

Geography 225 - Introduction to Geographic Information Systems (Fall 2009)

Faculty: Holly Barcus

Lab Instructor: Birgit Mühlenhaus

Lecture: MWF 8:30-9:30am – Car 107

Lab: M 10:50-12:20 pm; T 1:20-2:50 pm – Car 108

Office: Carnegie 104c

Office: Carnegie 103

Office Phone: 651.696.6139

Office Phone: 651.696.6906

Email: barcus@macalester.edu

Email: muehlenhaus@macalester.edu

Office Hours: M/W 9:30-10:30am; Wed 1-2
or by appointment

Office Hours: M 2-3 pm; T 10-11 am
or by appointment

COURSE DESCRIPTION AND OBJECTIVES

The ability to create, visualize, and analyze spatial data is an increasingly important skill for assessing and understanding our rapidly changing global, regional, and local communities. Maps are the primary medium through which we communicate our knowledge of the spatial world, but are, by design, generalizations of more complex spatial data. In the first part of this course we will explore the principles of map production and geographic concepts that provide a foundation for spatial data analysis. During the second half of the course we will shift our focus to Geographic Information Systems and the development, display, and analysis of spatial data in a digital environment. We will approach each topic conceptually through our lecture sessions and then apply these principles during lab sessions. By the end of this course you should:

- Understand maps and their projections, scale, resolution and accuracy
 - Be a more critical map user
 - Acquire a basic GIS vocabulary
 - Become familiar with the most used features of ArcGIS software
 - Learn to solve common geographic problems using a GIS
 - Be able to carry-out a GIS project from problem conceptualization to final analyses and interpretation
-

COURSE READINGS

Required Texts

- Monmonier, Mark. 1991. *How to Lie with Maps*. Chicago: University of Chicago Press

Additional Reading

- See attached reading list

COURSE RESOURCES, REQUIREMENTS & GRADING

Resources: For each class meeting, the lecture slides and assignments will be made available on Moodle immediately following our lecture time. Other resources such as additional readings, web and news links can be found here as well. Please use this site as a resource for studying and exploring varied and interesting dimensions of GIS.

Attendance – Attendance is expected for each lecture and lab period. Please attend regularly and keep up with all assignments and exams – your input and participation are key to making it interesting and relevant to you own experiences. Please BE ON TIME and TURN OFF YOUR CELL PHONE to avoid disrupting the class.

I frequently take attendance simply to keep track of who is regularly attending. My experience is that students who attend regularly are better equipped to successfully wed the conceptual and theoretical components of GIS with the applied technical requirements.

The lab section of this course also meets regularly. Most of the material covered in lab is not easily made up if you are absent. If you are absent from lecture or lab for any reason, please realize that it is your responsibility to obtain the information you missed.

Lecture Exercises and Final Project – Over the course of the semester we will venture into the lab during lecture periods for more applied exercises in which you will utilize the concepts that we are discussing in lecture. Lecture exercises are designed to allow you to experiment with different techniques that we have discussed in lecture. We will discuss each exercise during the class period in which it is due.

Towards the end of the semester, you will complete a final project (150 pts). In brief, the project consists of four major components: a project proposal, a final paper, an oral presentation, and a digital poster. Details will be forthcoming.

Exams will consist of short answer, essay, and applied problem-solving questions. There are three exams; each exam is 100 points and will cover lecture and lab material. The final exam is comprehensive.

Incompletes – Incompletes will be given according to Macalester policy. That means it will be given only to students “who have encountered difficulties beyond their control that have hindered their academic progress.”

Make-up and Late Assignments

- **Exams** – Students are expected to take exams at the scheduled time. If extreme circumstances make it impossible to take an exam at the scheduled time, please notify me as far in advance as possible or as soon as possible after an unanticipated emergency.
- **Lecture assignments** – Late assignments will be accepted for partial credit only.
- **Lab assignments** – Late assignments are only accepted in exceptional cases, such as illness or family emergency. In such cases, please contact Birgit *prior* to the due date. For unexcused absences, late assignments will be deducted one letter grade from your earned score for each day it is late.

CLASSROOM POLICIES

Courtesy – The first and most important classroom policy is to BE COURTEOUS! This includes:

- If you arrive late or need to leave early, do so with a minimum of disruption.
- Please turn-off all cell phones, I-pods, etc. during class.
- Be polite when others are speaking, there is enough time to discuss all perspectives.

Computers – Everyone will be assigned a particular computer in the lab where you will save all your projects. You will also be expected to make use of the lab outside of regular class time to work on your assignments and projects. It is your responsibility to coordinate your schedules.

Course Information – A fair amount of course information will be disseminated via Moodle and email. Please be sure to check your Macalester email account and the course Moodle page regularly.

