GEO4151/5159

Fundamentals of Geographic Information Systems

(Spring 2006)

Instructor:
Dr. Xiaojun Yang, 304 Bellamy, Phone: 644-8379, Email: xyang@fsu.edu

Class Hours:
Mondays: 9:00 - 11:30 p.m., Room 0035 Bellamy

Office Hours:
Wednesdays and Fridays: 1:00 – 2:30 p.m., or by appointment.

Lab Instructor (any question concerning the lab assignments):
Sharla Lair (lalair@yahoo.com)

Lab Sessions:
Tuesdays: 2:00 - 3:15 p.m. OR Thursdays: 11:00 am - 12:15 p.m. (320 Bellamy)
(You must register one of the above two lab sessions; they are in separate course codes, GEO4905 or 5908; If you have any question about this, please contact me or Sharla Lair)

Computing Lab Manager (any problem related to computer system):
Mr. Shawn Lewers (SWL2727@mailer.fsu.edu)

Course Description

Geographic Information Systems (GIS) represent the latest technologies that are revolutionizing the disciplines of geography and environmental sciences in the information age. This course will offer an introduction to methods and technologies for managing and processing spatial information. Emphasis will be placed on the nature of spatial information, spatial data models and structures, data input, storage and manipulation, spatial analytic and modeling techniques, and output. The course is made of two components: lectures and labs. In the lectures, the conceptual elements of the above topics are explained. The labs are designed in such a way that students will gain first-hand experience in data input, data management, data analyses, and result presentation, using one or more GIS software packages. Weekly discussion of peer-reviewed journal articles or book chapters is required for graduate participants. Graduate participants also need to prepare a short research proposal that focuses on the use of GIS to solve a practical problem. The proposals should be openly discussed in the class.

Course Objectives

In general, this is an ice-breaking course into GIS and serves as the foundation for other advanced courses in geographic information technologies and environmental modeling. The basic objectives of this course for students are: (1) To understand the basic components, concepts, and methods of GIS; (2) To build a hand-on experience with daily routines of GIS operations; (3) To gain practical experience with the leading GIS commercial software package; and (4) To access GIS literatures concerning basic and applied research.

Prerequisite

Currently, there is no any prerequisite enforced for this course. However, we are considering to use a cartography course as prerequisite in near future. You will know that GIS has a fundamental root on cartography. If you do not feel comfortable with a basic cartographic concept, you should try to read a cartography textbook. ***Note that this course requires a great deal of patience and a substantial (after class) time commitment. If you have any question about this, please contact the instructor.***

Computing Environment, Software and GIS Lab Policies

Windows based ArcGIS software package will be used for lab assignments. ***However, you must be aware that this is not a software training course. If you are looking for such a course (learning a specific software package), you should visit the homepages for specific software packages. These vendors may provide short training courses or more software-specific training materials.***

You will be given a temporary account in order to log on a computer in COSS GIS Lab. This account may expire by the end of the semester. When you are at the computer lab, you must observe the COSS GIS lab and FSU's related policies. The GIS lab rules include (on the following page):

- *No food or drink in the lab.*
- *Lab computers are for GIS work only. Your other class work is to be done in other labs.*
- *Lab printers are for GIS work only.*
- *DO NOT install software without permission from your instructor or the lab manager. If you need software, ask!*
- *DO NOT save your work on the local machines. Use your Z:\ drive. If you use the local machine or temp directory, others will be able to see your work and it may not be there later.*
- *DO NOT waste color prints, as they are expensive. Use the black and white printer whenever possible.*
- *Be courteous of others in the lab and stay quiet.*
- *Clean up after yourself. Lab attendants will throw out things that are left behind.*
- *DO NOT remove equipment that belongs in the lab from the lab. You will be criminally prosecuted if you are caught.*
- *DO NOT download MP3 or movie files. Most of these websites are compromised by viruses.*
- *Always log-off the computers when you are done, but DO Not shut them down.*
- *No instant messaging is allowed.*
- *Follow the FSU Honor Code and Code of Conduct rules and behave in an adult-like manner.*

It is your responsibility to check and observe these rules. Any violation of these rules can result in the loss of privileges to use this facility. If that happens, it is your responsibility to find an alternative so that you could work on your lab assignments. If you are unsure about a rule or rules, ask a lab employee or Shawn Lewers (swl2727@fsu.edu).

