

CGN 4321
GIS Applications in Civil & Environmental Engineering
Course Syllabus

Spring 2009

General Information

Instructor Prof. Fang Zhao
Office EC 3677
Classes Mondays 6:25 - 9:05 p.m.
Classroom EC 3239
Office Hours Tuesdays and Thursdays 3:00 – 5:00 p.m.
Other hours by appointment.
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Teach Assistant Ms. Shanshan Yang
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Office Hours Mondays 1 – 4 pm, and Wednesdays 2 – 5 pm

Require Course Text *Introduction to Geographic Information Systems* with Data Files CD-ROM, 4th Edition, Kang-tsung (Karl) Chang, McGraw Hill, Boston, 2008. ISBN-13 9780073312798

Software Reference *Getting to Know ArcGIS Desktop: Basics of ArcView, ArcEditor, and ArcInfo* with CD, Author: Ormsby, Tim (Ed.), Napoleon, Eileen / Burke, Rob / Groessl, Carolyn, 2nd Edition, Environmental Systems Research, Redland CA, 2004. (Available on WebCT/Resources/ArcGIS Reference Books/, without the accompanying CD).

Course Objectives

This course provides an introduction to the basic concepts, features, and capabilities of GIS. The focus of this course is to learn the usefulness of GIS in solving problems in various civil and environmental engineering disciplines and to develop basic skills of using GIS software for problem solving. The course will require the completion of a series of homework assignments, one of which will be a mini-team project that solves a selected civil engineering or environmental engineering problem, or a problem from your area of study if you are not from civil or environmental engineering. Specific objectives to be achieved include:

- Apply knowledge of mathematics, science, and engineering to solve civil engineering problems;
- Analyze and interpret data related to various technical areas of civil engineering;
- Identify, formulate, and solve civil engineering problems;
- Utilize the techniques, skills, and modern scientific and engineering tools necessary for civil engineering practices;
- Work with others as a team;
- Improve written, oral, and graphical communication skills;
- Learn the impact of engineering solutions in a global and societal context;
- Learn contemporary issues facing society as a whole;
- Recognize graduation is a first step in development of professional engineering competency;
- Recognize the need for lifelong learning; and
- Have an understanding of professional and ethical responsibility.

Class Policies

Class Participation

You are expected to participate in the lectures and are responsible for submitting assignments on time. If for a legitimate reason, you cannot attend a class or submit an assignment on time, I must be consulted **in advance or as soon as possible** (by either a phone call or email message). You will be excused from attending the class due to sickness and emergencies, but not vacations, attending a wedding, or preparing for an exam. It will be your responsibility to catch up with the missed lectures, labs, and assignments. An attendance sheet will be signed at the beginning of each class, and class attendance will be considered when determining the final grades.

This course is a *Web-Assisted* course, meaning that supplemental materials will be provided through the Blackboard. You are required to use Blackboard for information on the course, including syllabus, handouts, assignments, discussions of questions related to assignments, assignment updates, quizzes, blackout dates for office hours, etc. You are expected to frequently check for web site updates so that you do not miss important deadlines. Your visits to the web site will be monitored and considered as part of class participation. The URL of Blackboard is <http://online.fiu.edu>. You may find information regarding the use of Blackboard at <http://ce6migration.fiu.edu>.

Homework

While collaboration is encouraged, it is limited to sharing ideas and information, helping each other with concepts, and solving problems related to the use of software when completing homework assignments. All homework is **individual work. No Team Work Is Allowed except for the mini-term project.** Cheating (intentionally or unintentionally) is prohibited and will be punished severely. Please see FIU *Policies and Procedures* regarding *Academic Misconduct* (<http://www.fiu.edu/provost/polman/sec2/sec2web2-44.htm>).

When ArcGIS is used in the completion of an assignment, the assignment should always be submitted with a map print or prints unless specified otherwise. An assignment turned in without required map print(s) will not be graded. You are advised to take extra time to complete homework and to account for possible delays due to equipment problems.

