# GEOG 508
## GEOGRAPHIC INFORMATION SYSTEMS I
### KANSAS STATE UNIVERSITY
#### DEPARTMENT OF GEOGRAPHY
##### FALL SEMESTER, 2002

| Course Reference #: 13210 | Instructor: Dr. Max Lu |
| Meeting Time: TU 2:05 pm - 3:20 pm | Office: Seaton Hall 117 |
| Meeting Place: Ackert 221 | Phone: 532-3413 |
| Remote Sensing Lab: Seaton 164L | E-mail: maxlu@ksu.edu |

### Course Description
GIS (Geographic Information System) is an exciting and rapidly developing technology that has been used extensively throughout all levels of government, private sector, and academia to provide support for spatial decision making and problem solving. The objective of this course is to introduce you to the fundamentals of this technology. You will learn GIS theory and concepts, issues related to spatial data acquisition, input, manipulation and analysis, as well as the kinds of operations available in GIS for spatial analysis, such as proximity, buffer, overlay and site selection. A number of examples will be discussed to illustrate the wide range of areas to which GIS has been applied. You will also acquire very useful technical skills by carrying out a series of computer-based lab exercises using ArcView 3.2, a desktop, user-friendly GIS software package developed by the Environmental Systems Research Institute (ESRI).

### Course Format
To achieve the above objective, this course combines lectures, in-class demos and lab exercises. The lectures will focus on conceptual issues in GIS while in-class demos and lab exercises provide you with practical experience using GIS techniques. These components complement each other, yet they have different focuses and require different study habits to be effective. The lecture component requires you to read the assigned chapters in the text books and be prepared to discuss issues in class. The demo and lab components, on the other hand, require you to fully understand the significance of the concepts presented in each lab and the procedures that are followed in solving a GIS problem. The importance of class participation and instructor/student interaction cannot be stressed enough. At the same time, it is essential for you to complete the lab assignments independently in order to make the most of this opportunity for hands-on experience with a professional GIS system.

Every student in this class must also enrol in a lab session.
Prerequisites

Students taking this course are required to have at least junior standing. While no previous knowledge of GIS, cartography or geography is assumed, students are expected to be familiar with the Windows environment and the basics of the Internet and the World Wide Web.

Lab Exercises

There will be 10 lab exercises throughout the semester. The instructions for the lab exercises will be posted on the web site:

http://www.ksu.edu/geography/people/MaxLu

You may do your lab exercises in the Geography Department’s Remote Sensing Lab (Seaton 164L). You are strongly encouraged to complete your labs during the lab session you have chosen or a few other designated sections of time since only in those times will my TA be available to help you with problems you encounter. However the lab will be open during normal business hours and sometimes even in evenings. Students who have signed up for a particular lab session have the priority of using computers during that period of time.

The lab exercises require access to an ink-jet or color laser printer for printing maps. The line printers available in the public labs will not generate acceptable maps even though ArcView is available in those labs.

Class Project

In addition to the labs, you are required to develop and complete a modest GIS project using the digital data for Manhattan, KS (or data you have collected for your own work). The purpose of the project is to give you a chance to apply the GIS knowledge and skills you learn in the course to tackle a real world issue, however small that issue may be.

I generally do not limit what you may do in your project (when it comes to GIS applications, the sky is the limit. Or is it? From Venus and Mars to the stars themselves, GIS is actually helping us form a better understanding of what lies beyond our planet!). But you need to have a clear goal, make reasonable assumptions, document every step of your project, and present your results in a carefully prepared report.

Fourteen themes (layers) of digital data for Manhattan, including airport, boundaries, historical sites, parcels, parks & trails, schools, soils, streets, subdivisions, traffic accidents, utilities, zoning, and floodplain, are available for you to use and will be put on the computers in the labs. Additional information may be obtained from other sources. The project is to be carried out in two steps. By the mid-semester, you need to submit an initial idea for your project and explore the data sets. And the complete project is due by 5 pm, Friday, December 6 (notice: this is the Friday before the last day of classes!). You are encouraged to discuss with me your ideas about the project.
Textbooks

Two books are required for this course:


   **Every book comes with a free demo version of ArcView 3.2a, which will be functional for 4 months!**


Both are available at the Student Union Bookstore and Varney’s Bookstore.

