NRM 87 Course Outline as of Fall 2024

CATALOG INFORMATION

Dept and Nbr: NRM 87 Title: GIS APPLIC IN NAT RESRC
Full Title: Geographic Info. Systems Applications in Natural Resources
Last Reviewed: 12/12/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade or P/NP
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
Students will explore the use of Geographic Information Systems (GIS) to analyze and interpret natural resources data, and to solve common conservation problems. This course introduces the value and uses of GIS software, with an emphasis finding and evaluating the quality and fitness of published data sources, applying GIS overlay and proximity analysis tools to subject data, and preparing maps for publication and presentation of findings. Conservation topics include the analysis of habitat for endangered species, visualization and assessment of watershed health, and analysis of the potential impact of human activities on natural resources under a land manager’s stewardship.

Prerequisites/Corequisites:

Recommended Preparation:
Course Eligibility for GIS 40

Limits on Enrollment:

Schedule of Classes Information:
Description: Students will explore the use of Geographic Information Systems (GIS) to analyze

and interpret natural resources data, and to solve common conservation problems. This course introduces the value and uses of GIS software, with an emphasis finding and evaluating the quality and fitness of published data sources, applying GIS overlay and proximity analysis tools to subject data, and preparing maps for publication and presentation of findings. Conservation topics include the analysis of habitat for endangered species, visualization and assessment of watershed health, and analysis of the potential impact of human activities on natural resources under a land manager's stewardship. (Grade or P/NP)
Prerequisites/Corequisites:
Recommended: Course Eligibility for GIS 40
Limits on Enrollment:
Transfer Credit: CSU;
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**			Effective:	Inactive:
CSU GE:	**Transfer Area**			Effective:	Inactive:
IGETC:	**Transfer Area**			Effective:	Inactive:
CSU Transfer:	Transferable	Effective:	Fall 2002	Inactive:	
UC Transfer:		Effective:		Inactive:	

CID:

Certificate/Major Applicable:
Both Certificate and Major Applicable

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Use Geographic Information Systems (GIS) to analyze and interpret natural resources data.
2. Analyze GIS data and make recommendations to guide conservation planning.

Objectives:
At the conclusion of this course, the student should be able to:
1. Demonstrate the use of a basic GIS software tools, data structures, and reporting capability.
2. Understand the concept of "Green Infrastructure" and the quality of habitat in different locations across the United States.
3. Access authoritative web sites and source data to determine their value in analyzing habitat for threatened or endangered species.
4. Calculate acreages and predict changes in wildland resources over time and space, due to natural or anthropogenic sources, using authoritative GIS data.
5. Compare State and Federal Watershed classification systems and use published data to visualize and analyze local watershed conditions.
6. Determine and discuss the effects of road density on competing watershed values.
7. Examine the nature of and map the extent of human activities (e.g., land use, stream blockages, etc.) that may be incompatible to threatened or endangered species within the watershed.

8. Identify vegetative characteristics (e.g., native vs. invasive species, physiognomy, and areal extent) that may benefit or be detrimental to threatened or endangered wildlife species.
9. Perform GIS overlay analysis on habitat, watershed, and species data in a target watershed in Sonoma County and publish the results as an analog (i.e., paper) thematic map or a web-based thematic map.

Topics and Scope:

I. Introduction to Geographic Information Systems (GIS)
A. Basic terminology and computer operation
B. Uses and objectives of spatial data systems
C. Working with industry-standard GIS software products such as ArcGIS Online and ArcGIS Professional to explore and visualize data
D. Developing a project geodatabase to assemble data drawn from disparate sources into a common coordinate system and datum.
E. Using appropriate overlay and proximity analysis tools to understand the potential relationships between natural resource data and human activities.
II. Analysis of Habitat Loss for Endangered Species
A. Understand the Endangered Species Act and the difference between threatened, endangered, and species of concern.
B. Understand the roles and responsibilities of different agencies mandated with tracking, managing, and protecting threatened and endangered species.
C. Identify authoritative data sources used by State and Federal agencies for monitoring threatened and endangered species and critical habitat.
D. Explore and evaluate the level of fitness of different data sources for answering questions about species habitat and/or distribution.
E. Apply concepts learned toward evaluating the habitat and range of a target threatened or endangered species (e.g., salmonid species).
III. Assessing Data Quality
A. Display and use of authoritative data to analyze a target resource problem (e.g., potential blockages to salmonid migration upstream).
B. Evaluation of multiple GIS data layers from different agencies to determine the most appropriate data source to address the research question.
C. Display and use of orthophotography and/or Light Detection and Ranging (LiDAR) to assess ground conditions within a watershed.
IV. Watershed Analysis
A. Use of authoritative State and Federal data to delineate watershed boundaries.
B. Understand the flow of energy in a watershed, the types of work performed by a stream (e.g., erosion, deposition, and transport), and the resulting landforms created.
C. Thematically analyze road networks that threaten stream habitats
V. Environmental Analysis of a Local Sonoma County Watershed
A. Create a project geodatabase showing conditions for the target watershed.
B. Analyze the extent and characteristics of landforms and vegetation within the target watershed.
C. Analyze the extent of human activity within the target watershed.
D. Identify the proximity of species distribution to critical habitat conditions and human activity.
E. Identify land parcels meeting target criteria for conservation, owner outreach, education, field monitoring, and effective ongoing stewardship.

All topics are covered in the lecture and lab portions of the course

Assignment:

1. Weekly reading (25-30 pages)
2. Develop GIS projects based on geodatabases and project files (3-6) containing the following:
   A. Feature data, attribute data, charts and graphs, map layouts or web maps, and model diagrams
   B. The tools needed to develop resource development plans and identify environmental constraints to threatened or endangered species
3. Executive summary assignment (1 page) to be presented with a GIS project.
4. Quizzes (3-6)
5. Midterm and final exam

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Executive summary assignment	Writing 5 - 10%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

GIS projects	Problem solving 20 - 25%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

GIS projects	Skill Demonstrations 30 - 35%

Exams: All forms of formal testing, other than skill performance exams.

Quizzes; midterm and final exam.	Exams 25 - 35%

Other: Includes any assessment tools that do not logically fit into the above categories.

Participation	Other Category 5 - 10%

Representative Textbooks and Materials:

GIS Fundamentals: A First Text on Geographic Information Systems. 6th ed. Bolstad, Paul. XanEdu Publishing Inc. 2019.
Land Resource Management Using Remote Sensing and GIS. Manickam, Lalitha. Lambert Academic Publishing. 2015 (classic).
Introductory Geographic Information Systems. John R. Jensen and Ryan R. Jensen. Pearson Publishing. 2013 (classic).
Geographic Information Systems and Environmental Modeling. Clarke, Keith and Parks, Bradley and Crane, Michael. Pearson. 2001 (classic).

Managing Natural Resources with GIS. Lang, Laura. Esri Press. 1998 (classic).
Instructor prepared materials