GEOG 0090 - INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Catalog Description

Hours: 72 lecture
Description: Study of Geographic Information Systems (GIS) and its applications to spatial data management. Focus on project design, data acquisition, database management, geographic analysis, and map design. Explores how GIS solves spatial problems, such as those in natural resources, earth and life sciences, environmental planning, local government, business, transportation, and other related fields. (C-ID GEOG 155) (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Identify appropriate ways to map geographic features, whether using vector or raster methods.
- CSLO #2: Compare and contrast different geographic coordinate systems, map projections and datums used in GIS.
- CSLO #3: Evaluate effective map design based on cartographic principles and use of scale.
- CSLO #4: Convert and incorporate GPS data, CAD data, other databases or tables into the GIS using software techniques.
- CSLO #5: Develop metadata as part of data dictionary; explain attributes and value codes.

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. Identify ways to represent geographic features as raster or vector (point, line, or polygon; evaluate the capabilities of various GIS software programs; identify data sources and appropriate formats).
2. Compare and contrast maps, then be able to integrate different geographic coordinate systems, map projections and datums into GIS.
3. Evaluate effective map design, sorting, symbolization, color scheme and apply cartographic principles of scale.
4. Examine the relationship between geographic features and attribute tables as related to GIS queries.
5. Incorporate GPS data, field data (e.g., survey forms), CAD data and other stand-alone databases into the GIS.
6. Develop metadata, including a data dictionary to explain attribute codes, meeting metadata protocol standards and guidelines, using appropriate software, such as ArcCatalog.
7. Discriminate between different attributes types, such as qualitative and quantitative data types.
8. Perform basic spatial overlay and GIS analysis using case studies.
9. Demonstrate the process of converting analogue data to digital data for use in a GIS.
10. Design a flow chart for a research project, including statements of purpose, process and ultimate product.
11. Create and modify a "geodatabase" using appropriate tools, such as ArcCatalog.
12. Conduct a comprehensive data search to select most suitable data sources.
13. Convert and integrate existing data into correct projection / datum of imagery source.
14. Import and integrate CAD (cadastral) data.
15. Collect field data with GPS units; then integrate into GIS.

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
- UC Transferable

Methods of Evaluation

- Objective Examinations
  - Example: 1. Exam question: If you were working with small-scale data, how would this affect what type of features you choose and develop (referring to apply proper map design, scale and appropriate symbology)? If you were working with a large-scale data set, how would this affect your integration of small-scale data? Use an example.
- Problem Solving Examinations
  - Example: 1. Students must be able to decipher that a small-scale data portrayal of the landscape (zoomed-out) could not represent cities as polygons (rather points) or roads as "rights-of-way" but rather as lines. On the other hand, working with large-scale data, you could have parcels of a city and often the data has a much greater accuracy than small-scale data, such as GPS surveyed data. Using both small-scale data with large-scale data will frequently not match, and in fact, relative locations may really confuse the viewer, such as a road switching sides of a survey due to accuracy issues. 2. In regards to GPS data, students identify preliminary steps to insure accuracy and data integration through mini projects and assignments (related to "incorporate GPS data, field data, e.g., survey forms, CAD data and other stand-alone databases into the GIS"). Likewise, student must establish an interactive process to build a data dictionary to reflect the landscape features that are needed on the final maps. Students are encouraged to critically think about future queries, symbolization, filtering, geographic analysis, and even modeling.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. The instructor prompts/asks students to envision and critically think about the goals and objectives of a GIS project by role-playing as members of a resource agency. Students are put in groups to brainstorm some common tasks and problems to solve that might occur at their agency, such as fire prevention methods, mapping dead and dying trees, locations of fire stations, etc. The instructor will then help translate these tasks and problems into GIS layers and attribute tables, in the process learning how GIS can help solve their problems. Students can design a flow chart, if needed to help conceptualize problem-solving. Lectures, verbal discussions, and hands-on exercises reinforce the GIS concepts and software techniques.
2. Using a real-world example to solve a spatial problem and similar to the textbook examples, the instructor will demonstrate how to properly symbolize a choropleth map (as they can be deceiving). For example, during the presidential election, a map of just the states in either red or blue color suggests a state votes one way or another. Students will map each county as to the outcome by party.

Distance Learning

1. Instructor will use technology that is in the cloud and demonstrate the concept that sometimes it is necessary to merge two or more separate but adjacent layers into a single thematic layer. Instructor will review the textbook example then apply method to a similar function with different data. By illustrating 2 or 3 times with different data, the student will begin to see the pattern and effectiveness of tools such as merging features.

Typical Out of Class Assignments Reading Assignments

1. Read "What is GIS?" and "What are people doing with GIS?" (case studies illustrating applications of GIS). Read about typical GIS software operations and symbolization, focusing on the relationship between maps and attribute tables and be prepared to discuss in class. 2. Read about adding and symbolizing GIS layers in your exercise book as well as read an in-class assignment that mirrors these concepts and techniques and be prepared to discuss in class. 3. Research how to create Geodatabases using ArcCatalog; then read about how to rename features, copy and delete feature layers, and modify attribute tables associated with new Geodatabase and be prepared to discuss in class.

Writing, Problem Solving or Performance

1. Transfer concepts and perform software operations learned from the software tutorial book to similar concepts and software operations using real-world data (e.g., managing scale thresholds using different GIS data.) 2. Write a brief overview on how to conceptualize a GIS project (for a natural resources agency, for example) taking into consideration specific tasks and problems you are trying to solve, what GIS layers you should develop, and how to structure the database to best work with the GIS software. 3. Create Geodatabases using ArcCatalog; rename features, copy and delete feature layers, and modify attribute tables.

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

Plan, evaluate and execute a GIS project 1. Identify a problem of a geospatial nature 2. Outline a strategy to solve the problem 3. Locate relevant data sources 4. Design and evaluate a plan to acquire the relevant data sources 5. Incorporate data sources into a Geographic Information System (GIS) 6. Apply principles of spatial analysis with results

Required Materials

- GIS Tutorial 1
  - Author: Wilpen L Gorr; Kristen S Kurland
  - Publisher: ESRI Press
  - Publication Date: 2016
  - Text Edition: 6th
  - Classic Textbook?:
  - OER Link:
  - OER:
- GIS Tutorial 2
  - Author: David W Allen
  - Publisher: ESRI Press
  - Publication Date: 2016
  - Text Edition: 1st
  - Classic Textbook?:
  - OER Link:
  - OER:

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