South Dakota State University

GEOG 473/573 - S01, 3 credits
GIS Data Creation & Integration
Course Syllabus (Spring 2018)

Course Instructor: Dapeng Li, Ph.D.

Meeting Time: Tue. 1:00-1:50 pm

Meeting Location: Wecota Hall, Room 0004 (basement floor)

Office Hours: Mon. & Tue. 2:00 - 4:00 pm (or by appointment)

Office & Phone: Wecota Annex 413, (605) 688-4620

Email: dapeng.li@sdstate.edu (primary contact)

Lab Section

SECTION	LAB INSTRUCTOR	DAYS	LOCATION	MEETING TIME
373/573L S01	Dinesh Shrestha	Tue	Wecota Hall 014	2:00 PM – 3:50 PM
		Thu	Wecota Hall 014	2:00 PM – 3:50 PM

Lab Instructor

Name	E-mail	Phone	Office
Dinesh Shrestha	dinesh.shrestha@jacks.sdstate.edu	605-592-0793	Wecota Annex 405

Course Description

This course is an advanced course on Geographic Information Systems (GIS) and introduces spatial database design and management. Specifically, this course covers the following aspects: basic concepts and principles of relational and spatial databases, relational/spatial database design, entity-relationship (ER) diagram, structured query language (SQL), spatial query, data/user management, spatial indexing, etc. Meanwhile, this course also aims to help students develop some practical skills in spatial databases using the open source PostgreSQL/PostGIS (or the commercial software ArcGIS Geodatabase) in the lab section.

Course Prerequisites

GEOG 372 Introduction to GIS or equivalent course/experience.

Instructional Methods

Lecture, discussion, demonstrations, lab assignments, final project, presentation, quizzes/exams.

Course Schedule

Date	Lecture Topic	Readings	Lab
1/9	Course Overview	SC Ch. 1	Lab Overview (Software)
1/16	Introduction to Spatial Database	SC Ch. 1 WD p. 35-50 OH Ch. 1	Lab 1: OH Ch. 1
1/23	Field Trip: EROS Center	OH Ch. 5 WD p. 50-52	Lab 2: OH Ch. 5; TBD (SQL)
1/30	Spatial Data Types	OH Ch. 2	Lab 3: OH Ch. 2
2/6	Coordinate Systems	OH Ch. 3	Lab 4: OH Ch. 3
2/13	Spatial Database Design	SC Ch. 2 WD p. 53-80	Lab 5: OH Ch. 4
2/20	Spatial Query	SC Ch. 3 OH Ch. 9	Lab 6: OH Ch. 9
2/27	Spatial Data Processing	OH Ch. 6 OH Ch. 11	Lab 7: OH Ch. 6 OH Ch. 11
3/6	**No Class (Spring Break)**	OH Ch. 10	No Lab (Work on Proposal)
3/13	Geocoding/Reverse Geocoding	Li (2018) OH Ch. 8	Lab 8: OH Ch. 8
3/18	Final Project Proposal Due		
3/20	Proximity Analysis & Topology	OH Ch. 10 OH Ch. 13	Lab 9: OH Ch. 10 OH Ch. 13
3/27	Spatial Data Organization	OH Ch. 14	Lab 10: OH Ch. 14
4/3	Spatial Storage and Indexing	SC Ch. 4 OH Ch. 15	Introduction to Geodatabase
4/10	No Class (AAG Conference)	Check D2L	Project time
4/17	Project Advising & Support	Review Study Guide	Project time
4/24	Final Project Oral Presentation	Final project Due on 4/27 @ 5 pm	
5/3	Final Exam	May 3 (Thurs.), 4:00 – 6:00 pm @ Wecota Hall 0004	

Abbr.: Shekhar & Chawla (SC), Worboys & Duckham (WD), Nasser (N), Obe & Hsu (OH),

This schedule is subject to change. Students will be notified of any changes.

Course Requirements

Required Textbooks

Lecture

Shekhar, S., & Chawla, S. (2002). *Spatial databases: A tour*. Pearson.

Worboys, M. F., & Duckham, M. (2004). *GIS: A computing perspective*. CRC press.

