

INTRODUCTION TO GEOSPATIAL TECHNOLOGY AND ANALYTICS

COURSE DESCRIPTION

This course develops critical thinking skills through the exploration of the fundamental components of data analytics in terms of spatial data and geospatial technologies. This includes the basic concepts and skills related to the 3 core areas of analytics, 1) data, 2) analysis, and 3) visualization. Data structures and skills are examined within the context of Geographic Information Systems (GIS.) Spreadsheets, database tools, GIS software, and geospatial technology are used to capture, manage, and store spatial data. Analysis tools, such as spreadsheet functions, scripts, and GIS software are used to investigate data sets related to discipline-specific projects. Geovisualization of results are communicated using map applications, dash boards, and story maps

COURSE GOALS AND LEARNING OUTCOMES

General Education goals: GEO104 is an approved course in the WCU General Education Distributive Requirement in Science. Lectures and assignments are aligned with these goals and outcomes, as well as those of the Department and those specific to this course. Assignments are designed to accumulatively introduce and reinforce communication, analytical, and quantitative skills. Since each module, of the course, is rooted in scholarly and scientific topics, all three of these Learning Goals are woven through each assignment. These goals are mapped to specific assignments, in the **Assignments** table. The course is designed to help students meet the following WCU General Education Learning goals:

1. **Communicate Effectively (G1):**
 - a. Express oneself effectively in common college level written forms
 - b. Revise and improve written and/or presentations
 - c. Express oneself effectively in presentations
 - d. Demonstrate comprehension of and ability to explain information and ideas accessed through reading

Understand and articulate the use of data/spatial analytics core area components, appropriately explain and represent spatial information, and create research and project outputs using data management and geovisualization tools. This will be accomplished through the use of Discussion and reading assignments, lab reports, and verbal, written, and mapping presentation assignments.

2. **Think Critically and Analytically (G2):**
 - a. Use relevant evidence gathered through accepted scholarly methods, and properly acknowledge sources of information, to support an idea
 - b. Construct and/or analyze arguments in terms of their premises, assumptions, contexts, conclusions, and anticipated counterarguments
 - c. Reach sound conclusions based on a logical analysis of evidence
 - d. Develop creative or innovative approaches to assignments or projects

Student will learn and apply the basic methods and thought processes of accepted scholarly methods as they relate to disciplines that use spatial information and analysis, through Tech and Analysis Labs, as well as a Final Project. Discussion and reading assignments review and critique information and publications that use the components of spatial data analytics. Labs and the project require that students publish and present their work following sound methods to construct analytical models and defend the results of their work.

3. **Employ Quantitative Concepts and Mathematical Methods (G3):**
 - a. Employ quantitative methods to examine a problem in the natural or physical world
 - b. Apply the basic methods and thought processes of the scientific method for natural/physical science in a particular discipline.

To achieve this goal, students will employ the quantitative methods of spatial data analytics, including data, statistical, and spatial (such as buffer, dissolve, and intersect) analysis. The Tech and Analysis Labs will also introduce spatial data management and analysis skills, related to real world problem analysis regarding calculating run-off volume, the spread of disease due to vector modeling, and identification of market area via demographic analysis.

Geography & Planning's B.A. Program goals: This course contributes to the program goals for the Department of Geography & Planning, including:

1. Fundamental knowledge of the discipline of Geography: students will be able to demonstrate an understanding of the key concepts of place, space, scale, and location. (GP1)
2. Technical skills: students will be able to demonstrate an understanding of geographic analysis and problem-solving. (GP2)
3. Information literacy: students will be able to demonstrate an understanding of how to conduct geographic research. (GP3)
4. Communication skills: students will be able to demonstrate an understanding of how to communicate effectively in oral and written formats appropriate for professional audiences. (GP4)

Course Learning Goals: By the end of the course students should be able to:

1. Define geospatial technologies and their role in science and business
2. Identify and download appropriate data, from the cloud, for analysis and research
3. Understand and articulate the role and use of spatial analysis in science and business
4. Identify data types, organize data sets, and create simple database schema
5. Create comma-delimited data files and understand their use across software packages
6. Create a spreadsheet, import data, and construct a basic database table
7. Learn spreadsheet functions for calculations, statistics, and summary tables, using formulas, pivot tables, and macros

8. Create graphs and dashboard components from a spreadsheet, to communicate quantitative results
 9. Create spatial database tables and map coordinates
 10. Import spatial data sets into ArcGIS and ArcGIS Online and map data
 11. Perform statistical, calculation, and summary functions using ArcGIS database commands and query spatial data based upon attributes and location
 12. Automate ArcGIS functions using python scripting
 13. Perform basic spatial analysis functions such as buffer and dissolve
 14. Create map compositions and web-based maps for communication of results and presentation
 15. Develop analysis experience in science and business using GIS software and spatial models for runoff calculations, disease tracking, and market analysis
 16. Learn geovisualization, communication skills with ArcGIS for Office and ArcGIS Dashboards
- Create Story Maps to present spatial analysis and for project reporting