Grades

Your grade in the course will depend on two non-cumulative examinations (one midterm and one final), 10 lab exercises, 1 class project, and attendance. The distribution of credit is as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Midterm Exam</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Lab Assignments</td>
<td>40%</td>
</tr>
<tr>
<td>Class Project</td>
<td>12%</td>
</tr>
<tr>
<td>Attendance</td>
<td>8%</td>
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Final grades will be determined based on the standard scale, that is, 90-100=A, 80-89=B, and so on.

Course Policy

1. Regular attendance is **required** and participation in class discussion strongly encouraged. Students should show common courtesy and observe basic rules of behavior in class.

2. Students are expected to take exams at the scheduled time. As a general rule, no make-up exams will be given. In those cases where extenuating circumstances (e.g., illness or personal catastrophe) exist, make-up exams may be permitted if the instructor is informed before the exam, and satisfactory documentation is provided.

3. Lab assignments should be turned in on the due date (to be announced in class). You are normally given one week to complete a lab exercise. Late assignments will incur substantial penalty in the form of reduced scores (usually 10% less for each day late).

4. Cheating and Plagiarism in any form will not be tolerated.
# Tentative Course Outline

<table>
<thead>
<tr>
<th>Week of</th>
<th>Major Topics</th>
<th>Readings</th>
<th>Lab</th>
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<tbody>
<tr>
<td>Aug. 25</td>
<td><strong>Course Introduction</strong></td>
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</table>
| | **Overview of GIS**  
- what is GIS?  
- components of a GIS  
- history and current trends  
- major GIS software programs and companies  
- examples of GIS applications  
- Internet GIS resources | KC Chap. 1 | |
| Sept. 1 | **Getting Started with ArcView**  
- graphic user interface (GUI)  
- document types  
- data visualization  
- querying data | HD 1, 2, 3 | Lab 1 |
| Sept. 8 | **Cartographic Essentials**  
- type of maps  
- map projections  
- scale and level of resolution  
- map analysis | KC 2  
HD 4, 5, 6 | Lab 2 |
| Sept. 15 | **Making Maps With GIS**  
- map components  
- choropleth mapping  
- ArcView layouts | KC 8  
HD 7,8 | Lab 3 |
| Sept. 22 | **Data Structure and Data Acquisition**  
- spatial vs attribute data  
- characteristics of geographic data  
- vector  
- raster  
- ways of structuring data  
- data sources and data quality | KC 3,4,7 | Lab 4 |
| Sept. 29 | **Data Manipulation and Data Management**  
- data reduction and generalization  
- rectification and registration  
- merging, edge matching and interpolation  
- spatial database management systems  
- relational database | KC 5,6  
HD 10 | Lab 5 |
| Oct. 6 & 13 | **Advanced ArcView I**  
- creating & editing themes  
- geocoding  
- spatial queries  
- ArcView extensions | KC 9  
HD 9,11 | Lab 6 |
| Oct. 20 & 27 | **GIS Operations**  
- error detection and editing  
- measurement  
- buffer  
- proximity  
- overlay  
- spatial modeling | KC 10, 11  
HD 12, 13 | Lab 7 |
|---|---|---|---|
| Nov. 3, 10 | **Terrain Mapping and Analysis**  
- DEM and TIN  
- Terrain Mapping  
- Terrain Analysis  
**Site Suitability Analysis**  
**Advanced ArcView II**  
- spatial analyst extension  
- network analyst extension | KC 12, 16 | Labs 8, 9 |
| Nov. 17 & 24 | **Spatial Interpolation**  
- control points  
- global and local methods | KC 13, 14, 15 | --- |
| Dec. 1 | **Spatial Analysis in a GIS Environment**  
Class project due on Friday, Dec. 6 | | Lab 10 |
| Dec. 8 | **GIS Applications**  
- resource management  
- urban planning and management  
- Facilities Management (FM)  
- social/demographic applications  
**GIS Design Issues**  
**Customizing GIS**  
- why and how  
- object-oriented languages  
- AVENUE | HD 14, 15 | --- |
| | **Final Exam (9:40am - 11:30am, Wednesday, December 18, Ackert 221)** | | |