

# STRANDS AND STANDARDS

## GIS REMOTE SENSING



### Course Description

This course is designed to introduce remote sensing of the environment through digital image processing (photography, multispectral scanning and microwave imagery) from airplane, satellite (Landsat), and manned-spacecraft data. The goal is to develop an understanding of inventorying, mapping, and monitoring earth resources through the measurement, analysis and interpretation of electromagnetic energy emanating from features of interest. Image interpretation, practical applications in earth science, and use of remotely sensed data in geographic information systems (GIS).

<b>Intended Grade Level</b>	9-12
Units of Credit	0.5
Core Code	35.02.00.00.090
Concurrent Enrollment Core Code	None
Prerequisite	Introduction to GIS
Skill Certification Test Number	Pending
Test Weight	0.0
<b>License Area of Concentration</b>	CTE and/or Secondary Education
<b>Required Endorsement(s)</b>	
Endorsement 1	Information Technology Systems
Endorsement 2	CAD Architectural Design
Endorsement 3	N/A

## STRAND 1

### Understand Basic Concepts of Remote Sensing.

#### Standard 1

Understand the big picture context of observing Earth with space-based instruments.

- Tell why people use satellites to study the Earth.
- Describe aspects of the Earth that can be observed using Earth observing satellites.
- Clarify the comparative values of high, moderate and coarse resolution for studying the Earth.
- Identify some of the ways people use one kind of satellite system, Landsat, for decision making in the domains of agriculture, climate, disasters, ecosystems and biodiversity, energy, forestry, urban planning, and/or water monitoring and management.

#### Standard 2

Explain elementary science and technology of remote sensing observations.

- Explain how remote sensing uses our knowledge of the electromagnetic spectrum.
  - Explain wavelength and wavelength range.
  - Explain how different kinds of surfaces interact with light.
  - Show where infrared light appears on the electromagnetic spectrum.
  - Explain the meaning of “spectral signature.”
  - Define “pixel.”
  - Define “digital image.”
  - Define spatial resolution.
  - Describe the polar orbit of Landsat.
- Describe characteristics of passive and active remote sensing systems (such as multispectral, LiDAR and Radar).
- Describe the difference between paper, digital, and Geographic Information System (GIS) and remote sensing maps.

## STRAND 2

### Collect Remote Sensing Data.

#### Standard 1

- Locate and download a Landsat scene from one of the two U.S. Geological Survey websites, Global Visualization Viewer (GloVIS) or Earth Explorer.
- Name one or more sources of free Landsat data.
- Using either GloVIS or Earth Explorer, identify the scene of interest.
- Give details about the scene based on the metadata
- Determine optimal dates for download.
- Download scene.
- Open scene in visible and false color band combinations using ImageJ (no cost) or Photoshop.
- Optimize image quality.

## STRAND 3

### Landsat Satellite Images - Find Features of Interest and Analyze Patterns.

#### Standard 1

Become familiar with Landsat satellite images.

- Identify land cover types (vegetation, water bodies, cities, suburbs, roads) in a satellite image.

- Identify ecosystems in a satellite image (forest, desert, wetland, and glacier).
- Identify specific cities, mountain ranges, islands, rivers, lakes, and other geographic landmarks in a satellite image.
- Find indications of disease or drought in a forest or agricultural area.
- Find evidence of a current or recent fire.

### **Standard 2**

Quantify changes in land cover time using printed images.

## **STRAND 4**

### **Use Remote Sensing Analysis Software (ImageJ).**

#### **Standard 1**

Download and become familiar with basic tools of ImageJ software.

- Become familiar with basic ImageJ toolbar.
- Understand pixel coordinates and values.
- Create and animate an image stack in order to compare the images.

#### **Standard 2**

Identify two ways that vector and raster data are different.

#### **Standard 3**

Quantify observations of digital images by making distance and area measurements in ImageJ.

- Spatially calibrate digital images (set the scale).
- Add a scale bar.
- Make area measurements.
- Perform image classification techniques such as supervised and unsupervised classification on remotely sensed data. [Do if possible with ImageJ; can be done with MultiSpec, also free.]

## **STRAND 5**

### **Explore Careers in Remote Sensing.**

#### **Standard 1**

Describe at least three careers that employ remote sensing.

#### **Standard 2**

Identify education needed to work in a remote sensing field at an introductory, intermediate, and advanced levels.

#### **Standard 3**

Identify remote sensing professional organizations and explain how participation in their conferences might support development of a specific career.

## STRAND 6

### Create a Remote Sensing Project.

#### Standard 1

Identify, plan, complete, and publish a local geo-spatial project.

- Identify a local problem to be solved.
- Compile background information on the project.
- Determine the time, scope, and resources needed for the project.
- Draft a workflow document.
- Plan a data inventory.
- Acquire data, organize, manage, and maintain data files.
- Analyze and interpret the information.
- Describe accuracy assessments (field data collection, other data collection) required for quality assurance.
- Finalize workflow document.
- Publish and present the project.

#### Performance Skills

- Expand content knowledge of geospatial concepts and location analytics.
- Create a full remote sensing project.
- Gain the skills necessary in today's tech-centric industry.

#### Workplace Skills

- Communication
- Critical Thinking
- Dependability
- Accountability
- Legal Requirements / Expectations

## Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions	
		1	2	3	4	5	6	7	8	9	10			