

# Geographic Information Systems in Natural Resources

Department of Forestry  
University of Kentucky  
FOR 599-003 (3 credits)

**Instructor:** Songlin Fei  
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**Class Schedule:** T 3:10 – 5:00, W F 11:00 – 12:50

**Class Location:** 121 T.P. Cooper Bldg. (Computer Lab)

**Office Hours:** Monday 11:00- 12:00 or by appointment

**Course Description:** This course will introduce you to the fundamental principles, methodology and analysis of geographic information systems (GISs) in natural resources. No prior knowledge of any GIS is required. The course will cover the following topics: data models, spatial coordinate systems, data entry (digitizing, the global positioning system, remotely sensed imagery, and digital data sources), tables, basic spatial analysis, raster analysis, spatial models and modeling, spatial interpolation, and 3D analysis. Most of the materials used in the course will be natural resource related. The course has a laboratory component, which introduces students to the ArcGIS 9.1 software package. Laboratory exercises provide practical experiences that complement the theory covered in lecture.

**Course Objectives:** Students completing this course should be able to

- Understand the principles of GIS (e.g. data layers, data models, map projections);
- Create digital spatial datasets;
- Locate and retrieve spatial datasets from public domain sources;
- Perform basic spatial analysis;
- Develop the ability to organize and solve spatially related natural resource problems.

**Optional Texts:** (Purchasing of text books are recommended but not required)

- *GIS Fundamentals: A First Textbook on Geographic Information Systems*, 2<sup>nd</sup> edition. Bolstad, Paul V., Eider Press, 2005.
- *Getting to Know ArcGIS Desktop*. 2<sup>nd</sup> edition. Ormsby, Tim, Eileen Napoleon, Robert Burke, Carolyn Groessl, and Laura Feaster. ESRI Press, 2004.

**Software:** ArcGIS 9.1 will be utilized for the course. ArcGIS is a product of a private company called Environmental Systems Research Institute (ESRI) in Redlands, CA. The software is available in the classroom and a number of student computing laboratories across campus. Registered students will also receive a free copy of a one-year fully-functional student version of the basic ArcView, Spatial Analyst, Geostatistical Analyst, and 3D Analyst from the instructor, which can be installed on a home computer.

**Course Web Site:** A course web site will be maintained. This web site URL is [Http://www.uky.edu/ag/forestry/GIS](http://www.uky.edu/ag/forestry/GIS) This site contains the course syllabus, outline, PowerPoint presentations (posted after each class), class exercises for the course, and links to a series of tutorials on ArcGIS software.

**Student Grading:**

Course grades will be based on a weighted average of results as follows:

**Undergraduate Students**

Homework/Lab – 50%  
 Weekly Quizzes – 10%  
 Midterm Exam – 20%  
 Term Project – 20%

**Graduate Students**

Homework/Lab 50%  
 Weekly Quizzes – 5%  
 Midterm Exam – 15%  
 Term Project – 30%

Homework assignments are due at the beginning of the class one week after they are assigned, unless otherwise noted. Late homework will not be accepted for a grade. If your homework is late (without excused absence), I will be happy to review the homework but you will not receive credit for the assignment. Makeup labs are possible if the instructor has advance notice. Labs are generally turned in as printed maps and/or tables. If you are working at home it is possible to submit the printed lab assignments via email as a PDF. Please do not send .mdx or shapefiles. Your grade is for individual effort; copied files/maps from other students will be construed as cheating.

Weekly quizzes are to test your knowledge about the broad topics we are covering in class. Typically, I draw from what has been covered during previous classes or readings. I will give the quiz during the first few minutes of class. The quizzes are usually made up of a few multiple choice, short answer, true/false questions. Weekly quizzes are also designed to check your attendance. Your attendance in class is expected. Attendance will start counting on the first day of class following the end of the Drop/Add period. Three or more unexcused absences can result in your being removed from the class role. University closures will prevail.

The midterm exam will be a *Keyboard Exam*. This will be an open notes/book/help file exam. You will NOT be able to utilize any help from other people. You will be given a problem or a series of problems, data, and time to produce a product or a series of products based on concepts we have covered in the course.

