

**SAN DIEGO COMMUNITY COLLEGE DISTRICT
MESA COLLEGE
ASSOCIATE DEGREE COURSE OUTLINE**

SECTION I**SUBJECT AREA AND COURSE NUMBER:** Geographic Information Systems 120**COURSE TITLE:** Introduction to Remote Sensing**Units: 4**
Letter Grade or Pass/No Pass Option**CATALOG COURSE DESCRIPTION:**

This course introduces students to the basics of remote sensing, characteristics of remote sensors, and remote sensing applications in academic disciplines and professional industries. Emphasis is placed on image acquisition and data collection in the electromagnetic spectrum and ~~data set manipulations~~. This course is designed for geographic information systems (GIS) students interested in imagery analysis.

REQUISITES:**Advisory:**

GISG 111 with a grade of "C" or better, or equivalent

FIELD TRIP REQUIREMENTS: May be required**TRANSFER APPLICABILITY:** Associate Degree Credit & transfer to CSU and/or private colleges and universities**TOTAL LECTURE HOURS:** 40 - 45**TOTAL LAB HOURS:** 72 - 81**STUDENT LEARNING OBJECTIVES:**

Upon successful completion of the course the student will be able to:

1. Define and describe remote sensing and explain its applications and history.
2. Define and describe basics of electromagnetic spectrum and interactions with various types of media.
3. Describe sensors and image acquisition methods.
4. Analyze and explain remote sensing purposes, advantages, and limitations.
5. Describe basic characteristics of remote sensing imagery.
6. Describe industry-specific image sources, ~~select appropriate collection methods, platforms and sensors.~~
- ~~7. Assess remote sensing in a variety of academic and applied fields.~~

SECTION II**1. COURSE OUTLINE AND SCOPE:****A. Outline Of Topics:**

The following topics are included in the framework of the course but are not intended as limits on content. The order of presentation and relative emphasis will vary with each instructor.

- I. Remote Sensing and GIS
 - A. Remote Sensing Defined
 - B. Applications of Remote Sensing
 - C. Basic Processes
- II. A brief history of remote sensing for earth observation
 - A. History of photography
 - B. Digital images
 - C. Evolution of platforms
 - D. Sensor Characteristics
- III. Remote Sensing Basics
 - A. Remote Sensing Data Collection
 - B. Remote Sensing Process
 - C. Earth Observations
 - D. Electromagnetic Radiation
 - E. Atmospheric Energy-Matter Interactions
- IV. Frame Captured Sensors and Line Scanners
 - A. Frame Capture
 - 1. Photographic Cameras
 - 2. Digital Cameras
 - 3. Videography
 - B. Scanners
 - 1. Across-track Scanners
 - 2. Along-track Scanners
 - 3. Hyperspectral Scanners
- V. Satellite-based Sensors in Visible and Infrared Wavelengths
 - A. Low-spatial Resolution Sensors
 - B. Medium-spatial Resolution Sensors
 - C. High-spatial Resolution Sensors
- VI. Active Sensors: Radar and Lidar
 - A. Active Microwave (RADAR) Remote Sensing
 - B. Radar Interferometry
 - C. Passive Microwave Radiometers
 - D. Lidar
 - 1. Lidar Principles
 - 2. Lidar-derived Vegetation Information
 - 3. Lidar-derived Urban Information
- VII. Sonar
 - A. Side-scan sonar
 - B. Multibeam sonar
 - C. Global Seafloor Topography
- VIII. Aerial Imagery – Visual Interpretation
 - A. Nature of Aerial Images
 - B. Ground Verification and Processing
 - 1. Control Points
 - 2. Ground Truthing
- IX. GIS Integration
 - A. Raster to Vector
 - B. Image Formats
- X. Remote Sensing Applications
 - A. Agriculture
 - B. Forestry
 - C. Geology
 - D. Oceanography
 - E. Archaeology
 - F. Military
 - G. Urban Infrastructure

B. Reading Assignments:

Reading assignments are required and may include but, are not limited to, the following:

- I. Assigned textbook related to remote sensing.
- II. Newsletters, such as:
 - A. ESRI ArcNews
 - B. ESRI ArcUser
- III. Professional journals, such as:
 - A. PE&RS (Photogrammetric Engineering and Remote Sensing Journal)
 - B. ArcNews
 - C. GIS World
- IV. Websites and Internet articles, such as:
 - A. ENVI and ENVI EX, <http://www.itvis.com>
 - B. ESRI website: <http://www.esri.com>
 - C. ESRI ArcLessons: <http://gis2.esri.com/industries/education/arcllessons/arcllessons.cfm>

C. Writing Assignments:

Writing assignments are required and may include, but are not limited to, the following:

- I. Write short answer responses given questions related to remote sensing.
- II. Document the workflow involved in acquiring and processing earth images for data analysis appropriate to intended users.
- III. Write and then present a final semester project, which includes a demonstration of problem solving and incorporates imagery acquisition, data processing and formal written presentation.

D. Appropriate Outside Assignments:

Outside assignments may include, but are not limited to, the following:

- I. Research current trends in remote sensing applications.
- II. Research Remote Sensing employment opportunities and related job skills as defined by the Geographic Information Systems & Technology Body of Knowledge.
- III. Attend user group meetings, conferences, and online training.
- IV. Interview a geospatial professional.
- V. Design an imagery analysis solution for a business or an organization.

E. Appropriate Assignments that Demonstrate Critical Thinking:

Critical thinking assignments are required and may include, but are not limited to, the following:

- I. Plan and model a workflow of image processing, including image acquisition, data download, digital data manipulation and imagery interpretation to achieve objectives using earth observation data.
- II. Research, analyze, and propose a workflow process to achieve a remote sensing image analysis goal.
- III. Evaluate the accuracy and effectiveness of completed remote sensing projects based on stated goals.

2. METHODS OF EVALUATION:

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

- I. Imagery analysis and image data processing assignments.
- II. Written responses on tests, quizzes, essay questions and assignments.
- III. Participation in class discussions, online chats, and group projects.
- IV. A culminating project presented in class.
- V. Class participation.

3. METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to, the following:

- * Lecture-Lab Combination
- * Computer Assisted Instruction
- * Audio-Visual

- * Collaborative Learning
- * Other (Specify)
- * Guest speakers

4. REQUIRED TEXTS AND SUPPLIES:

Textbooks may include, but are not limited to:

TEXTBOOKS:

1. Aronoff, Stan. Remote Sensing for GIS Managers, ESRI Press, 2005, ISBN: 9781589480810

MANUALS:

1. ITT Visual Information Solutions. ENVI-EX Online Tutorial, ITT Visual Information Solutions, 01-01-2010
2. ITT Visual Information Solutions. ENVI Online Tutorial, ITT Visual Information Solutions, 01-01-2010

PERIODICALS:

SOFTWARE:

1. ArcGIS. ESRI, 9.3 ed.
2. ENVI. ITT Visual Information Solutions, 4.7 ed.
3. ENVI-EX. ITT Visual Information Solutions, EX ed.

SUPPLIES:

1. Portable storage device, such as flashdrive or external memory.

PROPOSAL ORIGINATOR: Eileen Goff

CO-CONTRIBUTOR(S)

PROPOSAL DATE: 05/20/2010