

# GEOG G190: DIGITAL MAPPING: INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS

Item	Value
Curriculum Committee Approval Date	12/07/2021
Top Code	220610 - Geographic Information Systems
Units	3 Total Units
Hours	72 Total Hours (Lecture Hours 45; Lab Hours 27)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)
California State University General Education Breadth (CSU GE-Breadth)	• CSU D5 Geography (D5)

## Course Description

This course introduces students to the technology, capabilities, and functionality of Geographic Information Systems (GIS); as well as, the concepts, principles, and methods of geospatial analysis. Students will create interactive maps and visualizations and apply principles of spatial inquiry to analyze the distributions and relationships of physical, social, cultural, and economic features. The course utilizes computer technology, GIS software, aerial photography, satellite imagery, topographic maps, and global positioning systems (GPS). Students learn proper techniques for sourcing, manipulating, managing, and mapping social and scientific data. Course activities may be applied to a variety of fields including Geography, Anthropology, Political Science, Economics, Business, Marketing, Geology, Environmental Science, Biology, Public Health, Criminal Justice, and Architecture. ADVISORY: CS G130. Transfer Credit: CSU; UC. C-ID: GEOG 155. C-ID: GEOG 155.

## Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Analyze spatial information using GIS software.
3. Design digital maps and visualizations using cartographic applications and processes.
4. Organize geospatial data and files.

## Course Objectives

- 1. Explain digital mapping applications with respect to physical and social scientific needs such as climate, ecosystems, urban planning, health, public safety, economics, politics, and cultural concerns.
- 2. Evaluate sources of geographic data to be integrated into interactive maps.
- 3. Organize geographic data utilizing a variety of spatial analysis techniques.

- 4. Analyze geographic patterns presented in a digital context and relate them to societal issues.
- 5. Construct map projections, themes, models, files, and representations for interactive maps.
- 6. Design presentation-quality real-world mapping projects.

## Lecture Content

Introduction and basic concepts Windows navigation Network file system Enterprise systems GIS terminology and overview Definition of GIS Social and environmental spatial data Database attributes Computer cartography Essential elements of a GIS system Essential components of a GIS Hardware and software requirements GIS software ESRI and ArcGIS Free open source View and layout windows Exploring ArcMap Opening a map document Displaying social and environmental map data Navigating a map Identifying features Exploring ArcCatalog Browsing map data Searching for social and environmental map data Adding data to maps Creating and editing data Creating shapefiles Digitizing and editing features Editing feature attribute values Exporting data Base maps, coordinate systems, and map projections Defining a map projection Projecting data for display Geographic grids Latitude and longitude State Plane coordinate system Universal Transverse Mercator coordinate system Converting digital data to a uniform projection and scale Types of geographic data and representations Vector data Points, lines, and polygons Features Raster data Aerial photographs Topographic images Digital surfaces Attribute files Adding new variables Calculating new variables Introduction to converting data from raster to vector and vector to raster Cartographic principles and map design Map composition essentials Map scales Fractional Verbal Graphical Legend Neatline Inset maps Title North arrow Source(s) Date(s) Cartographic symbology Point, line, polygon Text Color Graphics Map layout and design Laying out the page Creating a cartographically-accurate map Adding final touches to the map Setting the print and page options Data collection database management Internet sourcing Recognizing and identifying valid sources of GIS data Working with compressed files Changing file sizes File and workspace organization Metadata Spatial data analysis Database queries based on spatial data operations Creating buffers Overlays Clip Dissolve Geocoding Georeferencing Global Positioning Systems (GPS) data collection and input Additional types of spatial analysis Interpolation and surface analysis Network analysis Applications in decision making Modeling GIS applications Public and private sector applications Environmental Urban planning Government Business and marketing User needs assessment Final project design Asking geographic questions Identifying a problem of a geospatial nature Solving problems with GIS Locating relevant geographic data sources Designing and evaluating a plan to acquire relevant geographic data source s Analyzing data by using tools and queries Applying geographic knowledge in a specific application Presenting results

## Lab Content

Exploring the GIS in the laboratory Displaying map data Navigating around a map Looking at features and attributes Exploring map libraries Displaying map data in a GIS Symbolizing features and rasters Changing symbology on a map Symbolizing features by attribute categories Using styles and creating layer files Symbolizing rasters Classifying features and rasters Classifying features through standard methods Classifying features manually Density Mapping Graduated and chart symbology Labeling features Utilizing dynamic labeling Establishing rules for label placement Interactive labels and annotation Obtaining Information about map features Querying data Finding, identifying, and hyperlinking features

Selecting features by attribute Creating reports Joining and relating tables Joining tables Relating tables Analyzing feature relationships Selecting features by location Using location queries Combining attribute and location queries Preparing data for analysis Dissolving features Creating graphs Clipping layers Exporting data Analyzing spatial data Buffering features Overlaying data Calculating attribute values Projecting map data Projecting map data on the fly Defining a map projection Creating and editing data Building geodatabase Creating and using a personal geodatabase Creating different feature classes Adding fields and domains Creating features Drawing features Using feature construction tools Editing features and attributes Modifying and deleting features Splitting and merging features Editing feature attribute values Geocoding addresses Creating an address locator Matching addresses Rematching addresses and correcting errors Presenting data Making maps from prepared templates Opening an existing map template Adding x,y, and z data to a map Drawing customized graphics on a map Making maps for presentation Laying out the map display page Adding a legend, title, and text boxes Adding a north arrow, scales, and sources Customizing with graphics and printing options Introduction to GIS modeling techniques Designing and creating a model Starting a model Building out a model Enhancing and customizing a model

## Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

## Instructional Techniques

1. Lecture
2. Audio/Visual demonstrations
3. Laboratory assignments illustrating lecture topics
4. Collaborative assignments and peer reviews
5. Handouts/review of current GIS literature and applications

## Reading Assignments

Textbook chapters Handouts and other supplemental reading related to course content

## Writing Assignments

Essays or final projects In-class writing assignments Written data analysis and interpretation

## Out-of-class Assignments

Observations and data collection related to course content Homework related to course content Completing mapping and data analysis exercises Completing final projects

## Demonstration of Critical Thinking

Relate concepts learned in the course to real-world phenomena using GIS tools demonstrated through course assignments. Evaluate and interpret spatially-referenced data Assess and implement the most effective ways to display and analyze spatial relationships using GIS

## Required Writing, Problem Solving, Skills Demonstration

Organize data and construct maps to display and analyze spatial interactions Hypothesize and predict spatial interactions based on spatially-referenced social and environmental information Written

analysis and interpretation of maps and spatial data. Final project demonstrating introductory knowledge and application of GIS.

## Eligible Disciplines

Geography: Masters degree in geography OR bachelors degree in geography AND masters degree in geology, history, meteorology, or oceanography OR the equivalent OR see interdisciplinary studies. Masters degree required.

## Textbooks Resources

1. Required Law, M. Collins, A.. Getting to Know ArcGIS Desktop, 6th ed. Redlands, CA: ESRI Press, 2021
2. Required Gorr, W.L. Kurland, K. GIS Tutorial for ArcGIS Desktop 10.8, ed. Redlands: ESRI, 2020
3. Required Bolstad, P. GIS Fundamentals: A First Textbook on Geographic Information Systems, 6th ed. White Bear: Eider Press, Inc, 2019