Late homework, make-up quizzes and exams will only be given with an excused absence (S.R. 5.2.4.2). It is the student's responsibility to inform the instructor of the absence, preferably in advance, but no later than one week after the absence.

The purposes of the term project are 1) to enable you to explore in-depth an analysis performed with GIS and 2) to make an oral presentation that will be informative to you and to your classmates. Undergraduate student and graduate student will receive different assignments on term projects. Detailed instruction of the term project will be handed out in the fifth week of the semester.

I will try to grade all lab exercises and exams in a one-week period, for quick turn around. However, this won't happen in all cases. **Grading will be on a straight scale, not on a curve.** If you all do well, you will all get an A. The scale is:

A 90 – 100    B 80 - 89    C 70 – 79    D 60 - 69

**Academic Integrity:** Cheating or plagiarism in any form is strictly prohibited. We will all follow the rules governing us set forth by the University of Kentucky. For more information, see Part II of "The Code of Student Conduct" which can be viewed online at <http://www.uky.edu/StudentAffairs/Code/part2.html> or can be obtained in the Dean of Students Office. The minimum penalty for either of these academic offenses is an "E" in the course, with suspension and dismissal also possibilities.

**Disability Resource Center:** If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours or another time. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, [jkarnes@uky.edu](mailto:jkarnes@uky.edu)).

**Note:** The instructor reserves the right to modify the syllabus at any time during this semester in order to achieve the learning objectives of the class. This includes steps to correct errors and omissions that may have occurred. If I do modify the syllabus, the new version will be provided to each student. There will also be a reasonable amount of time for the correction to be implemented.

**FOR 599 Schedule (Subject to change by instructor)**

Week	Lab Topic – Tue.	Lecture Topic – Wed.	Lecture Topic – Fri.	Readings
1 (8/20/06)				GTK <sup>*</sup> Ch 1-4
2 (8/27/06)	Introduction to ArcGIS	Introduction to GIS & ArcGIS,	Introduction to raster, vector data structure	GF <sup>**</sup> Ch 1; handouts; GTK Ch 5-7
3 (9/03/06)	Displaying Data	Data models, map basics, vector data – point, line and area	Data models, raster data, tin, quadtree	GF Ch 2, Ch3 pp. 67-87 GTK Ch 8-9
4 (9/18/06)	Getting Information about features	Data format, coverage, shapefile	Data format, Geodatabase	GTK Ch 10-11
5 (9/17/06)	Analyzing feature relationships	Relations databases, table manipulation	Data sources, entry and editing, metadata	GF Ch 8; GTK Ch 12-13
6 (9/24/06)	Analyzing feature relationships	Data sources, entry and editing	Basic geodesy, datum, coordinate systems, map projections	GF Ch 4; handouts; GTK Ch 14-16
7 (10/01/06)	Creating and editing data	Map transformation	Presenting data	GF Ch 6; GTK Ch 18-19
8 (10/8/06)	Study for Exam	<b>Exam</b>	GPS	GF Ch 5
9 (10/15/06)	GPS	Photos and satellite images digital data	Photos and satellite images digital data	GF Ch 6
10 (10/22/06)	Creating Models	Basic spatial analysis	Raster analysis and modeling	GF Ch 9-10
11 (10/29/06)	Vector analysis	Terrain analysis	Interpolation geostats	GF Ch 11
12 (11/05/06)	Spatial analysis	Interpolation geostats	Habitat modeling	GF Ch 12
13 (11/12/06)	Spatial analysis	Habitat modeling	Cartographic modeling	GF Ch 12-13
14 (11/19/06)	Raster Analysis	<b>Fall Break</b>	<b>Thanksgiving</b>	GF Ch 12-13
15 (11/26/06)	Cartographic modeling	Data quality and future trends	Presentation preparation	GF Ch 14
16 (12/03/06)	Oral Presentation	Oral Presentation	Oral Presentation	

\* Getting to know ArcGIS desktop; \*\*GIS Fundamentals