You are responsible for keeping multiple copies of assignments on different media and backing up files as necessary. No extension of an assignment submission deadline will be given on the basis of failure to take precautions thus losing a completed assignment. Please be advised that when completing an assignment using ArcGIS, frequent savings of the files (e.g., every five minutes or so) should take place as the program or network may crash unexpectedly.

Homework assignments shall be submitted at the beginning of each class on the day when they are due. Any homework turned in after the class begins is considered late and is subject to the late penalty. The late penalty schedule is as follows:

Late for one day	10%
Late for two days	30%
Late for three days	50%
Late for four days	70%
Late for five days	100%

Computer Account and Network Access

Electronic mail and Blackboard will be used as the principal means for communication. You should use your FIU account or other Internet service for email, some of the homework assignments, and additional information related to homework assignments, quizzes, and projects. An EIC network account will also be assigned to each registered student for completing homework assignments and projects. This account will give you the access to a class folder on the EIC network, which will be used for dissemination of information and data related to labs and assignments. These accounts will expire after the semester ends.

Grading

Homework assignments are graded based on correctness, clarity, on-time submission, and meeting requirements specified in the assignment. Simply double check all the assignment requirements posted on the Blackboard will help you earn the easy points that only require attentions.

Final grades cannot be changed once assigned. Any discussion about a grade for a quiz, an assignment, or the final grade must take place within five working days immediately after the grade is assigned. To be fair to all students who may or may not have time to invest additional effort in the class, no additional work will be given to an individual student for the purpose of improving his/her grades. If your scholarship or continued enrollment in your program depends on the grade of this class, work on the class now instead of expecting for a break at the end. No incomplete grades are given in this course.

Homework Assignments	50%
Quizzes	20%
Presentation	5%
Project	20%
Participation/Attendance	5%
Total	100%
Each unexcused absence	-5%

Grading Scale

A	A-	B+	B	B-	C+	C	C-	D+	D	F
≥ 95	≥ 90	≥ 85	≥ 80	≥ 75	≥ 70	≥ 65	≥ 60	≥ 55	≥ 50	≥ 0
	< 95	< 90	< 85	< 80	< 75	< 70	< 65	< 55	< 55	< 50

Course Outline

Topics

1. Introduction to GIS
2. Coordinate Systems
3. Georelational Vector Data Models
4. Object-Based Vector Data Models
5. Data Acquisition and Processing
6. Data Manipulation and Spatial Analysis
7. Raster Models
8. Raster Data Analysis
9. Terrain Mapping and Analysis
10. Viewsheds and Watersheds
11. Spatial Interpolation
12. Geocoding and Dynamic Segmentation
13. Path Analysis and Network Applications
14. GIS Models and Modeling

Readings

- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 6, 7, 8, 9
- Chapter 11, 12
- Chapter 5
- Chapter 13
- Chapter 14
- Chapter 15
- Chapter 16
- Chapter 17
- Chapter 18
- Chapter 19

Additional References

Selected Journals

- Journal of Computing in Civil Engineering*, ASCE.
- Journal of Computer-Aided Engineering*
- Journal of Water Resources*, ASCE
- Journal of Water Resources planning and Management*
- Urban Water*
- Journal of Environmental Engineering*, ASCE
- Journal of Environmental Management*

Journal of Environmental Quality
Environmental Modeling and Software
Environmental Pollution
Science of the Total Environment
Environment and Planning
Journal of Urban Planning and Development
Computers, Environment and Urban Systems
Environmental and Resource Economics
Urban Ecosystems
Ecological Modeling
Coastal Management
Environmental Health Perspectives
Journal of Exposure Analysis and Environmental Epidemiology
Journal of Transportation Engineering, ASCE
Transport Geograpy
URISA Journal (<http://www.urisa.org/Journal>)
Transportation Research Record, Transportation Research Board
Transportation Research Part A, B, C, D
Transportation Planning and Technology
European Journal of Operational Research
Transactions in GIS
Geographic Information Systems, an International Journal

Selected Magazines and Newspapers

ArcUser GIS (<http://www.esri.com/news/arcuser/index.html>)
GIS World
Geolnfo Systems
Geospatial Solutions
GEOEurope, Europe's Geographic Information Systems Magazine Since 1992, 10 issues per year, Adams Business Media Company (<http://www.geoplace.com/ge/>).
ArcNews, Since 1987, quarterly, ESRI (<http://www.esri.com/news/arcnews/arcnews.html>).
Geospatial Solutions, since 1991, 11 issues per year, Adams Business Media Company (<http://www.geoinfosystems.com/index.html>).
GEOWorld, since 1988, 12 issues per year, Adams Business Media Company (<http://www.geoinfosystems.com/index.html>).

