GEOG 0093 - ADVANCED GIS

Catalog Description

Prerequisite: Completion of GEOG 90 with grade of "C" or better
Hours: 72 lecture
Description: Explores advanced topics that build upon previously learned GIS concept and skills. Improve problem solving skills, spatial database organization, modeling, and producing various map outputs. Student completes a research project and assembles a map portfolio. (CSU)

Course Student Learning Outcomes

- CSLO #1: Design GIS model for research project, while investigating other models used in the subfield, such as watershed analysis or urban planning.
- CSLO #2: Draft a flowchart of necessary layers and other data needed for project.
- CSLO #3: Organize data for future queries and analysis determined by project goals and problems solving (objectives).
- CSLO #4: Assess appropriate geovisualization tools to illustrate highly detailed terrain related problems or requirements, such as the use of LIDAR data (which is high resolution topographic rendering of landscapes).
- CSLO #5: Assemble a portfolio of well-organized, purposeful maps that solve real-world, spatial problems using industry standard methods and geographic layers.

Effective Term

Fall 2021

Course Type

Credit - Degree-applicable

Contact Hours

72

Outside of Class Hours

144

Total Student Learning Hours

216

Course Objectives

1. Determine flowchart thematic layers and data collection requirements.
2. Design a GIS model for a research project, land management or practical business application.
3. Assess an appropriate geovisualization tool to illustrate points, lines, and polygons, such as use of LIDAR data or a DEM to draw.
4. Organize data (e.g., geodatabase) with future queries and analysis in mind to generate expected outputs.
5. Digitize parcel map accurately using heads-up method.
6. Examine "Geocoding" methods, if needed, such as for zip codes, street addresses, or other references.
7. Buffer points for proximity analysis; conduct site suitability analysis.
8. Investigate ArcGIS extensions and functions, such as 3D Analyst and ArcGIS Spatial Analyst.
9. Accurately control which values to display or limit.
10. Create maps with quantities, series, or those with charts; mapping standards used in colors schemes and symbology.
11. Determine which overlay to use for finding what's inside or nearby.
12. Evaluate the results of GIS analysis and decide, when appropriate, to reiterate procedures to modify inputs and outputs.
13. Create final project that demonstrate a students ability to analyze the primary purpose, process and GIS product for a specific task, like creating election maps.

General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- CSU Transferable

Methods of Evaluation

- Objective Examinations
  - Example: Given a specific objective, such as producing a choropleth map, students are evaluated upon justifying the best way to organize data (e.g., geodatabase) with future queries and analysis in mind to generate expected outputs (election map results).
- Problem Solving Examinations
  - Example: Student need to explain how to create a DEM relief map from given data of N. Calif. Student must be able to get data, most likely from USGS website, import into the GIS, then manipulate to correctly show shaded elevation or relief. Student may be able to acquire higher resolution LIDAR data, with corresponding steps to create shaded relief.
- Projects
  - Example: Students collect and organize spatial data with a specific task or objective in mind, such as creating an election results map. Additional skill building, such as queries and categorizing data for scientific and objective outputs, such as a choropleth map showing a specific aspect of the project. Students also write a report on the process and include a final product, often a map.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Instructor will demonstrate how to strategically design and implement a complex project, beginning with goals and objectives or problems to solve. For example, the City of Roseville needs to organize their Parks & Recreation asset, from chin-up bars to underground culverts. Goals might be comprehensive list of assets by category and objectives might be to inventory all culverts based on material, such as steel versus plastic, with various lifespans necessary for replacement. Students start with the problem, then

work their way through specific processes and techniques to accomplish these objectives. In regard to culverts, the instructor shows how to setup a data dictionary and begin a GPS inventory.

2. In order to create effective maps that tell a story, the instructor will focus on common symbology and colors used as mapping standards, such as road symbols and green for open space or yellow for urban areas. Teaching by example, the instructor shows the FAA maps, or the USGS standard Topographic maps as effective tools to communicate spatial relationships quickly. Students also compare maps to judge which one communicates the information quickly and intuitively. Other aspects of mapping such as accuracy and future analysis should be addressed as well.

Distance Learning

1. Instructor lectures on Geoprocessing tools, such as during GIS analysis of relationships between land-use or zoning designations and proximity to major highways or roads, for example. Students interact with these Geoprocessing tool to analyze relationships among geographic features of their choice to be included in final project using various layers needed. The lecture will be delivered through a slide lecture presentation on a LMS platform. Or perhaps the instructor uses videos uploaded into LMS for students to watch the#instructor demonstrate web-map services, and multiple geoprocessing analytical tools. Student then complete worksheets based on the lecture or videos and upload them via LMS. Projects are reported on LMS Discussion Board.

Typical Out of Class Assignments
Reading Assignments

1. Read software manual on GIS extension to create a Digital Elevation Model with ESRI's Spatial Analysis product, including problem-solving areas and be prepared to discuss in class. 2. Investigate and read about spatial analysis and specific case studies, such as Dr. John Snow's original map of Cholera incidence in the area of Broad Street in London (1854) and be prepared to discuss in class. 3. Research how to populate Geodatabase by importing data, working with shapefile data, and loading subtypes and be prepared to discuss in class.

Writing, Problem Solving or Performance

1. Prepare a statement of intent for a GIS semester project that identifies overall goals and specific objectives along with the business process. Identify specific spatial problems to solve along with identifying data needed to create and gather (sources). Propose a flow-chart and procedures to gather and construct a GIS. 2. Prepare a 10 minute oral presentation to demonstrate whether your anticipated outcomes were met or not met, including reiteration process involving database design and specific data to collect. Emphasis should be on GIS analysis, methods and tools to achieve outcomes and solve spatial problems. 3. Publish map to ArcGIS online and be familiar with ESRI ArcPro software.

Other (Term projects, research papers, portfolios, etc.)
Required Materials

- Getting to Know ArcGIS Pro, second edition
  - Author: Michael Law, et. al
  - Publisher: ESRI Press
  - Publication Date: 2019
- Text Edition: 2nd
- Classic Textbook?:
- OER Link:
- OER:

Other materials and-or supplies required of students that contribute to the cost of the course.