

**GEO5158/4930 04**  
**Advanced Geographic Information Science/Systems**  
**(Fall 2005)**

**Instructor:**

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

**Class Hours:**

Mondays: 2:30 - 5:00 p.m., 320 Bellamy Building (COSS GIS Lab)

**Office Hours:**

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

**Teaching Assistant:**

TBA

**Computing Lab Manager (any problem related to computer system):**

Mr. Shawn Lewers (SWL2727@mailers.fsu.edu)

**Course Description and Objectives**

The goal of this course is to introduce students with selected advanced topics and cutting-edge techniques in Geographic Information Science (GISci), both in theory and in practice. This will take students beyond the development of geographic mapping technology that simply answers the question, "Where is it?" to integrated systems that help answer the question, "Why is it?".

Designed as the sequel to the introductory course in GIS (GEO4151/5159), this course will cover a combination of the following topics: spatial cognition and geographic representation, geographic database management, spatial pattern analysis, linear modeling, spatial autocorrelation, spatial modeling and simulation, spatial interpolation, digital terrain modeling and visualization, spatial data mining and reasoning, data quality and uncertainty, mobile GIS mapping, internet GIS, GIS design and implementation, and social dimension of geographic information. Weekly discussion on an assigned journal article is required for graduate participants, and each graduate student is required to lead at least one discussion. Each participant will need to complete a project and present the results to the entire class.

**Prerequisite**

GEO4151/5159 Geographic Information Systems or equivalent.

**Computing Environment, Software and GIS Lab Policies**

Windows based ArcGIS (and extensions) and IDRISI software packages will be used for class 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 Policies**

***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:***

<i>Components</i>	<i>Description</i>	<i>GEO5158</i>	<i>GEO4930</i>
Lab assignments	There are about 10 labs that need to be completed within a fixed time frame.	30%	40%
Reading and discussion assignments	A selection of journal articles; leading and summarizing the discussion (50%); participating the discussion (50%)	15%	0%
Exam 1	Open book; need to be completed within 24 hours	15%	20%
Exam 2	Open book; need to be completed within 24 hours	15%	20%
Research project (presentation and report)	Identifying a topic, writing a short proposal (one page or so), conducting research, presenting the findings to the entire class, and preparing a final report	25%	20%

***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 stickily.

***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 score 16 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 time on 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 **20%** 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.***

***Reading assignment and discussion:***

A set of journal articles will be assigned for reading purpose. Each graduate student is expected to lead a discussion on an assigned journal article. Students could choose his/her own journal article but must get approved by the instructor. 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 20~40 minutes depending upon the topic assigned. All graduate students are expected to participate the discussion. The list of assigned articles will be posted on the blackboard later. Undergraduate students are not required to lead a discussion but the attendance is absolutely required.

***Research project:***

Will be discussed in a separate document.

## Course Materials

### Required text:

- Longley, P. A., Goodchild, M. F., Maguire, D. J. and Rhind, D. 2005. *Geographical Information Systems and Science*. New York: Wiley and Sons. 454p.

In addition to the above required text, a few selected chapters from the following books and other journals will be used as reading assignments:

- Burrough, P.A. and R. A. McDonnell, 1998. *Principles of Geographic Information Systems*. New York: Oxford University Press, 333 p.
- Camara, A. S. and J. Raper (eds.), 1999. *Spatial Multimedia and Virtual Reality*. Taylor & Francis, London, 159 p.
- Chrisman, N. R., 2001. *Exploring Geographic Information Systems (2nd )*. John Wiley & Sons, New York.
- Fotheringham, S. and M. Wegener, 2000. *Spatial Models and GIS : New Potential and New Models*. Taylor & Francis, London, 279 p.
- Gurnell, A. M. and D.R. Montgomery (edited), 2000. *Hydrological Applications of GIS*. John Wiley, New York, 176 p.
- Harmon, J. E. and S. J. Anderson, 2003. *The Design and Implementation of Geographic Information Systems*. John Wiley, New York, 264p.
- Heywood, I., S. Cornelius, and S. Carver, 1998. *An Introduction to Geographical Information Systems*. Prentice Hall, New Jersey, 279p.
- Lo, C. P. and A. K. W. Yeung, 2002. *Concepts and Techniques of Geographic Information Systems*. Prentice Hall, New Jersey, 492p.
- Longley, Paul and Michael Batty (eds.), 1996. *Spatial Analysis: Modelling in a GIS Environment*. GeoInformation International, Cambridge, UK, 392 p.
- Malczewski, Jacek, 1999. *GIS and Multicriteria Decision Analysis*. John Wiley, New York, 392 p.
- O'ullivan, D. and D. J. Unwin, 2003. *Geographic Information Analysis*. John Wiley & Sons, New Jersey, 436p.
- Peng, Z. R. and M. H. Tsou, 2003. *Internet GIS: Distributed Geographic Information Services For the Internet and Wireless Networks*. John Wiley & Sons, New Jersey, 679p.
- Zeiler, M., 1999. *Modeling Our World: The ESRI Guide to Geodatabase Design*. ESRI Press, Redlands, California, 199p.

### 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* (academically the most prestigious)
- *Photogrammetric Engineering and Remote Sensing* (academically the most prestigious)
- *Transaction in GIS* (a good GIS journal)
- *Cartography and Geographic Information Science* (the cartography journal for ACSM; more emphasizing GIS use in cartography). However, it is more cartography than GIS.
- *Computer, Environment and Urban Systems* (academically a good journal, focusing on urban applications of GIS)

- *GeoWorld* (formerly GIS World) (This is a trade magazine, but it does contain many short, well illustrated articles on the actual application of GIS technology in different situations. You should read this constantly to keep yourself informed of changes.)
- *GeoInfo Systems* (another trade magazine, but sometimes it contains some real good articles with more depths than those in GeoWorld).

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*, 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 from 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](mailto:sdrc@admin.fsu.edu), Disabled Student Services, 08 Kellum Hall, Florida State University, Tallahassee, FL 32306-4066, (850) 644-9566.

**Tentative Schedule**  
(Fall 2005)

<b>Weeks</b>	<b>Dates</b>	<b>Lectures</b>	<b>Labs</b>	<b>Chapter Reading Assignments</b>	<b>Discussion/Remarks</b>
1	8/29	Course introduction Introduction to GIS ArcGIS Overview Video show	Lab 1: Introduction to ArcGIS	Chapters 1, 2, and 7, and web materials	GIS Lab account setting up
2	9/05	Labor Day; No Class			
3	9/12	Spatial data models Video show (cont.)	Lab 2: Introducing ArcGIS data models	Chapters 3 and 8 and web materials	Reading and discussion topic assignment
4	9/19	Georeferencing	Lab 3: Working with coordinate systems	Chapter 5	Discussion questions due
5	9/26	Data quality	Lab 4: Database uncertainty and decision risk	Chapter 6	Discussion (I)
6	10/03	Database management	Lab 5: Geoprocessing	Chapters 9 and 10 and web materials	Discussion (II) <b>Research proposal due</b>
7	10/10	<b>Exam one</b>	Lab or project work		
8	10/17	Spatial analysis	Lab 6: Spatial analysis	Chapters 4, 14 and 15 and web materials	Discussion (III)
9	10/24	Spatial Interpolation	Lab 7: Spatial interpolation	Burrough Chapter 5 (handout) and web materials	Discussion (IV)
10	10/31	Surface modeling Geovisualization	Lab 8: Surface analysis	Chapter 16 and web materials	Discussion (V)
11	11/07	Network analysis	Lab 9: Network analysis	Web materials	Discussion (VI)
12	11/14	Spatial modeling GIS implementation	Lab 10: Spatial modeling	Chapters 16, 17, 18, 19 and 20	
13	11/21	<b>Exam two</b>	Research project work		
14	11/28	Reserved For Independent Research Projects			
15	12/05	<b>Research Project Presentation (I): GEO4930/GEO5158</b>			
16	12/12	<b>Research Project Presentation (II): GEO5158 Project report due by December 12, 2005 (midnight)</b>			