

# GIST 53: ADVANCED GEOSPATIAL TECHNOLOGY & SPATIAL ANALYSIS

## Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2022
Units:	4
Hours:	2 lecture, 6 laboratory per week (96 total per quarter)
Advisory:	This is an advanced level course in GIS, and assumes in-depth understanding of GIST and data structures and fluency using industry standard software; successful completion of the following courses strongly recommended: GEOG 11 or GIST 11, and GEOG 12 or GIST 12, and GIST 52.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

## Student Learning Outcomes

- Determine an appropriate approach to solving a problem using geospatial tools and methods.
- Organize the data sets resulting from analysis.
- Present the results of a geospatial analysis using appropriate terminology and visualizations.
- Run geoprocessing tools individually and implement a model to run several tools in sequence.
- Student will be able to prepare data for use in Geospatial analysis.

## Description

Introduction to problem-solving and decision-making using geospatial analysis techniques, applicable to a range of disciplines.

## Course Objectives

The student will be able to:

1. Prepare data for use in analysis.
2. Determine an appropriate approach to solving a problem using geospatial tools and methods.
3. Run geoprocessing tools individually and implement a model to run several tools in sequence.
4. Organize the data sets resulting from analysis.
5. Present the results of a geospatial analysis using appropriate terminology and visualizations.

## Course Content

1. Reviewing the basics of geospatial data
  - a. Data sources
  - b. Data types
  - c. Vector and raster data formats
  - d. Basic cartographic data presentation techniques
2. Introduction to geospatial analysis
  - a. Database joins
  - b. Classifying and displaying data with a variety of statistical methods
  - c. Presenting results as graphs and maps
3. Using advanced attribute and spatial queries for data exploration
  - a. Metadata and data dictionaries
  - b. Formulating queries
  - c. Types of selections
4. Using advanced attribute and spatial queries for data exploration
  - a. Fundamentals of coding for advanced analysis operations
  - b. Integrating machine learning tools to GIS analysis
  - c. Using GIS to build models
5. Vector data analysis
  - a. Overlay techniques
  - b. Creating a site selection model
  - c. Networks and network analysis
6. Building an automated model
  - a. Uses and applications of models
  - b. Planning and implementing models
7. Raster data analysis: working with topographic data
  - a. Topographic data
  - b. Viewshed analysis for site selection
  - c. Reclassification
  - d. Map algebra
  - e. Hydrographic data
  - f. Density surfaces
8. Database design and schema implementation
  - a. Subtypes
  - b. Default values
  - c. Importing existing database schema

## Lab Content

1. Reviewing the basics of geospatial data
  - a. Acquiring data
  - b. Formatting data
  - c. Reprojecting data and transforming coordinate systems
  - d. Vector and raster data formats
  - e. Basic cartographic data presentation techniques
2. Introduction to geospatial analysis
  - a. Database joins
  - b. Classifying and displaying data with a variety of statistical methods
  - c. Presenting results as graphs and maps
3. Using advanced attribute and spatial queries for data exploration
  - a. Using metadata and a data dictionary
  - b. Formulating queries
  - c. Selection by location

4. Using advanced attribute and spatial queries for data exploration
  - a. Using data dictionaries to interpret attribute tables
  - b. Formulating Boolean queries
  - c. Selection by location
  - d. Buffering
  - e. Implementing a model
5. Vector data analysis: overlay techniques
  - a. Union
  - b. Intersect
  - c. Converting from coverage format to modern GIS data format
6. Vector data analysis: creating a site selection model
  - a. Proximity analysis using line and polygon buffering
  - b. Geospatial data model flow charts
  - c. Creating a model that satisfies multiple location criteria
7. Vector data analysis: network analysis
  - a. Building topology
  - b. Network routing
  - c. Modeling of network impedance
  - d. Generating service areas
8. Building an automated model
  - a. Setting environmental settings prior to running the model
  - b. Setting model parameters in order to later model inputs
  - c. Implementing a multi-step model using automation tools
  - d. Exporting and editing model script
9. Raster data analysis: working with topographic data
  - a. Using elevation data to create slope, aspect, and hillshade surfaces
  - b. Analyzing an environmental issue using elevation derived data sets
  - c. Reclassifying raster data
  - d. Map algebra
  - e. Viewshed analysis for site selection
10. Raster data analysis: working with hydrographic data
  - a. Generating stream flow direction using accumulation surfaces
  - b. Creating watersheds based on topographic data
  - c. Using hydrographic data to analyze a scientific question
11. Raster data analysis: density surfaces
  - a. Interpolating density surfaces from point data
  - b. Converting between vector and raster formats
12. Database design and schema implementation
  - a. Subtypes
  - b. Default values
  - c. Importing existing database schema

## Special Facilities and/or Equipment

Access to industry standard geospatial software and a computer with an internet connection.

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Labs  
Exams

Portfolio

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture presentations and classroom discussion  
Demonstrations and hands-on exercises  
Laboratory exercises  
Reading assignments

## Representative Text(s) and Other Materials

Bolstad, Paul. [GIS Fundamentals: A First Text on Geographic Information Systems, 6th ed.](#) 2019.

## Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Weekly reading assignments from text and outside sources ranging from 30-60 pages per week.
2. Weekly lecture covering subject matter from text assignment with extended topic information. Class discussion is encouraged.
3. Hands-on exercises and demonstrations: Weekly computer labs. Each exercise covers assigned reading and lecture topics.

## Discipline(s)

Geography or Drafting/CADD or Environmental Technologies or Forestry/  
Natural Resources