

Michigan Technological University
School of Forest Resources and Environmental Science

Fundamentals of Geographic Information Systems and Remote Sensing
Technologies for Natural Resource Management

FW3540
Spring Semester 2009

Instructor: Ann Maclean, 189 Forest Resources (Horner Hall)
amaclean@mtu.edu, 487-2030

Teaching Assistants: Lucas Spaete, 135 Forest Resources, lpspaete@mtu.edu
Sinan Abood, 135 Forest Resources, saabood@mtu.edu

Ann's Office Hours: Tuesday 10-12, Friday 11-12 or by appointment

Texts:

Required: Introduction to Geographic Information Systems, 4th Edition
Kang-tsung Chang, 2007, McGraw-Hill

DO NOT purchase an earlier edition. The chapter content, lab exercises and the included CD are not the same. If you buy a used copy, be sure the CD is included

Reference: Remote Sensing of the Environment: An Earth Resource Perspective
John R. Jensen, 2006, Prentice Hall

Class Website: <http://forest.mtu.edu/classes/fw3540/>

Class Objectives:

This class is designed to provide you with the knowledge and practical skills for working with GIS technology to develop potential solutions and alternatives to natural resource management issues. Hence, you will learn how to find, develop and integrate data into a GIS, including remotely sensed data, perform spatial analysis, and develop coherent output products. You will also acquire expertise in working with ESRI ArcMap. This software package is the most widely used GIS analysis software in the world, holding over 70% of the market share.

Expectations:

It is important that you attend all lectures and labs, be on time for both, and not sleep in either. Each lecture and lab will build on knowledge and skills presented in previous sessions. If you fall behind it is very difficult to catch up due to the extensive technical vocabulary and the software skills needed to perform the analyses in the lab exercises. I am assuming you know how to read and will read the assigned textbook chapters. Not all the material in the chapter will be covered in lectures. However, you are responsible for knowing and understanding the

concepts and terms presented in each of the assigned chapters. Questions on any of the reading assignments are encouraged and should be brought to lecture.

If your algebra, statistical, or basic computer skills are rusty, you should brush up on them. Basic math and statistical skills are a prerequisite for this class. You need to be able to do algebraic calculations as easily as you can add and subtract, as well as calculate a mean, standard deviation, variance and correlation and be able to interpret the output. You also must be able to create file folders, understand file naming conventions, delete files, access the internet, and keep data organized in a coherent manner.

SYLLABUS

Week 1: January 12 - 16

Lectures: Introduction to GIS, maps and spatial information
Ellipsoids, spheroids, and datums
Map projections and coordinate systems- how we get from information from the earth's curved surface to a flat 2D display
Lab: Introduction to ArcMap and ArcCatalog, working with coordinate systems
Readings: Chapters 1 and 2

Week 2: January 19 - 23

No lecture Monday, January 19th, Martin Luther King, Jr. Day
Lectures: Overview of vector data model and topology
Digital line graph (DLG) data
Lab: Downloading and importing DLG SDTS data into ArcMap.
Reading: Chapter 3

Week 3: January 26 - 30

Lectures: Raster data model
Digital elevation models (DEM) and Triangulated Irregular Networks (TIN)
Derived thematic layers (slope, aspect and hillshade,) from DEMs
Lab: Importing DEM data into ArcMap, generation of slope, aspect and hillshade thematic layers.
Readings: Chapters 5 and 14

Week 4: February 2 - 6

Winter Carnival Recess, February 4 - 6th. No Lecture Friday, February 6th. No labs this week
Lectures: Land use and land cover data- what is it, classification schemes
National Land Characterization Data, National Wetlands Inventory
Readings: Handouts and online references

Week 5: February 9 - 13

Lectures: Data display and cartographic output
Types of maps
Attributes and spatial data

Lab: Production of a cartographically correct map in ArcMap
Readings: Chapters 10 and 9

Week 6: February 16 - 20

First Hour Exam, Monday, February 16th

Lectures: Attributes - input and management

Database management, sequential query language (SQL)

Lab: Attribute information management and generation with DLG data

Readings: Chapter 9

Week 7: February 23 - 27

Lectures: Introduction to remote sensing

Types of remotely sensed data

Aerial photography- film types

Lab: Visual interpretation of land use/cover- polygon delineation

Readings: Chapters 5 and 6 (Jensen)

Week 8: March 2 - 6

Lectures: Geometry of vertical aerial photography

Scale calculations, area measurements, and terrain effects

Satellite imagery- what is readily available

Lab: Visual interpretation of land use/cover- polygon labeling, area calculations, refinement of polygons

Readings: Chapters 6 and 7 (Jensen) and online references

Spring Break: March 9 - 13

Week 9: March 16 - 20

Lectures: Deriving thematic information from satellite imagery

Vector based GIS analysis functions

Lab: Vector based GIS analysis functions

Readings: Online references and Chapters 11 and 12

Week 10: March 23 - 27

SECOND HOUR EXAM, Friday, March 27th

Lectures: Additional vector based GIS analysis functions

Raster based GIS analysis

Lab: More vector based GIS analysis functions

Readings: Chapters 11 and 13

Week 11: March 31 - April 4

Lectures: Additional GIS raster analysis functions

Viewsheds

Watershed analysis

Lab: Raster GIS analysis functions

Readings: Chapters 13 and 15

Week 12: April 7 - 11

Lectures: Watershed analysis (continued)
The National Hydrological Data Set
Mapping riparian areas- A GIS application
Lab: Watershed analysis with ArcHydro
Readings: Chapters 15 and handout

Week 13: April 14 -18

Lectures: Mapping soils and input into GIS
Utilizing STATSGO data set
Lab: Dry run lab exam
Readings: Online references

Week 14: April 21 - 24

Third Hour Exam, Monday, April 21st

Lab Practical- scheduled lab time

No lectures on Wednesday, April 23 or Friday April 25- study for your lab practical

The lab final will be a cumulative, comprehensive exam on the use of ArcMap to answer a series of resource management questions. The exam is open book/notes and will take approx. 3 hrs. to complete. It will take place during your scheduled lab time.

Grade Composition

3 One Hour Exams @ 20% each	60%
Lab Reports	20%
Lab Final	15%
Class Participation	05%

Grading Scale

93-100	A
90-92	AB
83-89	B
80-82	BC
70-79	C