Discipline: Agriculture	Sub-discipline: Forestry/Natural Resources
General Course Title: **Geographic Information Systems and Remote Sensing**	Min. Units: **3 Semester**
	Proposed Suffix: **L**

Course Description:
This course examines the theory behind Geographic Information Systems (GIS), Remote Sensing and Global Positioning Systems (GPS) and their application to spatial data collection and analysis. Remote sensing technology will be used to interpret, recognize and delineate vegetation types, forest cover types, land management practices, wildlife habitat, water resource management and other significant environmental parameters. Students map and spatially analyze these landscape features using computerized GIS.
Laboratory required.

Required Prerequisites or Co-Requisites[1]

Advisories/Recommended Preparation[2]

Course Objectives: *At the conclusion of this course, the student should be able to:*

- Identify the elements of geographic information system (GIS) and global positioning system (GPS)
- View and perform queries on existing GIS layers.
- Manipulate GIS attribute tables.
- Produce a map from GIS themes.
- Recognize and delineate forest and other vegetation types, wildlife habitat elements, and other environmental variables on panchromatic, color, and color infrared aerial images.
- Determine scale, area, and relief displacement on various topographic maps and aerial photographs
- Understand concepts behind satellite remote sensing and microwave radar imaging
- Navigate in the field using orienteering equipment such as hand compass, GPS receiver, topographic maps and aerial photographs or satellite imagery
- Evaluate map projections, datum and related characteristics in terms of their function, common types, and their effect on map accuracy
- Distinguish characteristics of geospatial technologies, along with essential concepts and range of applications. Employ a global position systems (GPS) and survey methods for the capture of geographic data for mapping

1. Course Content: Basics of Geographic Information Systems
   a. Spatial and attribute data
   b. Raster and vector data representation
   c. Database design
   d. Creating map layouts

2. Maps and Geographic Representation
   a. Geographic perception
   b. Types of maps, past and present
   c. Maps as tools for meeting the needs of society and environment
   d. Maps as tools of authority, power, control and inequality

3. Maps Accuracy, Precision and Measurement
   a. Scale and its representation
   b. Coordinate systems
   c. Partitioning systems
   c. Map projections and datums
   d. Orientation and direction

[1] Prerequisite or co-requisite course need to be validated at the CCC level in accordance with Title 5 regulations; co-requisites for CCCs are the linked courses that must be taken at the same time as the primary or target course.
[2] Advisories or recommended preparation will not require validation but are recommendations to be considered by the student prior to enrolling.

4. Geographic data and its collection
   a. Plane surveying
   b. Global positioning system
   c. Digitizing form imagery
   d. Tabular data and statistics
   e. Precision, accuracy and errors

5. Map representation
   a. Cartographic Principles
   b. Feature representation and abstraction
   c. Data classification
   d. Landscape visualization and 3D rendering

6. Image and Photo Interpretation
   a. Aerial photos and photogrammetry
   b. Principles of remote sensing
   c. Feature interpretation, physical and cultural
   d. Types of imagery
   e. Image resolution
   f. Image manipulation and enhancement

7. Geographic Information Systems
   a. Maps, projections, geographic relationships
   b. Database concepts, query, spatial query
   c. Software to enable the connection between location and attributes, topology

8. Physical Basis For Remote Sensing
   a. E-M Radiation
   b. Atmospheric Effects
   c. Energy-Matter Interaction: spectral reflectance, absorption, transmission
   d. Four kinds of resolution: spatial, spectral, radiometric, temporal

Laboratory Activities: Individual Laboratory Activities are designed to support course objectives.

Methods of Evaluation: Lecture	Methods of Evaluation: Laboratory
Comprehensive Quizzes and Exams	Laboratory Skill Validation by Observation
Written Critical Thinking Scenarios	Laboratory Reports
Problem Analysis and Solution	Laboratory Research Projects and Reports
Research and Term Papers	Laboratory Skill Practicum Exams

Typical Textbooks, Manuals, or Other Support Materials

Getting Started with GIS. Clarke, Keith. Latest Edition. Prentice Hall.
Geographic Information Systems and Environmental Modeling, Clarke, Keith, Bradley O. Parks, Brad E. Parks, Michael P. Crane. Latest Edition.. Prentice Hall
Getting to Know ArcView GIS. ESRI. Latest Edition.. ESRI Press.
Managing Natural Resources With GIS, Lang, Laura. Latest Edition. Environmental Systems Research Institute, Inc.
Map Use: Reading, Analysis and Interpretation, 4th Edition. Muehrcke et al. Latest Edition. Prentice Hall.
Aerial Photography and Image Interpretation. Paine, David P. and James D. Kaiser. Latest Edition. John Wiley and Sons.

Statewide Articulation: Currently articulated to universities as specific equivalent by individual community colleges, additional statewide course equivalency articulation currently underway, also currently transfers as lower division elective

FDRG Lead Signature: Date:

Mark E. Bender, PhD CSU Stanislaus

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