

"Knowing where things are, and why, is essential to rational decision making"

Jack Dangermond, President, Environmental Systems Research Institute (ESRI)

"A map is not the territory it represents, but, if correct, it has a similar structure to the territory, which accounts for its usefulness"

Alfred Korzybski, philosopher and scientist

Principles of GIS

NRE 531

Instructors	Daniel Brown Professor	Kendra Walker PhD Student	Hugh Stimson MS Student
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Office Hours:	Wednesday 1-3 pm or by appointment	Friday 10-1 pm	Monday 1-4
Class Meets	Lecture: Tuesdays and Thursdays 1 to 2:30 pm in 1040 Dana Bldg. Lab: Tue. 3-5 pm (002); Tues. 6-8pm (003); Wed. 3 to 5 pm (sec 004); Wed. 6 to 8 pm (sec 005) in 3325 Dana (computer lab)		
Ctools	At http://ctools.umich.edu the homepage will contain pdf copies of lecture graphics as well as lab assignments.		
Objectives	Making the most of geographic information, whether it be for investigating a scientific hypothesis or managing spatially distributed resources, requires the ability to think about spatial relationships, an understanding of the technical capabilities of computer based information systems, and GIS software skills. The goals of this class are, therefore, to provide a firm understanding of the conceptual and technical issues that affect the use of geographic information for research and a variety of planning and management applications. The focus is on how to think about and implement geographic data management and analysis, requiring both a discussion of basic concepts (i.e., lecture) and practice with implementing them with GIS software (i.e., lab). The lab is taught using ArcGIS 9.2 (ESRI, Inc.). Labs and lectures are intimately linked and "live" software demonstrations are included in the lecture.		
Prerequisites	This course is a lot of work; having an intermediate working knowledge of computers and the Windows environment will help. If you have no computer experience, please let me know. The course is designed so that students without GIS background can succeed, but previous experience will no doubt be helpful. Although not required for successful completion of this course, courses in all of the following areas can be helpful background for work in GIS: remote sensing and image interpretation, statistics, cartography, surveying, and computer programming.		
Required Readings	<ol style="list-style-type: none"> Textbook – Bolstad, P. 2005. <i>GIS Fundamentals: A First Text on Geographic Information Systems, Second Edition</i>. White Bear Lake, MN: Eider Press. Available at Ulrich's, Union Bookstore, Michigan Book & Supply, or www.atlasbooks.com Miscellaneous Readings - from various sources will be available on the CTools site. 		

Course Policies

Attendance	Attendance and participation in the lecture sessions is essential to your understanding of and performance in both lecture and lab. From my experience, the single best predictor of performance in the class is consistence of attendance. We will take attendance in the lab. It is important to be prompt in getting to the both lab and lecture, so as not to miss key instructions or disrupt the session for the other students.
Lab	You will probably not be able to complete the assigned tasks during your lab period. The software is available in both the instructional lab (3325) and the 2 nd floor public lab in Dana; both have open hours. You can pick up a student copy of the software (without all functionality needed!) for loading on your own machine. Also, you can access all software loaded onto the computers in the lab anytime from any machines (with a network connection) by logging into http://virtualsites.umich.edu . All labs will be due before the next lab period. We recommend that you keep a lab notebook (digital or hardcopy) into which you can put all lab assignments and your notes. Later labs rely on performing tasks that are described in detail in earlier labs.
Exams and Grading	Your grade will be based on two lecture exams, two lab exams, and 11 lab assignments. The lab exams are take-home, but require lab work and will cover skills learned in the lab section of the course. The lecture exams are non-comprehensive and focus on your understanding of the concepts presented in the course. Your lab instructor will grade your lab write-ups and exams. <i>There will be no extra credit.</i>
Disabilities	We will make every effort to accommodate the needs of students with hearing, visual, or other physical impairments and/or learning disabilities. Be sure to let us know your needs.