Lab

Nasser, H. (2014). *Learning ArcGIS Geodatabases*. Packt Publishing Ltd.

Obe, R. O., & Hsu, L. S. (2015). *PostGIS in action* (2nd edition). Manning Publications Co.

Other Recommended Books

Corti, P., Kraft, T. J., Mather, S. V., & Park, B. (2014). *PostGIS Cookbook*. Packt Publishing Ltd.

Elmasri, R., & Navathe, S. B. (2015). *Fundamentals of database systems* (7th Edition). Pearson.

Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic information science and systems* (4th edition). John Wiley & Sons (ISBN: 978-1118676950)

Marquez, A. (2015). *PostGIS Essentials*. Packt Publishing Ltd.

Manolopoulos, Y., Papadopoulos, A. N., & Vassilakopoulos, M. G. (Eds.). (2005). *Spatial databases: technologies, techniques and trends*. IGI Global.

Urbano, F., & Cagnacci, F. (Eds.). (2014). *Spatial Database for GPS Wildlife Tracking Data: A Practical Guide to Creating a Data Management System with PostgreSQL/PostGIS and R*. Springer.

Yeung, A. K., & Hall, G. B. (2007). *Spatial database systems: Design, implementation and project management*. Springer.

Other readings may also be assigned and will be provided accordingly.

Lab Materials

Students will also need (at least) an 8 GB Flash Drive to store their lab and final project materials. All the data on the lab computers will be automatically wiped out when the computers are rebooted. SAVE YOUR FILES!!!

Attendance Policy

Attendance and full participation in classes is expected of all students. Attendance will be checked periodically. The class participation credit is given based on class attendance and/or in-class/take-home exercises. If you do not show up, 5 points will be deducted each time.

Make-up Policy

If a student misses an exam, points can only be made up if the student has an excused absence. To be considered an excused absence, the student must contact the instructor with a legitimate excuse prior to the day of the exam.

Classroom Policies

- All cell phones need to be turned off during the class/lab.
- No recording (photos, audio, etc.) without permission.
- Using computers/smartphones to surf the internet or work on other tasks is not allowed.
- If a laptop is used to take lecture notes, please sit in the back of the classroom.

Important Dates:

- Januarys 9, Tuesday First day of class

- Januarys 9, Tuesday First day of lab
- January 15, Monday Martin Luther King Day Holiday
- January 17, Wednesday Last day to drop or add and adjust final fees
- February 19, Monday Presidents' Day Holiday
- March 5-9, Monday – Friday Spring Break
- March 12, Monday First Half Spring Term ends
- **March 18, Sunday** **Final project proposal due**
- March 30-April 1, Friday – Sunday Easter Recess
- April 3, Tuesday Last day to drop a course
- **April 27, Friday** **Final project paper due**
- April 30-May 4**, Monday – Friday Final exams

Overall Course Goals

Upon completion of this course, students will be able to:

1. Understand and recall the fundamental concepts and principles of spatial databases.
2. Understand the procedures in spatial database design, implementation, and management.
3. Understand relevant queries and operations in spatial databases.
4. Apply the knowledge learned in the class to design a spatial database for a specific application.
5. Be able to use PostgreSQL/PostGIS (or ArcGIS geodatabase) to implement a spatial database and manage spatial data for a specific application.

Student Learning Outcomes

Knowledge Outcomes

Students will master the basic concepts and principles in spatial database and learn how to design and implement a spatial database for a specific real-world application.

Skills Outcomes

Students will **develop specific skills and competencies in spatial databases** and **learn to use spatial databases in real-world applications**. Students will use the methods learned in the class to complete a final project. Other skill outcomes include: written communication, interpersonal communication, professional presentation, and planning and organization.

