GIS/Remote Sensing for Archeology and Paleontology
ANT 324L / GRG 356T Fall 2013
Unique 31400, 37873

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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 is 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 4ed., 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 Monday from 2-3 in the anthropology teaching lab SAC 5.172, and Wednesday from 2-3 in the anthropology computing resource room, SAC 5.112.

Lab meets Wednesdays 3-5 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. Lab exercises are due by 2 PM on Wednesday the week after they are assigned. **Each lab is worth 5 points toward the final grade. Late labs will be penalized 1 point per week after the due date.**

Schedule

Date	Topic	Readings and Lab
28 Aug.	Course Introduction	Lab Orientation and setup
4 Sept.	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
9,11 Sept.	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
16, 18 Sept.	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
23, 25 Sept.	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 pp. 131-164 and Chap. 5 pp. 183-200

Date	Topic	Readings and Lab
30 Sept. 2 Oct.	Editing & Geoprocessing Locating Errors Accuracy Standards Basic Editing Topology Edgematching Geoprocessing Digital Data Sourcs	Lab 5 Editing & Geoprocessing Bolstad Chap. 7
7, 9 Oct.	Attribute Data DB structures Editing DB schemas Adding data Joins Queries Expressions Cross Tabs Summaries	Lab 6 Managing Attribute Data Bolstad Chap. 8
14, 16 Oct.	Image Enhancement Image Bands Type of Resolution Convolution Filtering Fourier Tranforms Resolution Merge	Lab 7 Image Enhancement ERDAS Field Guide: Intro to Enhancements 455-459; Radio-Spatial Enhancements 463-483; PCA 492-498.
21, 23 Oct.	Classification Classification theory Ground Truthing Unsupervised classification Accuracy Assessment	Lab 8 Classification ERDAS Field Guide 545-583
28, 30 Oct.	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

Date	Topic	Readings and Lab
4, 6 Nov.	Map Design and Layouts Principles of Cartography Key elements of a map Designing map layouts	Lab 10 Map Layouts Review Bolstad Chap. 7
11, 13 Nov.	Spatial Analysis 1 Measuring Distance Pattern Analysis Spatial Autocorrelation and Variagrams Interpolation and Kriging	Lab 11 Spatial Analysis 1 Bolstad Chap. 9
18, 20 Nov.	Spatial Analysis 2 Raster Data Formats GRID Map Calculator Cost Surfaces Zonal Analysis Comparing Raster and Vector Data	Lab 12 Spatial Analysis 2 Bolstad Chap. 10
25 Nov.	Open Source GIS	Review
4 Dec.	Final Exam	Final Exam