Selected Online Conference Proceedings and Resources

ESRI User Conference Proceedings (<http://www.esri.com/library/userconf/archive.html>)
Geo-spatial Information Systems for Transportation (GIS-T) Symposium series proceedings (<http://www.gis-t.org/>)
National Transportation Library (<http://ntl.bts.gov/>)

Full papers online

You may find full text journal papers at <http://www.sciencedirect.com/> if you use an FIU computer since FIU subscribes to the service.

Internet Resources

There is a rich source of GIS literature and data on the Internet. The web site <http://gislab.fiu.edu/portal/> provides many links to GIS resources. The ESRI (the vendor of Arc/Info and ArcBiew products) also offers good information on GIS technology, applications, and products at their web site www.esri.com. Some of these web sites are listed below:

Links to GIS data providers (http://gislab.fiu.edu/dynamic/view.cfm?article_id=70&tid=7)
GIS Dictionary (<http://www.geo.ed.ac.uk/agidict/welcome.html>)

Class Mini-Project

The project will require the utilization of GIS concepts and techniques to solve a problem in your interested area using real world data. While GIS is a powerful tool with even only its visualization and mapping capabilities, this course goes beyond mapping and visualization by requiring spatial analyses – utilizing mathematical (specially statistics) and science knowledge and modeling techniques to quantitatively study relationships between two or more spatial phenomena. Simple spatial and statistical analyses are required as part of the project.

You can choose your own project topic. I will also suggest a topic related to the evaluation of pedestrian/bicycle environment. A team of two to three students who share similar interests will work on each topic. The project will require GIS data processing and analysis at a more comprehensive level than the individual homework assignments. A report that describes the project and a presentation is required. More information will be provided later regarding the project and report requirements.

A presentation of the mini-project is required. The presentation must be made in PowerPoint. The instructor's computer will be used for the presentations. Presentations will be limited to **8 minutes for one person, with two minutes for each additional team member**, subject to changes with approval from the instructor. Additional time may be granted based on the size of the projects. Time limit will be enforced.

Presentation will be graded based on the following criteria:

- Slides – good organization of materials, clear slides, good graphics
- Contents – good substance, depth, demonstration of clear understanding of the topic
- Presentation – ability to present ideas in a logical and concise manner, good presentation style (e.g., looking at audience, clear and loud voice, no fidgeting)
- Timing – adherence to time limit
- Question and answer – ability to understand and answer questions from audience concisely and clearly

Important Dates in Academic Calendar

January 5 Monday	Classes begin.
January 9 Friday	International Student Immigration Orientation (University Park and Biscayne Bay Campus).
January 12 Monday	Last day to complete late registration. Drop/Add Period ends; last day to drop courses or withdraw from the University without incurring a financial liability. Last day to change grading option.
January 14 Wednesday	International Student Immigration Orientation (University Park and Biscayne Bay Campus).
January 19 Monday	Martin Luther King Holiday (University Closed).
January 20 Tuesday	Undergraduate Studies Advising for Summer and Fall 2009 terms begins.
January 30 Friday	Last day to withdraw from the University with a 25% refund of tuition.
February 9 Monday	Last day to apply for graduation at the end of Fall 2007 term.
February 27 Friday	Deadline to drop a course with a DR grade. Deadline to withdraw from the University with a WI grade.
March 16-21 Monday –Saturday	Spring Break.
April 20-25	Final week of the semester - modified class schedule: Final exams and other course assessment activities are scheduled during this week.
April 25 Saturday	On-campus exams for on-line courses.
April 27&28 Monday & Tuesday	Commencement Exercises.
April 30 Thursday	Complete grade report available to students by web and at kiosks.