

**LAST REVIEW: 2009-10**

*(i.e. 2003-2004)*

**NEXT REVIEW: 2014-15**

*(i.e. 2008-2009)*

**STATUS: A**

*(A, I, D)*

**COURSE TITLE:** Remote Sensing and Applications

**COMMON COURSE NUMBER:** GIS 1030

**CREDIT HOURS:** 3

**CONTACT HOUR BREAKDOWN**

*(per 16 week term)*

**CLOCK HOURS:**

*(Voc. Course ONLY)*

Lecture: 48      Lab:

Clinic:              Other:

**PREREQUISITE(S):** Knowledge of Windows operating system

**COREQUISITE(S):** None

**PRE/COREQUISITE(S):**

**COURSE DESCRIPTION** *(750 characters, maximum)*: This course introduces basic concepts and fundamentals of remote sensing, image processing, and the global positioning system (GPS). The principles and processes involved in air photo interpretation will be reviewed and examined. Image processing techniques will be reviewed from practical and mathematical points of view. The course is intended to provide the student with the background information necessary to successfully use remotely sensed imagery and GPS in conjunction with GIS technology.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s):              Area

General Education Requirements – Associate in Science Degree (AS), meets Area(s):              Area

General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s):      Area

## **UNIT TITLES**

1. Fundamentals of Remote Sensing
2. Air photo Techniques and Interpretation
3. Satellites and Available Databases
4. Digital Images, Enhancement, and Processing
5. Principles of GPS
6. Integration of Remotely Sensed Data into GIS
7. Applications

**EVALUATION:** Upon successful completion of this course, the students should be able to understand the basic principles involved in the interpretation of remotely-sensed image data, describe the basic techniques utilized in data acquisition, and apply remote sensing and GPS to the development of land use/land cover classification.

## **UNITS**

### **Unit 1- Fundamentals of Remote Sensing**

#### **General Outcome:**

- 1.0 The student shall:** The students should be able to demonstrate a general understanding of remote sensing.

#### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 1.1 Describe the uses of remote sensing.
- 1.2 Describe how most remotely-sensed image data is obtained.
- 1.3 Discuss how the use of different image databases can help in environmental and urban planning.
- 1.4 Discuss energy sources and radiation principles involved in remote sensing.
- 1.5 Describe energy interactions in the atmosphere.
- 1.6 Describe energy interactions with earth surface features.
- 1.7 Discuss various methods of data acquisition and interpretation.
- 1.8 Discuss the use and importance of reference data.
- 1.9 Describe major applications.

**Unit 2- Air photo Techniques and Interpretation**

**General Outcome:**

- 2.0 The student shall:** The students should be able to utilize aerial photography to obtain information and interpret surface features for a GIS.

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 2.1 Describe the various types of aerial photography.
- 2.2 Explain photographic scale.
- 2.3 Explain digitizing and pixel resolution of aerial photography and relate to photographic scale.
- 2.4 Discuss scanning and types and availability of scanners.
- 2.5 Describe sources of geometric error in aerial photography.
- 2.6 Discuss the use of stereo photos.
- 2.7 Discuss the use of ortho photos.
- 2.8 Describe relationships between spatial and spectral resolutions.
- 2.9 Discuss the uses of panchromatic, color infrared, and true color aerial photography.
- 2.10 Discuss advantages of aerial photography over ground-based observation.
- 2.11 Describe the integration of aerial photography into GIS.

**Unit 3- Satellites and Available Databases**

**General Outcome:**

- 3.0 The student shall:** The students should be able to describe major imaging satellites and their instruments, discuss new satellite instrument capabilities, and determine the most appropriate source of data for GIS application.

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 3.1 Describe the optical path layout of remote sensing satellite instrumentation.
- 3.2 Discuss the differences in available spatial and spectral resolutions.
- 3.3 Discuss and describe types of data provided by various satellites.

**Unit 4- Digital Images, Enhancement and Processing**

**General Outcome:**

- 4.0 The student shall:** The students should be able to discuss digital images and describe methods of enhancement and processing.

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 4.1 Discuss different file formats of raster imagery.
- 4.2 Interpret image histograms.
- 4.3 Describe image contrast stretching.
- 4.4 Discuss image filtering such as smoothing and edge detection.
- 4.5 Describe level slicing.
- 4.6 Discuss atmospheric correction on imagery.
- 4.7 Describe radiometric correction.
- 4.8 Discuss geometric correction and resampling.
- 4.9 Discuss band ratios.
- 4.10 Explain the use of principal component analysis in image analysis.
- 4.11 Describe supervised and unsupervised image classifiers.
- 4.12 Explain the need for post-classification smoothing.
- 4.13 Discuss the implication and techniques of classification accuracy, both positional and thematic.
- 4.14 Discuss change detection.
- 4.15 Explain multisensor image merging.

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**Unit 5- Integration of Remotely Sensed Data into GIS**

**General Outcome:**

**5.0 The student shall:** The students should be able to demonstrate a general understanding of integrating remotely sensed data into GIS.

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 5.1 Explain the integration of classified results as a feature layer.
- 5.2 Discuss heads-up digitizing.
- 5.3 Discuss the generation of image maps.

**Common Course Number: GIS 1030**

**Unit 6- Principles of Global Positioning Systems (GPS)**

**General Outcome:**

**6.0 The student shall:** The students should be able to demonstrate a general understanding of the global positioning system and its application in GIS.

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 6.1 Describe global positioning systems.
- 6.2 Explain the generation, transmission, and information sent by Navigation Signals.
- 6.3 Describe the causes and significance of error in the GPS.
- 6.4 Discuss the types and capabilities of GPS receivers.
- 6.5 Describe selective availability.
- 6.6 Explain applications of GPS in GIS.

**Unit 7- Applications**

**General Outcome:**

- 7.0 The student shall:** The students should be able to discuss the basic remote sensing techniques and equipment utilized in environmental, forestry, geology, and urban applications.

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 7.1 Work in a group environment to bring a class project to completion.
- \*7.2 Design a basic algorithm for the calibration of radiance measurements.

\*Optional Outcome