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Example Syllabus: Spatial Analysis

COURSE DESCRIPTION: This course introduces students to problem-solving and decision making using spatial analysis techniques, applicable to a range of disciplines.

PREREQUISITES: Introductory Geospatial Technology course using Geographic Information Systems Software.

STUDENT LEARNING OUTCOMES (SLOs):

Fully successful students will be able to:

1. Prepare data for use in analysis.
2. Determine an appropriate approach to solving a spatial problem or answering a question using geospatial tools and methods
3. Run geoprocessing tools individually and implement a model to run several tools in sequence
4. Organize the data sets resulting from analysis
5. Present the results of a geospatial analysis using appropriate terminology and visualizations

COURSE OUTLINE AND RESOURCES:

Specific material/exercises/data/exams are at the discretion of the developer and are offered as samples, not mandatory components in the course. Our objective is to provide as complete a model course outline as possible without being too prescriptive on the precise course content. It is expected faculty that adopt these outlines will modify the material to meet their own local industry needs.

Units	Unit Objectives
1. Raster & Vector Data Models	Students collect, create, process and analyze spatial data within a variety of environments. Students will apply the appropriate data model to support data as fields or as crisp entities. Students will be able to select appropriate classification methods for data. Describe and explain the similarities and differences between spatial data models, as well as how data is treated differently within each model to include the conversion of data between different models. Students will correctly apply concepts of scale using each data model. (SLO 1,2,4,5)
2. Coordinate Systems	Students will apply geographic and projected coordinate systems properly. Students will be able to troubleshoot datasets for common coordinate system problems. Students will be able to select and defend the appropriate coordinate system for various mapping tasks. Demonstrate proficiency with coordinate system management (SLO 1)
3. Queries & Joins	Students will construct SQL and spatial queries to select features. Students will apply Boolean operators appropriately. Students will employ queries to identify spatial patterns. Students will successfully use attribute and spatial joins during analysis. Students will make use of data cardinality to deduce and employ the proper join/relate or spatial join. (SLO 2)
4. Geodatabases	Students will collect, record, develop, and utilize spatial data and databases. Students will employ advanced GDB features including domains and subtypes in developing schemas and organizing data. Demonstrate an understanding of the fundamentals of topology as applied to spatial data Students will demonstrate use of the topological editor in identifying and correcting errors in planar topology. (SLO 1, 2)
5. Editing	Students will demonstrate the ability to use editing tools to create, validate and modify geometry. (SLO 1)
6. Network Analysis	Students will construct utility and transportation networks, and apply the appropriate analytical tools for each type of network. Students will be able to correctly use network-specific terminology. Students will be able to use network analysis to determine service areas. (SLO 3, 5)
7. Overlay Analysis	Students will employ extraction and combination tools among layers to answer geospatial questions. Students will successfully differentiate between and employ union, intersection, and erase supporting Boolean analysis and other outcomes. (SLO 2, 3,4)
8. Map Algebra	Students will identify and use appropriate overlay tools for raster analysis. (SLO 2, 3,4)

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9. Geoprocessing	Students will use clip, buffer, dissolve, union, and other vector as well as raster tools in a sequence of operations as part of a GIS analysis. (SLO 2, 3,4)
10. ModelBuilder	Students will use a graphical scripting tool to build geoprocessing workflows and model analytical processes. (SLO 2, 3,4)
11. Metadata	Students will describe the varied aspects of data quality, and identify the principal metadata standards. Students will be able to use editors, templates and other vehicles to develop and maintain metadata. (SLO 1)
12. Final Project	Students will create their own data using electronic methods and solve a problem using geospatial technology from goals and data acquisition to analysis and processing to cartographic presentation and publishing. (SLO 1, 2, 3, 4, 5)

*Refer to the GSIS102 Geospatial Technology Model Course Outline for unit alignment with the Geospatial Technology Competency Model

METHODS OF EVALUATION: A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

- Quizzes
- Lab Exercises
- Tests
- Final Project

METHODS OF INSTRUCTION: Methods of instruction may include, but are not limited to, the following:

- Lecture Discussion
- Learning Modules
- Audio-Visual
- Collaborative Learning
- Lecture-Lab Combination
- Computer Assisted Instruction

REQUIRED TEXTS AND SUPPLIES:

1. Reading materials may include, but are not limited to:
   a. TEXTBOOKS:
      i. Price, Maribeth. 2014. Mastering ArcGIS. 6th Edition. McGraw-Hill.
      ii. Maher, Margaret M. 2013. Lining Up Data in ArcGIS: a guide to map projections. 2nd Edition. ESRI Press.
   b. OTHER:

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i. GeoTech Teaching Resources, http://www.geotechcenter.org
ii. Zeiler, Michael and Jonathan Murphy. 2010. Modeling Our World, The ESRI Guide to Database Concepts. 2nd Edition. ESRI Press.
iii. Lo, C.P. and Alberty K. W. Yeung. 2007. Concepts and Techniques in Geographic Information Systems, 2nd Edition. Pearson Education.
iv. Stillwell, John and Graham Clarke. 2004. Applied GIS and Spatial Analysis. John Wiley & Sons.
v. Allen, David. W. 2011. Getting to Know ModelBuilder. Esri Press.
vi. Snyder, John P. 1987. Map Projections—A Working Manual. U.S. Geological Survey Professional Paper 1395.
vii. Snyder, John P. and Philip M. Voxland. 1989. An Album of Map Projections. U.S. Geological Survey Professional Paper 1453.

2. SOFTWARE: Access to industry standard geospatial software.
3. SUPPLIES: Computer with an Internet connection.

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