

# GEOG/RGPL 419/519

## Geographic Information Systems (GIS) for Environmental Applications

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 Texts: A. M. Price. 2011. *Mastering ArcGIS*. 5th Edition. McGraw-Hill: New York, NY. (required) B. *Introduction to GIS Class Notes* available at Copies Now (required).

**Course Objectives: By the end of the semester, students will be able to:** 1) Understand the geographic dimensions of natural phenomena and human-environment interaction 2) Understand what geographic information systems are and how they work 3) Understand how geospatial technologies are presently being used by environmental scientists and resource managers 4) Understand how the capabilities of GISs enable the visualization and analysis of the environment 5) Use industry-standard GIS software to derive information from databases, and address environmental problems with spatial dimensions.

### Class Schedule

<u>Week of</u>	<u>Topic(s)</u>
Aug 30	Introduction to course. Discussion of texts, computer facilities, how things are going to done. <i>What is a Geographic Information System (GIS)? Why is GIS useful for Environmental Applications and analyzing natural phenomena? Base environmental applications and examples.</i> <b>Read A. Introduction and B. Class Review of Notes</b>
Sept 6	<i>A typology of Environmental GIS Applications. Standard Environmental Geospatial Datasets. Map Projections and Coordinate Systems: Map Scale and Projections. Geographic coordinate systems. Characteristics of geographic information. Metadata. GIS Data Structures - Vector Data Model: Geometric Objects. Topology. Higher level objects.</i> <b>Read A. Ch. 3, 11, 15 B. Class Review of Notes</b>
Sept 13	<i>GIS Data Structures - Vector Data Model, Raster Data Model: Geometric Objects. Issues in the Integration of Geospatial Field Data with GIS for environmental applications. Topology. Higher level objects. Types of Raster Data. Integration of Raster and Vector Data. Discussion of GIS functionality.</i> <b>Read A. Chs. 1, 2 B. Class Review of Notes</b>
Sept 20	<i>Vector, Raster Data Input: Existing spatial data (reading and understanding metadata), Data input methods: digitizing, scanning, Global Positioning System (GPS), image and remote sensing data. Visualization of phenomena on the earth's surface; Data Display and Cartography. Making Maps with GIS: Map elements, types of maps, map design. Introduction to ArcGIS and ArcView 10: Adding data, working with layers, data frames, and map files</i> <b>Read A. Chs. 3, 4 B. Class Review of Notes</b>
Sept 27	<i>Learning ArcGIS 10 continued: Visualization of phenomena on the earth's surface; Data Display and Cartography. Attribute Data Input and Management: Database management, relational database management systems (RDBMS). Data Exploration. Attribute Data Query, Spatial Data Query. Understanding RDBMS structure, relational join and relate operations, database (attribute) queries.</i> <b>Read A. Ch. 5, 6 B. Class Review of Notes</b>

Oct 4	<b>MIDTERM EXAM</b>
Oct 6	Identifying distributions on the earth's surface: Query and Visualization. <i>Learning ArcGIS 10 continued: Attribute Data Input and Management: Database management, relational database management systems (RDBMS). Data Exploration. Attribute Data Query, Spatial Data Query. Understanding RDBMS structure, relational join and relate operations, database (attribute) queries.</i>
Oct 11	<i>Processing Geospatial Data and Reporting by Administrative Unit. Attribute Data Input and Management: Database management, relational database management systems (RDBMS). Data Exploration. Attribute Data Query, Spatial Data Query. Learning ArcGIS 9 continued: Understanding RDBMS structure, relational join and link operations, database (attribute) queries. <b>Read A. Ch. 7. B. Class Review of Notes</b></i>
Oct 18	<i>Site Identification Applications and Techniques. Learning ArcGIS 10 continued: Database Operations (Attribute data classification and computation) and Spatial Data Query (Feature Selection by Spatial Relationship). Vector Data Analysis. <b>Read A. Ch. 8. B. Class Review of Notes</b></i>
Oct 25	<i>Site Identification Applications and Techniques. Vector Data Analysis. Describing attribute and spatial data statistically, Spatial analysis, GIS and Spatial Analysis. Learning ArcView 9 continued: Performing statistical and spatial analysis in ArcView. Geoprocessing Operations. <b>B. Class Review of Notes</b></i>
Nov 1	<i>Constructing and Evaluating Index Models. Raster Data Analysis and Spatial Analyst in ArcGIS.. <b>Read A. Ch. 8. B. Class Review of Notes</b></i>
Nov 8	<i>Constructing and Evaluating Index Models. Raster Data Analysis and Spatial Analyst in ArcGIS.. <b>B. Class Review of Notes</b></i>
Nov 15	<i>Satellite Imagery, Remote Sensing and Change Detection. Some more advanced GIS functionality: ArcView Extensions...Spatial Analyst, Network Analyst, 3-D Analyst. Learning to think spatially...using GIS to analyze specific problems. <b>Read A. Ch. 13 B. Class Review of Notes</b></i>
Nov 21-27	<b>Thanksgiving Break</b>
Nov 29	<i>Bringing it all together: GIS Analysis of Environmental Problems. Relevant topics: geodatabases;</i>
Dec 6	<i>Bringing it all together: GIS Analysis of Environmental Problems. Relevant topics: geodatabases;</i>
Dec 15	<b>8 AM - 11 AM FINAL EXAM ACTIVITIES</b>

**Grading Procedure:** Evaluation will be based on two exams of equal value (a midterm and a final) (40%); regular assignments and exercises (40%), and attendance, in-class exercises and participation (20%). A late penalty of 20% per day will be assessed on any assignment submitted after the deadline. Assignments/Exercises will be graded as follows: 80 to 85% of the total points will be awarded based on following instructions and/or deriving the correct answer; the other 10 to 15% of the points will be given based on initiative, care, creativity, and professionalism of the final product turned in. More than two unexcused absences will result in a **5% reduction** in a student's final calculated percentage, with an **additional 5% reduction** for each additional unexcused absence.

**Additional Policies and Requirements:** 1) Students who have unexcused absences from class are responsible to catch up on class material on their own. 2) Students must be able to access the SEAL Lab and/or a personal computer with the appropriate version of ArcGIS 10.X to complete work for this course. 3) Students, by the end of the second week of the semester, should have a 500 mb minimum "flash" drive to store class data for assignments. 4) Students are responsible to check their IUP e-mail accounts daily to see if the instructor has disseminated information regarding the class. 5) All students will complete and turn in their own work for assignments.