Lab Hours – Lab time will be used to demonstrate cartographic and GIS applications using ESRI's ArcView 9.3.1 software as well as allow you time to begin your weekly assignment. Should you need to work outside of class time, TAs will be in the lab during certain hours to help you. The lab schedule will be posted on the GIS webpage <http://www.macalester.edu/geography/gis/> and on the door of the lab. Please do not leave your lab work until the last minute – the lab may not be available and systems do crash from time to time. Also, please note that the lab is a “teaching lab” and not a general computer lab – i.e. it is not the place to check email, write papers, etc. GIS assignments take priority during open lab times.

Lab Rules – While working in the computer lab, please

1. do not to bring FOOD or BEVERAGES into the lab; beverages in containers must be kept closed while in the lab
2. work on your designated computer and save all files to your personal workspace

3. preserve original data files (i.e. you will copy any GIS data into your personal workspace)
4. print only maps on the color printer (no written assignments – these can be printed in the library)
5. obtain permission from Birgit before downloading files and/or programs to the computer and before using any special contract data
6. turn off your cell phone *at all times* while working in the lab

Office Hours – Office hours provide a great opportunity to discuss questions, issues, or concerns about the class or to just talk about GIS. Feel free to stop by during office hours or schedule a different time to meet, if your schedule conflicts with the posted office hours.

Participation - This is an interactive class. Some days will be mostly lecture while others will be in-class exercises and discussions. Be prepared to participate.

Academic Integrity – Cheating and plagiarism are unacceptable and dishonest. In this class you are expected to complete and turn in your own work and to follow established academic practices regarding proper use and citation of materials and ideas that are not your own. Engaging in cheating or plagiarism will result in a failing grade in this class. More information is available about Macalester's academic integrity policy in the Student Handbook (www.macalester.edu/deanofstudents/handbook/acad_pol.htm#003).

810 point grading scale

300 = Exams (3; 100 pts each)
 150 = Final project
 250 = Lab Assignments (10; 25 pts each)
 80 = Lecture exercises (8; 10 pts each)
 30 = Participation

A = 93+ A- = 90.0 – 92.9%
 B+ = 87.0% - 89.9%; B = 83.0 – 86.9%; B- = 80.0 - 82.9%
 C+ = 77.0% - 79.9%; C = 73.0 – 76.9%; C- = 70.0 – 72.9%
 D+ = 67.0% - 69.9%; D = 63.0 – 66.9%; D- = 60.0 – 62.9%

General Schedule: Dates are approximate – we will adjust as needed.

WEEK	DATE	LECTURE TOPIC	READINGS	LAB ASSIGNMENT	LAB DUE
1	Sep 7	Labor Day - No Class		No Lab	No Lab
	Sep 9	Course Overview and Lab Intro			
	Sep 11	No Class			
2	Sep 14	What is GIS? Types of GIS Problems	Monmonier Ch 1 Delaney & Van Niel Ch 1	LAB 1: ArcGIS: An Introduction	M: 21.Sep T: 22.Sep
	Sep 16	What is Cartography? Map Types I	Monmonier Ch 5-6		
	Sep 18	Map Types II	Monmonier Ch 7-8		
3	Sep 21	Map Elements, Scale and Projection <i>Lecture exercise 1: Exploring scale and projections</i>	Monmonier, Ch 2; Monmonier p187-189; Delaney & Van Niel 2008, Ch 5	LAB 2: Map Types	M: 28.Sep T: 29.Sep
	Sep 23	Map Projections, cont'd Map Design I (Birgit)	Monmonier <i>Mapping it Out</i> , Ch 3 Monmonier Ch 11		
	Sep 25	Map Design, Typography and Color (Birgit)			
4	Sep 28	The Easiest Way to Lie with Maps: Data Classification <i>Lecture exercise 2: Data Classification (homework)</i>	Monmonier Ch10	LAB 3: Scale, Projections & Layout	M: 5.Oct T: 6.Oct
	Sep 30	Discuss data classification exercise Begin Poverty Mapping			
	Oct 2	<i>Lecture exercise 3: Mapping Poverty in the US</i>			