Grade Evaluation

Evaluation Components	Points (each)	Points	Percent Value
Participation	TBD	100	10%
Lab Assignments (10)	40	400	40%
Final Exam	200	200	20%
Final Project Presentation	100	100	10%
Final Project Paper	200	200	20%

Total	1000	100%

Course Grade Scale

Grade	Final weighted points
A	90-100
B	80-89
C	70-79
D	60-69
F	< 60

Weekly Lab Exercises: In the labs, we will use the open source PostgreSQL/PostGIS software and/or ESRI's Geodatabase to reinforce the concepts covered in the lectures. We have two labs each week. The students will do some demos in the first lab and work on the assignments in the second lab. Although class time has been allocated for lab tutorials and assignments, additional work may also be necessary. Lab assignments must be submitted electronically through the Dropbox on D2L. The TA will grade the assignments and post the grades in D2L. Points will be deducted each day for late submissions (Please check the lab syllabus for more details).

Exam: This course has a final exam. The exam will include true/false questions, multiple choice questions, matching questions, short answer questions, and comprehensive essay questions. The questions come from the key points covered in the lecture, and a study guide will be given before the exam.

Final Project: The students are expected to use what they have learned in the class to accomplish a final project. The project is about designing and implementing a spatial database for a special GIS application. The project must be original work. Thus, the students are STRONGLY encouraged to discuss with the instructor regarding project ideas as early as possible. Undergraduate students can work on the project by themselves or in groups of two. Graduate students need to work on the project on their own.

Specifically, the final project should include the following components:

1. A project proposal that includes introduction, background information, data sources, spatial database design, and expected results. (within 5 pages (including figures), word count: 800~1,500 (undergraduate), 1,000~1,500 (graduate))
2. A PowerPoint presentation (about 15 minutes) that summarizes the key steps in designing and implementing the spatial database.
3. A final report that consists of title, introduction, spatial data compilation, database design, database implementation, results, discussion, and conclusion (10 ~ 25 pages (double-spaced); word count: 1,500~2,500 (undergraduate), 2,000~3,000 (graduate)).

More details on each component will be provided during the semester. Please refer to the course calendar for specific due dates.

Class Participation: The course requires a regular attendance in BOTH lectures and labs. Student participation in class discussion and interaction is strongly encouraged. I will check attendance periodically. The class participation credit is given based on class attendance and in-class/take home exercises/quizzes.

Lab Section & Final Project

The lab section is designed to help students gain hands-on experience in spatial database design and management. There will be a number of weekly assignments for the students to enhance their skills in spatial databases. Upon the completion of these specially designed labs, the students will work on a final project to demonstrate their competency in using spatial databases in real-world applications. Please note:

- Attendance to all of the labs is required and lab attendance will be graded.
- The weekly lab assignments need to be completed and submitted on time; penalty will be applied for the late submissions (Please refer to the lab syllabus for more details).
- NEVER try to skip a lab or leave one unfinished before starting another one - the technical skills required for a latter lab are often based on previous ones.
- NEVER be too shy to ask. Feel free to ask me or your lab instructor if you have any questions.
- Memorize all the commands, the procedures, and the solutions you used to solve each of the problems or generate each of the maps.

ADA Statement:

Any student who feels s/he may need an accommodation based on the impact of a disability should contact Nancy Hartenhoff-Crooks (or successor) Coordinator of Disability Services (605-688-4504 or Fax, 605-688-4987) to privately discuss your specific needs. The Office of Disability Services is located in room 065 at the University Student Union.

Freedom in Learning Statement:

Students are responsible for learning the content of any course of study in which they are enrolled. Under Board of Regents and University policy, student academic performance shall be evaluated solely on an academic basis and students should be free to take reasoned exception to the data or views offered in any courses of study. Students who believe that an academic evaluation is unrelated to academic standards but is related instead to judgment of their personal opinion or conduct should first contact the instructor of the course. If the student remains unsatisfied, the student may contact the Department Head, Dean, or both, of the college which offers the class to initiate a review of the evaluation.

Student Academic Integrity and Appeals:

The university has a clear expectation for academic integrity and does not tolerate academic dishonesty. University Policy 2:4 sets forth the definitions of academic dishonesty, which includes but is not limited to, cheating, plagiarism, fabrication, facilitating academic dishonesty, misrepresentation, and other forms of dishonesty relating to academics. The policy and its procedures also set forth how charges of academic dishonesty are handled at the University. Academic Dishonesty is strictly proscribed and if found may result in student discipline up to and including dismissal from the University.