GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95020

**Course Outline**

Course: BIO 30 Division: 10 Also Listed As: GEOG 30

Term Effective: 200930, INACTIVE COURSE

Short Title: REMOTE SENSING

Full Title: Remote Sensing of Earth's Resources

| Contact Hours/Week | Units | Number of Weeks | Total Contact Hours |
|---|---|---|---|
| Lecture: 3 | 3 | 17.34 | Lecture: 52.02 |
| Lab: 0 | | | Lab: 0 |
| Other: 0 | | | Other: 0 |
| Total: 3 | | | Total: 52.02 |

Credit Status: D - Credit - Degree Applicable

Grading Modes: L - Standard Letter Grade

Repeatability: Repeatability: N - Course may not be repeated

Schedule Types: 02 - Lecture and/or discussion

Course Description:

An overview of the acquisition and utilization of remote sensing data. The course will cover basic physics of optics; basics of film and photography; remote sensing platforms; types of equipment and analysis of data. Emphasis will be on aerial and satellite image acquisition and interpretation. This course is also listed as Geography 30.
ADVISORY: English 1A, Mathematics 205, Computer proficiency recommended.

ARTICULATION and CERTIFICATE INFORMATION
Associate Degree:
CSU GE:
IGETC:
CSU TRANSFER:
Transferable CSU, effective 199930
UC TRANSFER:
Not Transferable

PREREQUISITES:

COREQUISITES:

STUDENT LEARNING OUTCOMES:
1. Students will be able to choose proper type of remote sensing instrument and platform to analyze a given feature or phenomenon.
2. Students will be able to use stereopairs of airphotos to make basic photogrammetric measurements.
3. Students will be ale to demonstrate an understanding of the basic physics of optics and electromagnetic radiation.
4. Students will be able to discuss the differences, strengths, and weaknesses of various remote sensing instruments and platforms.
5. Students will be able to explain how photographic images are acquired.

TOPICS AND SCOPE:
Inactive Course: 12/08/2008
1 3 Introduction:
Remote sensing defined.
Electromagnetic radiation - its properties and means of transfer.
The electromagnetic spectrum and its regions.
Types of radiation.
Transmission, reflection, scattering, absorption, skylight, and haze.
Albedo and spectral signatures.
Photography vs. image.
The "multi" concept.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems.
2 3 Cameras, Films, and filters
Types of aerial photos.
Types of aerial photography equipment.
Lens speed.
Angular field of view.
Ground distance.
Types, processing and uses of black and white film.
Types, processing and uses of color film.
Types and properties of photo products.
Resolution.
Film speed.
Panchromatic, normal color, black and white infrared, color intrared, ultra-violet and

additive color photographs.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems.

3 3 Principles of Airphoto Interpretation
Recognition elements and ground truth.
3-D photography and its acquisition.
Viewing photos with a stereoscope.
Classroom exercises involving the stereoscope and basic photo interpretation.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems which will include use of a stereoscope.

4 3 Principles of Photogrammetry
Scale and its calculation.
Image displacement.
Measurements possible from air photos.
Classroom exercises involving calculation of scale and use of displacement in the calculation of height of surface features and topography.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems which will include problems dealing with calculation of scale and height of surface features.

5-6 6 Airphoto Acquisition
Altitude and focal length.
Season and time of day.
Existing archives of airphotos and images.
Electro-opitical Sensors
Video cameras.
Across-track scanners.
Multi spectral scanners.
Thermal infrared scanners.
Image distortion.
Along-track sensors.
Thermal infrared and spectral distribution curves.
Internal thermal properties.
Environmental factors affecting radiant temperatures.
Differentiation of material types with thermal IR.
Uses of thermal IR images.
EO sensors in earth observation satellites.
National and international EOS programs.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems.

7 3 Microwave Sensors
Passive and active microwave sensors.
The principles of radar.
Side-looking aerial radar.
Resolution and detection.
Range and azimuth resolution.
Real aperture vs. synthetic aperture radar.