Course Blackboard Site

The Blackboard will be used to host the course lecture and lab materials. You may find the lecture slides there, but there is no guarantee that these lecture materials will be available on time. You will still need to take notes during a lecture session. You are required to check that site from time

to time because some important announcements may be posted there. The Blackboard address is: http://campus.fsu.edu. You will need to use your FSU email account username and password to access this site.

Grading Polices

System:

A	94-100	C	72-76
A-	90-93	C-	70-71
B+	87-89	D+	66-69
B	84-86	D	62-65
B-	80-83	D-	60-61
C+	77-79	F	< 59

In qualitative terms, the grade standards are: **A,** Outstanding, few errors or omissions (if any); **B,** Good, only minor errors/omissions; **C**, Satisfactory, at least one major error/omission; **D**, Poor, several major errors/omissions; and **F**, Fail: many major errors/omissions.

Components (including the lab component):

Components	*Description*	*GEO4151*	*GEO5159*
Exam 1	90 minutes	25%	20%
Exam 2	90 minutes; non-cumulative	25%	20%
Regular lab assignments	There are about 8~9 regular lab assignments (with detailed instruction)	25%	20%
Independent lab assignment	An independent lab project with data and tasks given plus some general guidelines; NO step-by-step procedural instructions	10%	10%
Journal article review	GEO4151 (2 articles); GEO5159 (2 articles) plus a presentation, leading discussion, and reporting (one article only); Active participation in the discussion is required	10%	20%
Research proposal	GEO5159 only (Identifying a research topic, writing a short proposal; and discussing this proposal in the class);GEO4151 students need to participate in the discussion	5%	10%

Attendance:

Students are required to attend all classes and be punctual. Missing even one lecture can affect your grade substantially. Announcements regarding the course outline and the schedule of the lectures, labs and exam (including changes of these) may be made in class. All organizational/administrative

announcements made during the class period are assumed to be known by all students. ***Cell phones, pagers, alarms, laptops, calculators, and other electronic devices must be turned off in class at all times. In a lecture session, please do not log on any lab computer!***

Exams:
The exam can involve any material covered in lectures, reading or discussion assignments, and labs. There is no provision for extra credit work. No make-up exam is allowed. If you miss the exam, you must present a signed physician's excuse or, if the exam is missed due to a family funeral, a dated newspaper obituary. Most other excuses for missing the exam are not acceptable. This policy will be applied strictly.

Lab grading policies:
Grades of your lab exercises are based on the quality of your answers. Any answer should be concise and be well organized. They must be **in print**. The grade for each of the exercises is reported as *points_scored /total_points_of_exercise*. For example, if an assignment is worth 20 points and your answers score16 points then you should see 16/20 on your marked assignment.

Each of the assignments will have a due day clearly written on the first page of your lab assignment. The due time is 5:00 p.m. on the due day. Any assignment that is turned in after the due day is considered late, which will receive penalty strictly.

The penalty for a late assignment is based on the number of days late (including weekends). If an assignment is late less than 24 hours, it is considered 1 day late. If an assignment is late less than 48 hours but more than 24 hours, it is considered 2 days late, and so on. Late assignments are penalized 2**0%** per day. Here is the formula for calculating the points of a late assignment:

*Points_get = Points_scored - 0.20*num_days_late*Points_scored*

The minimum value of Points_get is 0. Assignments handed in after I have returned the graded assignment to class (usually one week after the due date) will receive no points. Again, you must provide acceptable excuse (see exam section) in order to receive more time for you to complete lab exercises without penalty applied. You should discuss with your lab instructor about your situation no later than the due day. This policy will be applied stickily.

Note that every person must hand in his or her own lab assignments. Working together is permitted and encouraged, BUT each person will be graded separately, must answer "creative response" questions independently, and must create his or her OWN maps. Turning in identical or substantially similar assignments will result in significant grade reduction.

