GEOG 0086 - GLOBAL POSITIONING SYSTEM (GPS) FOR GIS

Catalog Description

Hours: 18 lecture
Description: Global Positioning System (GPS) theory and techniques, GPS field collection, GIS integration and publishing web maps. Discussion of state-of-the-art hardware and industry-standard software used by GIS professionals to prepare, collect and process spatial data. Data collected during class culminates in a comprehensive GIS mapping project used for analysis. (CSU)

Course Student Learning Outcomes

- CSLO #1: List 5 core steps on how a GPS works.
- CSLO #2: Determine and identify critical setup items needed before field collection of GPS.
- CSLO #3: Develop data dictionary on scratch paper then computer software keeping in mind an iterative process.
- CSLO #4: Mark and navigate to GPS waypoints.
- CSLO #5: Differentiate correct collected field data.

Effective Term

Fall 2021

Course Type

Credit - Degree-applicable

Contact Hours

18

Outside of Class Hours

36

Total Student Learning Hours

54

Course Objectives

1. List core mechanisms to how a GPS works, including in-depth discussion of each set-up steps.
2. Compare and contrast different levels of GPS data collection related to accuracy and the GIS setup.
3. Hardware/software setup needed before heading into the field for data collection.
4. Establish an interactive process for developing a data dictionary, focusing on the the data to be collected.
5. Distinguish which feature classes are easiest and most difficult to collect, edit and process for output to the GIS.
6. Manage in-office software and online applications (such as ESRI products) to import data and create maps.
7. Create final GIS mapping project used for analysis.

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: Example: How are GPS satellites able to produce accurate locations (within 10 meters), minimum number of satellites and methods.
- Problem Solving Examinations
  - Example: Example: What is the purpose, process and product of the GPS data collection. After a statement of purpose is created (ie: creating a trail map of campus) students are asked how to set-up the geographic features, attributes and values necessary to meet their goals and purpose.
- Projects
  - Example: Students culminate their knowledge of theory, problem solving skills, set-up skills with a final project that integrates collected GPS data with either a new or existing GIS online. Maps are publish via ArcGIS online.
- Skill Demonstrations
  - Example: Students must demonstrate they understand and can apply knowledge related to GPS set-up & skills, including producing a pilot data dictionary, going into the field to collect sample data, returning to import data, correcting and editing and creating simple map. Student is graded with skills matrix in person and with final project submitted at end of class.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Instructor introduces initial steps for a proper GIS set-up, for example with ArcGIS (professional online maps), then demonstrates how the GPS is used to gather data for the GIS (including online resources). Students then apply methods taught to create their own set-up for a proper GIS (including using online resources).
2. After initial instructor lectures on theory and proper set-up for an online GIS, students create their own data dictionary (list of collection items) to then collect field data, in this case with iPad connected to GPS units input in the industry standard software, such as ArcGIS online.
3. After instructor presentation on GIS layers, students will use resources online to integrate into their own maps created with GPS data and publish a web map for the local GIS community.

Distance Learning

1. After describing online resources that describe GPS, the instructor develops worksheets with basic GPS overview of the space segment, control segment, and user segment as describe by official websites. #Worksheets will be delivered through LMS. Example: Students list the major constellations of satellites world-wide and basic of how each satellite communicate. Students will complete the worksheet then take worksheet quiz on LMS.

Typical Out of Class Assignments Reading Assignments

1. Read online GPS constellation and operation information provided prior and during class time. Be prepared to discuss in class. 2. Set up maps in ESRI online maps for unit collection using user manual (or related material). Special attention must be focused on coordinate systems and the datum, data dictionary collection, file management (different formats), data collection operations, final output techniques, such as producing maps for the web.

Writing, Problem Solving or Performance

1. Summarize the logical and necessary elements of how a GPS works (triangulations, distance, accurate clock, etc.). Then investigate each item in more detail, for example, how is distance determined using timing? 2. Determine several ways to achieve sub-meter or near accuracy -- both in the field (real-time) and in the office (differential correction) with higher end GPS units. Provide examples of each application, for example, how the airline industry needs Wide Area Augmentation Systems (WAAS) accuracy for foggy landings (vertic. accuracy).

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

1. GPS final mapping project

Required Materials

- The ArcGIS Book: 10 Big Ideas about Applying The Science of Where
  - Author: Christian Harder and Clint Brown
  - Publisher: ESRI Press
  - Publication Date: 2017
  - Text Edition: 2nd
  - Classic Textbook?:
  - OER Link:
  - OER:

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