5	Oct 5	Poverty map presentations		LAB 4: Map Design Part 1	M: 12.Oct T: 13.Oct
	Oct 7	EXAM 1			
	Oct 9	GIS: Thinking about Spatial Problem Solving & Location Analysis	Smith 2007; Murphy 2008		
6	Oct 12	Representing Data in GIS: The Vector & Raster Models	Delaney & Van Niel 2008, Ch 2; Baha'Abukhater 2008; Hale 2008	PLEASE READ Monmonier <i>Mapping it Out</i> , Ch4, pp 105-117 and Sellers 2008 before lab!	M: 19.Oct T: 20.Oct
	Oct 14	<i>Lecture exercise 4: Exploring Raster Data (in class)</i> <i>Assign exercise 5: GIS Data Sources</i>			
	Oct 16	Analytical Problem 1: Geocoding & Basic Processes	Delaney & Van Niel 2008,Ch 8; Ledford 2008		
7	Oct 19	Analytical Problem 2: Buffers & Overlay <i>Lecture exercise 6: Using Overlay Analysis (homework)</i>	Layton et al. 2008; Delaney & Van Niel 2008, Ch 9	LAB 6: Geocoding	M: 26.Oct T: 27.Oct
	Oct 21	Discuss exercise 6 *Data presentations (4@5min ea)			
	Oct 23	TBA			
8	Oct 26	GPS 1 – Lecture	Harringa 2007; Hill 2008	LAB 7: Overlay & Geoprocessing	M: 2.Nov T: 3.Nov
	Oct 28	GPS 2 – Data Collection			
	Oct 30	Fall Break – No Class			
9	Nov 2	Analytical Problem 3: Demographic data and the US Census *Data presentations (2@5min ea)	Wombold 2008	LAB 8: GPS	M: 9.Nov T: 10.Nov
	Nov 4	<i>Lecture exercise 7: Using census data</i> *Data presentations (2@5min ea)			
	Nov 6	Analytical Problem 4: GeoVis <i>Lecture exercise 8: GeoVis</i>	Pratt 2007		
10	Nov 9	Project Discussion – posters, data organization, presentations Exam 2 Review		LAB 9: Joins and Queries	M: 16.Nov T: 17.Nov
	Nov 11	TBA			
	Nov 13	EXAM 2			
11	Nov 16	Project Work		Lab 10: Digitizing	M: 23.Nov T: 24.Nov
	Nov 18	Project Work			
	Nov 20	Project Work			
12	Nov 23	Project Work		Work Time	
	Nov 25	Project Work			
	Nov 27	Thanksgiving Break			
13	Nov 30	Project Work		Work Time	
	Dec 2	Project Work			
	Dec 4	Final Project Presentations			
14	Dec 7	Final Project Presentations		Optional: Data Backup	
	Dec 9	Final Project Presentations			
	Dec 11	Course Evaluation & Review			
15	Dec 14	FINAL EXAM Part 1			
	Dec 17 THURS	FINAL EXAM Part 2: 8am – 10am			

READING LIST

- Baha'Abukhater, Ahmed. 2008. Effective Growth Management: Demonstrating the MCE capabilities in GIS. *ArcUser* 11(2): 32-34.
- Delaney, Julie and Kimberly Van Niel. 2008. *Geographical Information Systems: An Introduction*. Oxford University Press: Australia.
- Hale, Elizabeth. 2008. Protecting Oregon Caves: GIS plays growing role in monitoring and limiting the impact of visitors. *ArcNews* 30(2): 30.
- Harringa, Emily. 2007. Farming the easy way. *Professional Surveyor Magazine* 27(3): 6-9.
- Hill, Barry. 2008. Water/sewer/storm water layer developed. *ArcNews* 30(1): 22.
- *Kinzel, Michelle. 2008. Impact of climate change on gray whale feeding grounds tracked with GIS. *ArcNews Online* www.esri.com/news/arcnews. Last Accessed 23 December 2008.
- Layton, Rob, Jeff Smith and Teresa Penbrooke. 2008. NFL puts GIS in play to analyze youth football programs. *ArcNews* 30(2): 23.
- Ledford, Jeff. 2008. Intelligence-led policing gives a crime-fighting advantage. *ArcNews* 30(20): 32.
- Monmonier, Mark. 1993. *Mapping It Out: Expository Cartography for the Humanities and Social Sciences*. Chicago: University of Chicago Press.
- Murphy, David. 2008. Planning Education Projects in Rural Ethiopia Using GIS. *ArcNews* 30(10): 33.
- Pratt, Monica. 2007. Déjà vu: Four years later, GIS use in fighting fires greatly expanded. *ArcUser* 10(4): 67-69.
- Sellers, Christopher. 2008. Watch your language while mapping: Writing, grammar, and spelling – the use of text in maps. *ArcNews* 30(1): 26-27.
- Smith, Melanie A., C. Travis Benton. 2007. Getting along on the range: Managing Elk and Cattle Grazing Interactions. *ArcUser*. 10(1): 28-31.
- *Tourre, Yves M., Delphine Fontannaz, Cecil Vignolles, Jacques-Andre Ndione, Jean-Pierre Lacaux, Murielle Lafaye. 2008. Early Warning Planning for Mosquito Borne Epidemics. *ArcNews* 30(1):28.
- Wombold, Lynn. 2008. Sample size matters: Caveats for users of ACS tabulations. *ArcUser* 11(1): 9-11.