Journal article review and discussion:
You are required to review a set of journal articles. Each student needs to review at least two articles (chosen by you own). They must be chosen from a set of journals (check Section Course Materials for details). You are NOT allowed to use any web materials to replace a journal article. Each GEO5159 participant needs to do a short presentation and lead discussion for one article. The leader is expected to prepare a set of questions (5~10 or so) for that particular article in one week

before the actual discussion. These questions should be posted on the Blackboard site momentarily (with the help of the instructor), and each student will need to address these questions when reading through that article. The leader should prepare several slides to initiate the discussion, and summarize the major findings resulting from the classroom discussion. The summary report is due one week after the discussion. Each discussion session could last 10-20 minutes depending upon the topic. All students are expected to participate the discussion.

Independent lab project:
Will be discussed in a separate document.

Research proposal:
Will be discussed in a separate document.

Course Materials

Required text:

- Heywood, I., Cornelius, S., and Carver, S., 2002. *An Introduction to Geographical Information Systems* (2nd). England: Prentice Hall, 295 p.

Other Texts:

- Aronoff, S. 1989. *Geographic Information Systems: A Management Perspective*. Ottawa: WDL Publications. 294 p.
- Bernhardsen, T. 2002. *Geographic Information Systems: An Introduction (3rd*). New York: John Wiley & Sons. 428p.
- Berry, J. K. 1993. *Beyond Mapping: Concepts, Algorithms, and Issues in GIS*. Fort Collins: GIS World Books, 246 p.
- Bolstad, P., 2005. *GIS Fundamentals* (2nd). Eider Press. 543p.
- Burrough, P.A. and R. A. McDonnell, 1998. *Principles of Geographic Information Systems*. New York: Oxford University Press, 333 p.
- Chang, Kang-tsung, 2006. *Introduction to Geographic Information Systems (3rd)*. McGraw Hill Higher Education. 432p.
- Clarke, K.C. 2003. *Getting Started with Geographic Information Systems (4th)*. Upper Saddle River, New Jersey: Prentice Hall. 340 p.
- Chrisman, N. 2002. *Exploring Geographic Information Systems (2nd)*. New York: John Wiley & Sons. 301p.
- DeMers, M.N. 2000. *Fundamentals of Geographic Information Systems (2nd)*. New York: John Wiley & Sons. 498 p.
- Huxhold, W. E. 1991. *An Introduction to Urban Geographic Information Systems*. New York: Oxford University Press. 337 p.
- Lo, C. P. and Yeung, A. K. W. 2002. *Concepts and Techniques of Geographic Information Systems*. New Jersey: Prentice Hall. 492p.
- Longley, P. A., Goodchild, M. F., Maguire, D. J. and Rhind, D. 2005. *Geographical Information Systems and Science*. New York: Wiley and Sons. 454p.
- Martin, D. 1996. *Geographic Information Systems: Socioeconomic applications*. Routledge, New York. 210 p.
- Theobald, D. M. 2003. *GIS Concepts and ArcGIS Methods*. Colorado: Conservation

Planning Technologies. 334p.

- Tomlin, D. 1990. *Geographic Information Systems and Cartographic Modeling*. New Jersey: Prentice Hall. 249 p.

Journal articles:

In this course, journal articles will be recommended to students to read. Students should constantly check the following journals for useful articles on GIS theories and applications:

- *International Journal of Geographic Information Science*
- *Transaction in GIS*
- *Computer, Environment and Urban Systems*

Because students in GIS classes come from different disciplines, they can refer to professional journals in their own fields to find useful GIS application papers, e.g. for landscape architects, a journal such as *Environmental Planning* and *Landscape and Urban Planning* will be useful. Two other geography journals are also useful: *Applied Geography* and *The Professional Geographer*. Also environmental management and natural resources journals contain more and more GIS papers (e.g. *Landscape Ecology*, *Ecological Modeling* or *Journal of Environmental Management*)

Electronic discussion groups and internet for GIS:

Students with an electronic mail account can sign up for an electronic discussion group on GIS. The most important group is called GIS-L. There are many discussion groups for individual software, e.g., there is one for ARC/INFO, one for IDRISI.