Multi channel SAR.
Shadows, foreshortening, return strength, image tone, surface slope, and surface roughness.
Specular and diffuse reflection.
Surface moisture.
Polarization.
Penetration of atmosphere and surface coverings.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems. A midterm exam will test mastery of all material to date.

8 3 Digital Image Processing

Characteristics and components of digital images.
Interactive and batch processing.
Restoration, enhancement and classification of images with computer programs.
Merging of data sets.
Classroom exercises with image processing programs.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems. An in-class quiz will test mastery of basic computer image processing techniques.

9 3 GIS and Land-Use Planning

Definition and demonstration of GIS.
Capabilities of GIS.
Technical elements of a GIS system.
Land use and land cover.
USGS hierarchical land and land cover classification system.
Uses of GIS.
Classroom exercises with GIS.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems. An in-class quiz will test mastery of basic GIS techniques.

10 3 Archaeological Applications

Use of remote sensing in archaelogy.
Shadow, soil and crop marks in site detection.
Site evaluation and mapping.
Site predicition.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems.

11 3 Agriculture and Soils

Remote sensing and large scale agricultural census and inventory.
Identification and classification of ag. land and crops.
Crop calenders.
Single date photos vs. multi-date photos.
Multi spectral analysis.
Identification and assessment of crop damage.
Soil surveys and evaluation of soil types.

Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems.
COURSE OBJECTIVES:
12 3 Hrs Forestry Applications
Remote sensing in forestry.
Classification of cover types and individual species.
Estimating tree volume and stand volume.
Estimation of floating round stock.
Detecting plant vigor and stress.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems.
13 3 Geological Applications
Compilation of topographic and geologic maps.
Mineral, hydrocarbon and water exploration.
Identifying hazardous features.
Lithology
Structures
Drainage
Landforms
Dip and strike
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems.
14 3 Engineering Applications
Surveys of construction materials.
Locating routes for transportation.
Selection of sites for dams, nuclear power plants and tunnels.
Investigations of landslides.
Surveys of disaster damage.
Investigation of water pollution.
Monitoring mine-disturbed land.
Inventories of stockpiles.
Student will demonstrate mastery of the above material by successfully completing assigned homework questions and problems.
15 3 Urban-Industrial Applications
Land-use and cover mapping.
Parking and transportation studies.
Environmental monitoring.
Real estate assessment.
Outdoor recreational surveys.
Evaluation of housing quality.
Damage surveys.
Planning for urban development.
Identification and classification of industrial features.
Calculaiton of storage tank capacities.
Student will demonstrate mastery of the above material by successfully completing assigned homework quesitons and problems.
16 3 Biological Applications

Ecotome identification and mapping.
Habitat location.
Community predictions.
Population census.
Development of oceanic surface phenomena.
Migration monitoring.
Student will demonstrate understanding of applica-
tions of remote sensing as presented in weeks 10-16
by completing a term paper reviewing utilization of
remote sensing as applied to a field of interest
to the student.
17 3 Review.
18 2 Final - The final exam will be comprehensive,
testing both the student's grasp of the
conceptual material from the entire semester and
the student's ability to apply basic
photogrammetric calculations.
ASSIGNMENTS:
Reading from the textbook will be assigned along with homework
problems and a term paper to meet the one-to-two out of class

METHODS OF INSTRUCTION:
Lecture, lecture demonstration, class exercises during lecture period.

REPRESENTATIVE TEXTBOOKS:
Avery & Berlin: ^uFundamentals of Remote Sensing and Airphoto^s
^uInterpretation^s, 1992, Prentice
or comparable college-level text.

SUPPLEMENTAL DATA:
Basic Skills: N
Classification: A
Noncredit Category: Y
Cooperative Education:
Program Status: 2 Stand-alone
Special Class Status: N
CAN:
CAN Sequence:
CSU Crosswalk Course Department: BIO
CSU Crosswalk Course Number: 30
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N
Occupational Course: E
Maximum Hours:
Minimum Hours:
Course Control Number: CCC000456065
Sports/Physical Education Course: N
Taxonomy of Program: 040100