

Montana State University
Geography 305
Advanced Geographic Information Science and Spatial Analysis

Credits; 3 Offered Fall and Spring semesters
Lecture: 2 hours / week
Lab; 2 hours / week
Texts: Geographic Information Systems and Science, Paul A. Longley et al
 Getting to Know ArcGIS Desktop, Second Edition, T. Ormsby et al

Introduction:

GEOG305 is the second in a series of three courses in Geographic Information Science offered by the Department of Earth Sciences at Montana State University . Spatial data principles and data models are explored in the context of analytical methods and modeling processes. The laboratory applies the theory and concepts to solve real world problems using state of the art GIS software. Students completing this course will understand fundamental spatial data analysis methods, and how to develop data models to support user needs and applications. Specific objectives include;

- Understand the roots and evolution of GIS
- Understand advanced data model concepts in the context of spatial analysis/synthesis
- Be able to describe how various spatial data models relate to your specific discipline.
- Understand spatial data conversion and editing processes
- Understand fundamental spatial analysis, synthesis and modeling concepts
- Be able to describe various analysis, synthesis and modeling concepts in terms of how they relate to your specific discipline or area of interest
- Understand concepts of error and uncertainty and how they relate to spatial analysis and applications in students discipline or area of interest
- Understand spatial data modeling and database design principles
- Understand current GIS technology in relationship to current computer technology
- Apply above concepts through hands on exercises using a major GIS software package

Prerequisites:

GEOG 211 Introduction to GIScience

Readings:

There will be a weekly reading assignment most weeks. Readings will be from the text books plus additional assigned readings that will be available at the library reserve. A good way to prepare for class each week is to do the assigned readings ahead of time

Term Paper:

Students will perform a literature review and write a term paper documenting GIS Case Studies and discussing case studies in terms of knowledge base covered in class.

Lab:

Labs will be managed using WebCt on-line course management system. Assignments and data will be available on WebCT. Before coming to the first lab make sure you have a WebCt login and password. You can do this by going to <https://webct.montana.edu>.

Lab exercises will often consist of tutorials from the lab manual followed by a problem statement. A good way to prepare for lab each week is to do the tutorial exercises prior to lab. This will give you more time during the scheduled lab working on the problem statement when the lab GTA is present. Plan to spend time each week outside of the scheduled lab time to complete lab exercises.

Lab exercises will be due by the beginning of the next weeks scheduled lab time.

Required Materials:

USB memory stick for backing up lab data and transferring files

Attendance and other expectations:

Attendance at all lectures and labs is **mandatory** to succeed in this class. Much of the material presented builds on previous material. Missing class will make catching up very difficult. If you miss a class, you are responsible for obtaining all materials, notes, assignments, etc. Time to complete lab exercises will vary between students. You should plan to spend time outside of scheduled lab time each week to complete lab assignments, but plan to be in lab during our scheduled lab time. Refer to the Lab Policies and Procedures manual for the policy regarding late work and plagiarism.

Cell phones must be turned off during class. Students caught with cell phones on during exams will receive an automatic F for the class.

Grades:

Mid-term exam	20%
Final exam	25%
Quizzes	10%
Lab exercises	30%
Term paper	15%

Grades will be assigned based on percentage breaks as follows:

93	A
90	A-
87	B+
83	B
80	B-
77	C+
73	C
70	C-
67	D+
63	D
60	D-
below 60	F

**GEOG 305 - Advanced GIScience and Spatial Analysis
Tentative Course Schedule**

Week #	Lecture - M/W	Reading	Lab
1	Intro / Syllabus Systems, Science, Study Review Spatial Data Principles	Longley chap 1 "Systems, science, and study"	Lab 1 Review Spatial Data Principles & Data Models Tutorial review including Joining Tables
2	Review Spatial Data Principles Spatial Data Models Relational Database Concepts	Longley chap. 5 "Georeferencing"	Projecting data Problem Statement Relational database and projections
3	Feature data model relational database continued topology	Longley chap 3 "Representing Geography" Longley chap 8 pp 178-190 "GIS data models"	Lab 2 Continue Review Problem statement Relational database Topology data model
4	Cartography review GIS output	Longley chap 12 "Cartography and map production" Longley chap 13 "Geovisualization"	Lab 3 Thematic map review Tutorial - Making maps... Problem statement Map design and composition
5	Data conversion	Longley chap 9 "GIS data collection"	Lab 4 Tutorial - Creating & Editing Features Problem Statement Georeferencing and conversion
6	Thinking Spatially Spatial Analysis spatial/attribute query	Longley chap 10 pp 217-227 Database management systems...	Lab 5 Tutorial - Spatial & attribute query Problem statement Spatial and Attribute query
7	Spatial analysis Vector analysis	Longley chap 14 "Query, measurement, and transformation"	Lab 6 Tutorial - Preparing & analyzing spatial data Problem statement vector analysis 1
8	Spatial Analysis mid term exam		no lab
9	Spatial analysis Vector analysis Uncertainty/error	Longley chap 6 "Uncertainty"	Lab 7 Problem statement vector analysis 2
10	Spatial analysis Raster analysis fundamentals Raster Overlay Map Algebra	Reserve Reading TBA	Lab 8 Tutorial - Raster fundamentals Problem statement raster analysis1
11	Spatial analysis Raster analysis Map Algebra Terrain analysis	Reserve Reading TBA	Lab 9 Problem statement raster analysis2
12	Object Oriented DB Concepts Database Design	Longley chap 10 pp 227 - 239 Geographic database design Longley chap 8 pp 190 - 197 Object data model and data modeling	Lab 10 Tutorial - Building Geodatabases Problem Statement Data Modeling
13	Data Modeling case study and exercise	Reserve Reading TBA	
14	GIScience technology Internet GIS	Reserve Reading TBA	Lab 11 Application programming and integrating technologies
15	Final lab flowchart Wrap up		Lab 12 Analysis and synthesis review
16	Final Exam		