Another trend in GIS is the use of Internet to deliver GIS data and maps. Some GIS analyses can also be done through the Internet. You should constantly check the websites. There are many websites on GIS. You can use a search engine, such as http://www.yahoo.com/ to search for them. If you are reading this syllabus in our GIS class website, you will be directed to link to a number of important websites for information on programs and data. The following websites (URL) are a must for you to explore:

- http://www.usgs.gov/ [USGS WEBSITE]
- http://www.esri.com/ [ARC/INFO WEBSITE]
- http://www.idrisi.com/ [IDRISI WEBSITE]
- http://www.census.gov/ [US CENSUS BUREAU WEBSITE]

Honor Code

Students are expected to uphold the Academic Honor Code. The Academic Honor System of The Florida State University is based on the premise that each student has the responsibility to:

- Uphold the highest standards of academic integrity in the student's own work,
- Refuse to tolerate violations of academic integrity in the University community, and
- Foster a high sense of integrity and social responsibility on the part of the University community.

PLAGIARISM: All submitted assignments must be your own original, independent work. All sources must be properly cited (especially in the graduate student paper). Ask the instructor if you are unsure what to do. Plagiarism will result in significant grade reduction.

ADA Requirements

Students with disabilities needing academic accommodations should:

- Register with and provide documentation to the Student Disability Resource Center (SDRC).
- Bring a letter to the instructor form the SDRC indicating you need academic accommodations.

This should be done within the first week of class.

For more information about services available to FSU students with disabilities, contact the Assistant Dean of Students: sdrc@admin.fsu.edu, Disabled Student Services, 08 Kellum Hall, Florida State University, Tallahassee, FL 32306-4066, (850) 644-9566.

Spring 2006 Tentative Schedule

Weeks	Lecture Dates/Topics		Lab Assignments	Reading	Remarks/ Discussion
1	1/9	Course introduction and overview What is GIS (definition/brief history/typical questions GIS can help answer/GIS components/case studies/issues raised/GIS application areas)	Introducing COSS lab facilities and policies (meet at COSS lab)	Ch1& 9	One-hour video show
2	1/16	Martin Luther King Jr. Day (no class)			
3	1/23	Nature of spatial data I (Introduction/Maps and their influence/Thematic characteristics)	Lab 1: Internet resources for GIS learning and education	Ch2	No GIS software is needed; Article assignments (GEO5159 only)
4	1/30	Nature of spatial data II (Sources and data issues)	Lab 2: Introduction to ArcGIS	Ch2&10	Questions for first two articles due
5	2/6	Spatial data modeling (data models/data structures/building computer worlds)	Lab 3: Map projection	Ch3	Article discussion I (2)
6	2/13	Attribute data management (DBMS/creating a database/database applications in GIS)	Lab 4: Exploring geographic data	Ch4	Article discussion II (2)
7	2/20	Exam One (10:00 -11:30 am); Midterm Feedback			
8	2/27	Data input and editing (Methods of data input/data editing/developing an integrated database)	Lab 5: Spatial data creation and editing	Ch5	Article discussion III (3)
9	3/6	Spring Break (enjoy!!)			
10	3/13	Spatial data analysis I (Measurement/queries/reclassification/buffering and neighborhood function/overlay)	Lab 6: Geocoding and address matching	Ch6	Article discussion IV (2)
11	3/20	Spatial data analysis II (Spatial interpolation/surface analysis/network analysis/quantitative analysis)	Lab 7: Spatial query	Ch6	Article discussion V (2)
12	3/27	Modeling in GIS/Map design and visualization	Lab 8: Buffer analysis	Ch7&8	Article discussion VI (3)
13	4/3	GIS implementation/GIS project design	Lab 9: Map design and production	Ch11&12	Discussion of proposals I (GEO5159-5)
14	4/10	Future of GIS/Review/Course Evaluation	Independent lab project	Ch13	Discussion of proposals II (5159-9)
15	4/17	Reserved for Independent lab project			
16	4/24	Exam Two (10:00-11:30 am; non-cumulative; cover everything after the first exam); independent lab project report/research proposal/article review (GEO4151) due (midnight April 24)			