Mon. Sept 27 (times TBD individually)
- Final Project Written Report – due Thur. Dec 9, 8am Pacific Time
- Final Project Presentations – Fri. Dec 10 and Sat. Dec 11 (times TBD individually)