

AC201 - Advanced Satellite Image Processing and Workflows

Course Duration: 7 Days

Training Fee: KSH 56,000 | USD 560

Course Registration: [Register Here>>](#)

1.0. Introduction

The recent past has experienced an increased availability of geospatial big data, which has partly been made possible by the dramatic reduction in satellite launch costs over the past two decades as well as emergence of low-cost nanosatellites and newer sensor technologies such as synthetic aperture radar and hyperspectral imaging. We are able to remotely retrieve data from the land or the ocean, coasts or the mountains, as well as from the atmosphere as a prerequisite for the study of various phenomena such as climatic change, the phenology trend, the changes in vegetation or many other environmental processes. The study of these phenomena is achieved by satellite image processing techniques.



1.1. Course Overview

This course looks into the theory, applications, and methods of digital image processing. We will explore the principles of electromagnetic radiation, satellite remote sensing platforms and sensors, image statistics extraction, radiometric and geometric correction, image enhancement, and thematic classification. Computer processing of digital satellite images will be a central part of the course. We will also process many different satellite image data sets ERDAS Imagine image processing software package. These data sets include Landsat MSS, TM, ETM+ and Sentinel.

1.2. Course Objectives

- To learn how to carry out Land use classification of Earth using satellite image
- To learn image Processing and analysis in depth
- To learn about Land use change Detection and generation of Accuracy assessment reports
- To know how to carry out land use modelling and prediction
- To understand the basics of Landsat Surface Reflectance Indices: NDVI, NDBI, NDWI
- To introduce learners to LiDAR and RADAR Imaging

1.3. Course Content/Outline

- i. **Introduction to Remote Sensing:** The core remote sensing concepts and definitions; EMR;
- ii. **Downloading Satellite Imagery:** The EarthExplorer, SAS Planet among other platforms;
- iii. **Satellite Image Analysis techniques:** Layer Stacking/Composite, Mosaicking, Sub-setting (Extraction by Mask)
- iv. **Image Restoration & Enhancement techniques:** Contrast enhancement - Calculation of a histogram; Linear stretching; Compare original and stretched images; Different linear

- stretch functions; Histogram equalization; Spatial enhancement - Low pass filters, Create and apply a user-defined low pass filter, High pass filters.
- v. **Image Preprocessing:** Correcting sensor errors, Geometric corrections and registration, atmospheric corrections, radiometric corrections; Dehazing.
 - vi. **Classification of remotely sensed imagery:** Feature identification, Training sites, Signatures, Supervised and Unsupervised Classifications
 - vii. **Time series/change analysis:** Land Use Land Cover Change detection, Image differencing and Thematic Change; Accuracy Assessment.
 - viii. **Land Use Change modelling:** Introduction to land use predictions using Community Viz Scenario 360.
 - ix. **Landsat Surface Reflectance Indices:** Normalized Difference Vegetation Index (NDVI); Normalized Difference Building Index (NDBI); Normalized Difference Water Index (NDWI)
 - x. **Introduction to RADAR Imaging and Analysis:** Radar Satellite images; Resolution; Atmospheric corrections.
 - xi. **Introduction to LiDAR Imaging and Analysis:** Definitions; Operating Principles; Sensors; Types of elevation data; characteristics of LiDAR data, LiDAR data products; LiDAR models and Point Clouds
 - xii. **Raster Dataset Analysis:** Surface interpolation; TIN and surface generation; Geo-statistics

1.4. Case Study: Analyzing and Processing Radar Satellite Imagery for Nairobi County

1.5. Expected Outcomes

By the end of this learning module, learners are expected to have:

- ❖ Ability to fully analyze, process and interpret Radar and LiDAR satellite images.
- ❖ Skills in image processing and expertise with a variety of software packages used by professionals in the field.

1.6. Training Material (Hardware and Software)

- ERDAS Imagine
- ENVI Software
- ArcGIS Desktop
- Community Viz
- A laptop/PC

1.7. Who should attend?

- Civil Engineers
- Water Resource Experts
- Student of GIS and Satellite Data Analysis
- Research Scholars
- GIS Analysts
- Geologists
- Environmentalists and Earth Scientists
- Urban and city Planners