Grade Calculation

	<u>Dates</u>	<u>Final Grade %</u>	<u>Overall %</u>	<u>Grade</u>
Lab Write-ups	weekly	40	97 or above	A+
Lab Midterm	Feb 20-21	10	92-96	A
Lec Midterm	Feb 22	20	90-91	A-
Lab Final	Apr 10-11	10	88-89	B+
Lec Final	Apr 26	20	82-87	B
			80-81	B-
			78-79	C+
			72-77	C
			68-71	C-
			62-67	D

NRE 531: Schedule of Events (subject to change)

Date	Topic(s)	Lab	Readings
Jan 3	Course Goals, GIS History & Components		Ch. 1
Jan 8	Maps as Models of the World	Intro to Lab & ArcGIS	Ch. 2, p. 30-33; Ch. 4, 112-120
Jan 10	Geographical and Attribute Measurement		Ch. 2, p. 25-30; p. 55-57
Jan 15	Map Design	Creating Map Displays	Carto.Communication (Geographer's Craft) ; Ch. 9, p. 306-313
Jan 17	Vector Data Structures		Ch. 2, p. 30-40; p. 52-55
Jan 22	Raster and Other Data Structures	Data Structures	Ch. 2, p. 40-52; p. 58-60
Jan 24	Projections and Coordinate Systems		Ch. 3
Jan 29	Data Creation from Secondary Sources	Projections & Coordinate Systems	Ch. 4, p. 121-150
Jan 31	Data Collection: GPS		Ch. 5
Feb 5	<i>Lecture by Sandra Arlinghaus (Brown -> DC)</i>	Data Creation	Look at GoogleEarth
Feb 7	Data Collection: Remote Sensing and Existing Data		Ch 6 and 7
Feb 12	Attribute Data Structures	Data Attributing	Ch. 8 p. 265-280
Feb 14	Metadata and Accuracy		Ch. 4, p. 150-153; Ch. 14
Feb 19	Review	LAB MIDTERM	
Feb 21	LECTURE MIDTERM		
Feb 23 - Mar 2	B R E A K		
Mar 4	Data Query and Description / SQL	Application: Basic Query and Analysis	Ch. 9 p. 295-306; 313-14
Mar 6	Distance and Buffer		Ch. 9, p. 315-323; Ch. 10, p. 371-374
Mar 11	Map Overlay	Application: Land Use Change	Ch. 9, p. 324-335; Chakraborty and Armstrong 2001
Mar 13	Neighborhood Operations		Ch. 10; p. 363-371

Mar 18	Overlay for Decision Support	Application: Raster Suitability Mapping	Ch. 10, p. 358-362; Ch. 13, p. 437-443; Cargin & Dwyer 1995
Mar 20	Network Analysis		Ch. 9, p. 335-342; Wood 2003
Mar 25	Terrain Analysis	Application: Terrain/Viewshed Analysis	Ch. 11; Russell et al. 1997
Mar 27	<i>Guest Lecture – TBA</i>		
Apr 1	Spatial Interpolation	Application: Choice of Labs (1 of 3)	Ch. 12, p. 395-418
Apr 3	Cartographic & Spatio-Temporal Modeling		Ch. 13, p. 433-436, 443-463
Apr 8	<i>No Class (Brown -> WI)</i>	LAB FINAL	
Apr 10	GIS and Society		McCall & Minang 2005
Apr 15	Review		
Apr 17	LECTURE FINAL (4-6 pm)		

Required Readings Available on CTools

Cargin, J and Dwyer, J. (1995). Pennsylvania's Low-Level Radioactive Waste Disposal Facility Siting Project: Process Summary. 1995 ESRI User Conference.

Chakraborty, J. and Armstrong, M.P. (2001). Assessing the impact of airborne toxic release on populations with special needs. *Professional Geographer*, 53(1):119-131.

McCall, M.K., and Minang, P.A. Assessing participatory GIS for community-based natural resource management: Claiming community forests in Cameroon. *The Geographical Journal*; 171(4): 340-356.

Russell, G.D., Hawkins C.P., and O'Neill, M.P. 1997. The role of GIS in selecting sites for riparian restoration based on hydrology and land use. *Restoration Ecology*, 5 (4): 56-68 Suppl. S.

Wood, G. 2003. Modelling the ecological footprint of green travel plans using GIS and network analysis: from metaphor to management tool? *Environment and Planning B*, 30(4): 523 – 540.