Lassen Community College Course Outline

GIS 4 – Spatial Analysis 3.0 Units

I. Catalog Description

This course covers the advanced and specialized topic of spatial analysis, in relation to Geographic Information Systems (GIS). Spatial analysis examines the spatial relationships of features in geospatial data, such as patterns, trends, connections, etc. GIS-based spatial analysis techniques are covered extensively for both vector and raster data models. A heavy emphasis is placed on using spatial analysis operations to aid in geospatial problem-solving scenarios as well. Geospatial modelling is a key component of the course, also. This course has been approved for online and hybrid delivery.

Prerequisites: Grade of "C" or higher in both GIS 1 and GIS 2.

Recommended Preparation: Students will need basic computer skills, and a strong and reliable Internet connection, to successfully attend this course.

Transfer Status: CSU/UC
34 hours lecture, 68 hours outside of class, 51 hours laboratory, 153 Total Hours of Instruction
Scheduled: Fall and Spring semesters

II. Coding Information

Repeatability: Not Repeatable, Take 1 Time
Grading Option: Graded or Pass/No Pass
Credit Type: Credit - Degree Applicable
TOP Code: 2206.10

III. Course Objectives

A. Course Student Learning Outcomes

Upon completion of this course the student will be able to:

1. Exercise Map Algebra calculations, via a Raster Calculator approach, to process raster data and derive end results.
2. Develop an effective GIS-based model that will process data in a sequence of geoprocessing steps to arrive at a final modeled result.

B. Course Objectives

Upon completion of this course the student will be able to:

1. Describe various types of spatial analyses conducive to GIS, as well as their appropriate uses.
2. Compile and prepare geospatial data for use in various geoprocessing analyses.
3. Determine proper protocol for choosing geoprocessing tools, whether individually or in a sequence of operations, to best serve a specific analysis-based scenario.
4. Employ basic vector-based geoprocessing tools and operations on geospatial data to help answer questions about the data.
5. Exercise Map Algebra calculations, via a Raster Calculator approach, to process raster data and derive end results.
6. Develop an effective GIS-based model that will process data in a sequence of geoprocessing steps to arrive at a final modeled result.

7. Manage and structure derived analysis outputs (i.e., data and information).
8. Adequately portray results of a modeled analysis application.

IV. Course Content

A. Outline of Topics

1. Spatial Analysis Introduction
    a. What is spatial analysis
    b. Geographic questions related to spatial analysis
    c. Patterns, trends, and connectivity
    d. Advantages and disadvantages of automated processing
    e. Spatial analysis data preparation
2. Geospatial Data Examination
    a. Queries – Spatial- and attribute-related
    b. Selections
    c. Find and replace tools
    d. Joins and relates
3. Basic Vector-based Analyses
    a. Extraction tools
    b. Overlay tools
    c. Buffering tools
4. Advanced Vector-based Analyses
    a. Network analysis
    b. Hot Spot analysis
    c. 3D analysis
5. Raster-based Analyses
    a. Terrain modeling
    b. Map Algebra and Raster Calculator
    c. Viewshed analysis
    d. Site Selection analysis
    e. Hydrographic analysis
    f. Spatial Interpolation
    g. Density and Distance analysis
6. Geospatial Data Modeling
    a. What is ModelBuilder
    b. Model design and construction
    c. Model implementation
    d. Model quality and assurance
    e. Interpreting model results
7. Spatial Analysis Results
    a. Interpreting analysis results
    b. Documenting analysis methodology
    c. Metadata incorporation
    d. Hardcopy and digital visuals and products

V. Assignments

A. Appropriate Readings

Additional readings may be assigned by the instructor, which will likely include information directly from the GIS software manufacturer of the GIS software that will

be used in this course. The software manufacturer's name is Esri (https://www.esri.com/en-us/home).

B. Writing Assignments
Two research-based short papers will be required in this course, with each covering a current topic associated with a GIS theme that is specific to spatial analysis, which the instructor will choose during the time of instruction.

C. Expected Outside Assignments
It is expected that for a typical week of the course, a student will spend approximately one hour on lecture material, 1 – 2 hours on reading material, 3 – 4 hours on lab exercise material, and an additional 1 – 2 hours on discussions, engagement with other students or instructor, etc.

D. Specific Assignments that Demonstrate Critical Thinking
Discussions (usually every week), quizzes (approximately every other week), research papers (two throughout the course), exams (mid-term and final exams), and lab exercises (usually every week).

VI. Methods of Evaluation

Traditional Classroom Instruction
Term paper (topic choice, thesis statement, outline, bibliography, rough draft, final draft), homework, classroom discussion, essay, journals, lab demonstrations and activities, multiple choice quizzes, and participation

Online Evaluation
A variety of methods will be used, such as: research papers, asynchronous and synchronous (chat/forum) discussions, online quizzes and exams, posting to online website and email communications using the districts approved learning management system

Hybrid Evaluation
All quizzes and exams will be administered during the in person class time. Students will be expected to complete online assignments and activities equivalent to in class assignments and activities for the online portion of the course. Electronic communication, both synchronous and asynchronous (chat/forum) will be evaluated for participation and to maintain effective communication between instructor and students.

VII. Methods of Delivery

Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee.

X Traditional Classroom Delivery Correspondence Delivery

X Hybrid Delivery **X** Online Delivery

Traditional Classroom Instruction
Lecture, discussion, audio/visual aids, demonstration, group exercises, guest speakers, lab, individualized programs and other as needed.

Online Delivery

A variety of methods will be used, such as: research papers, asynchronous and synchronous (chat/forum) discussions, online quizzes and exams, posting to online website and email communications using the districts approved learning management system.

Hybrid Delivery
Hybrid modality may involve face to face instruction mixed with online instruction. A minimum of 1/3 of instruction, including 100% labs, will be provided face to face. The remaining hours will be taught online through a technology platform as adopted by the district.

VIII. Representative Texts and Supplies

Geospatial Analysis, 6th edition, 2020 update, de Smith et. Al., ISBN = 9781912556038.
Free version online as well: https://www.spatialanalysisonline.com/HTML/index.html

IX. Discipline/s Assignment

Forestry/Natural Resources, Drafting/CADD, Geography, Engineering Support

X. Course Status

Current Status: Active
Original Approval Date: 05/05/2020
Course Originator: Charles Shoemaker
Board Approval Date: 06/09/2020
Chancellor's Office Approval Date: 06/30/2020
Revised By:
Curriculum/Academic Standards Committee Revision Date: 10/3/2023
Reviewed for IPR, no changes recommended: 03/15/2022