

SYLLABUS

GIS FOR ARCHAEOLOGY

Instructor: Dr. Shane J. Prochnow

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Overview: This workshop adopts an approach that is both practical and rigorous because most archaeologists are interested in a selective set of geospatial tools, but poorly described short cuts often bring questionable results by the user. The course condenses all the most important GIS concepts and operations that are commonly utilized by the archaeological community into a series of short lectures followed by relevant hands-on examples using ArcGIS software and extensions.

About the Instructor: Dr. Prochnow is a Research Scientist at the Center for Spatial Research and Lecturer of GIS through the Department of Geology at Baylor University. Prochnow is a trained geoarchaeologist and paleopedologist, but has always incorporated geospatial technology in his research. Dr. Prochnow currently works with GIS-based models to simulate watershed physical and biological processes, interpolate paleogeography through deep-time, and managing environmental pollution. Prochnow focuses on archaeological applications of GIS in each of his three advanced GIS courses offered at Baylor.

Strategic Goals:

This workshop intends to:

1. Rapidly achieve the “critical mass” of GIS concepts and practice for archaeologists to effectively learn GIS on their own in the future.
2. Learn appropriate applications and limitations of GIS techniques to solve archaeological problems.
3. Build knowledge in the discipline by immersing the student in practical applications and instrumentation while being supported by comprehensive theoretical training.

Technical Goals:

By the end of the workshop you will be able to:

1. Understand the basics of GIS applications in CRM, Excavation, 2D & 3D Site Modelling, “Landscape” Archaeology, and Spatial and Simulation Modelling for GIS.
2. See examples from the core areas of GIS archaeology research from the literature.
3. Understand the basics of coordinate systems, projections, and datums
4. Reproject data layers.

5. Find data layers critical to archaeological research from government agencies.
6. Incorporate surveyed (total station and theodolite) data into a GIS.
7. Evaluate and incorporate GPS data into a GIS.
8. Digitize and georeference hardcopy maps for inclusion in a GIS.
9. Understand the basics of data interpolation methods.
10. Build surface models using Geostatistical Analyst[®]
11. Evaluate interpolation quality in terms of interpolation “artefacts.”
12. Evaluate interpolation quality in terms of geostatistical metrics.
13. Make a grid data layer from a TIN.
14. Mosaic rasters
15. Understand the basics of map algebra.
16. Create slope, aspect, and contour maps from DEMs
17. Use low-pass filters to enhance visualization
18. Use high-pass filters to identify subtle boundaries (walls, faults)
19. Use hill shade functions to identify landscape features.
20. Use line-of-sight and visibility tools.
21. Use 2.5D and 3D visualization tools.
22. Use queries.
23. Perform a “buffer” analysis.
24. Create a virtual excavation grid
25. Clip rasters from a buffer polygon.
26. Understand the basics of spatial analysis
27. Evaluate spatial autocorrelation.
28. Perform cluster analysis
29. Perform nearest neighbour analysis
30. Understand Ripley’s K function.
31. Perform Hot-Spot Analysis
32. Create effective metadata

List of Exercises:

1. Sizing up the Earth
2. Datum Shift Exercise: *Dinosaur Valley State Park: Glen Rose, Texas*
3. How to Download DEMS and Other GIS Layers from TNRRIS
4. How to Mosaic DEMS and Other Rasters (Grids)
5. Building and Geoprocessing Surface Models: *The Prochnow Ranch Homestead Burned Rock Midden Complex: 41GL345-41GL347*
6. Working with Surface Analysis & Derivatives: *The Prochnow Ranch Homestead Burned Rock Midden Complex: 41GL345-41GL347*
7. Building Viewsheds: *A Viewshed for Horn Shelter: 41BQ46*

8. Making Virtual Excavation Grids: *Using Hawth's Tools to Build a Virtual Excavation Grid for the Prochnow Ranch Homestead Burned Rock Midden Complex: 41GL345-41GL347*
9. High Pass Filters for Edge Detection: *Horn Shelter Area: 41BQ46*
10. Adding Survey and Geophysical Data into a GIS: *The Stone Site (El Quiscat): The Original Waco*
11. Geoprocessing Geophysical Survey Data for Archaeology: *The Stone Site (El Quiscat): The Original Waco.*
12. Spatial Statistics of Low Conductivity Anomalies: *The Stone Site(El Quiscat): The Original Waco.*
13. Working with TINS: *Lake Whitney, Texas*
14. Vector Geoprocessing: *Texas Aquifers and Reservoirs*
15. Metadata and Data Standards
16. Georeferencing: *The Old Baylor University Sandtown: A Community Lost*

Schedule:

Day	Topic	Hours
1	Introduction and Theoretical Issues	8:00-9:00
1	Coordinate Systems, Datums, Projections and Transformations	9:00-11:00
1	Data Incorporation into a GIS	11:00-12:00
1	Lunch	12:00-13:00
1	Introduction to Rasters	13:00-14:00
1	Building and Geoprocessing Surface Models	14:00-15:30
1	Geoprocessing DEMs and Rasters	15:30-17:00
2	Digital Terrain Modeling with Rasters	8:00-10:00
2	Digital Terrain Modeling	10:00-12:00
2	Lunch	12:00-13:00
2	Geospatial Statistics	13:00-15:00
2	Vector Geoprocessing	15:00-17:00

Recommended Reading:

Conolly, J. and Lake, M. (2006). *Geographical Information Systems in Archaeology*. Cambridge University Press, 338 p. ISBN 0-521-79744-6.

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