

GIS/Remote Sensing for Archeology and Paleontology
ANT 324L / GRG 356T Spring 2013
Unique 31280, 37506

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Overview: This course surveys archeological and paleontological applications of remotely sensed data such as aerial photography and satellite imagery for use in locating field sites, planning field logistics and conducting landscape analysis. The remote sensing component of the course covers remote sensing data acquisition, image georectification, image processing and classification.

The GIS component of the course builds on the remote sensing component and adds to it the analysis of map features stored in databases. The course introduces databases theory and practice, and moves through the various stages of GIS workflow: the planning and design of GIS projects, building geospatial datasets, various methods of geospatial analysis and a short introduction to map layouts and reports.

This course covers GIS and remote sensing from an applied perspective and students are expected to invest lab time in completing tutorials on GIS and RS methods as well as applying these methods to individual projects.

Prerequisites and Expectations: This course is designed to compliment ANT 324L Digital Data Systems in Archeology, which has a greater emphasis on data acquisition and field methods. **This is NOT an introductory course in GIS and remote sensing.** This is an accelerated course in GIS and RS fundamentals. There are no enforced prerequisites, but students should have a comfortable working knowledge of computers and an introductory GIS or remote sensing course is recommended but not required.

Required textbooks:

Bolstad, P (2008) GIS Fundamentals: A first text on geographic Information systems 3ed., Eider Press: White Bear Lake, MN.

Recommended Textbooks:

The following book is recommended for those who are brand new to GIS using ESRI software:

Ornsby T *et al.* (2010) Getting to Know ArcGIS Desktop: Basics of ArcView, ArcEditor and ArcInfo. ESRI Press: Redlands, CA.

Lecture meets Wednesdays from 11-12 in the anthropology teaching lab SAC 5.172.

Lab meets Wednesdays 2-4 in the anthropology computing resource room, SAC 5.112. In the labs we will be using ESRI ArcGIS software and Leica ERDAS Imagine software for remote sensing. Each student will have access to their own GIS/RS workstation.

Grading: Grades for this course are based on weekly lab quizzes (18%), weekly lab exercises (60%), and a cumulative final exam (22%). Grading uses the +/- system. Final grades of A = 100-95, A- = 94-90, B+ = 89-87, B = 86-84, B- = 83-80 etc.

Schedule

| Date | Topic | Readings and Lab |
|---------|---|---|
| 16 Jan. | Course Introduction | Lab Orientation and setup |
| 23 Jan. | Introduction to GIS What is GIS? GIS software components GIS data types and data models | Lab 1 Introduction to ArcGIS Readings: Bolstad Chap. 1 & 2 |
| 30 Jan | Introduction to Remote Sensing Remote Sensing Platforms ERDAS Imagine Session Import-Export Compression formats Image Subsetting Image Mosaics | Lab 2 Image Preparation Bolstad Chap. 6 |
| 6 Feb. | Coordinate Systems History of Geographic Coordinates Ellipsoids and Spheroids Datums Map Projections Coordinate Calculator Projected Coordinate Systems UTM State Plane PLSS Reprojecting Raster Images | Lab 3 Coordinate Systems & Projections Bolstad Chap. 3 |

| Date | Topic | Readings and Lab |
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| 13 Feb. | Planning and Creating a GIS Building a GIS Database GIS and RS data sources Metadata Digitizing GPS Image Rectification | Lab 4 Geodatabases Bolstad Chap. 4 |
| 20 Feb. | Editing & Geoprocessing Spatial Data Locating Errors Accuracy Standards Basic Editing Topology Edgematching Geoprocessing Python | Lab 5 Editing & Geoprocessing Bolstad Chap. 5 |
| 27 Feb. | Attribute Data DB structures Editing DB schemas Adding data Joins Queries Expressions Cross Tabs Summaries | Lab 6 Managing Attribute Data Bolstad Chap. 8 |
| 6 Mar. | Image Enhancement Image Bands Type of Resolution Convolution Filtering Fourier Transforms Resolution Merge | Lab 7 Image Enhancement ERDAS Field Guide 155-242 |
| 13 Mar. | Spring Break | |

| Date | Topic | Readings and Lab |
|---------|---|---|
| 20 Mar. | Classification Classification theory Ground Truthing Unsupervised classification Accuracy Assessment | Lab 8 Classification ERDAS Field Guide 155-242 |
| 27 Mar. | Terrain Mapping Sources of elevation data Building terrain models DEM, TINS Aspects of Terrain Mapping Image Draping 3D Visualization | Lab 9 Terrain Mapping Bolstad Chap. 11 |
| 3 Apr. | SAA Meetings | No Lab |
| 10 Apr. | Map Design and Layouts Principles of Cartography Key elements of a map Designing map layouts | Lab 10 Map Layouts |
| 17 Apr. | Spatial Analysis 1 Measuring Distance Pattern Analysis Spatial Autocorrelation and Variograms Interpolation and Kriging | Lab 11 Spatial Analysis 1 Bolstad Chaps. 9,12 |
| 24 Apr. | Spatial Analysis 2 Raster Data Formats GRID Map Calculator Cost Surfaces Zonal Analysis Comparing Raster and Vector Data | Lab 12 Spatial Analysis 2 Bolstad Chaps. 10 |

| Date | Topic | Readings and Lab |
|-------------|---|-------------------------|
| 1 May | Open Source GIS Q GIS GRASS SpatialLite GeoDjango | No Lab |
| 11 May | Final Exam - 2-5 PM | |