This week, we will focus on remote sensing and Geographic Information Systems (GIS) integration. Remote sensing involves observing the Earth remotely via satellites and aerial vehicles and analyzing the data. In this course, what is remote sensing and its basic concepts, satellite images and aerial photographs, processing and analysis of remote sensing data, and integration of GIS and remote sensing data will be discussed.

1. What is Remote Sensing and its Basic Concepts

Remote sensing is a method of observing and measuring the earth's surface without direct contact. Data is collected and analyzed using various bands of the electromagnetic spectrum.

Remote Sensing Basic Concepts

Electromagnetic Spectrum: Rays of different wavelengths (visible, infrared, microwave, etc.) and the use of these rays.

Passive and Active Remote Sensing: Passive sensing collects data by reflecting sunlight, while active sensing uses its own energy (e.g., LIDAR, RADAR).

Resolution: The level of detail of remote sensing data (spatial, spectral, temporal and radiometric resolution).

Remote Sensing Process

Data Collection: Data collection via satellites and aircraft.

Data Processing: Processing and analyzing the collected data.

Data Interpretation: Making sense and using processed data.

2. Satellite Images and Aerial Photographs

Remote sensing is done through satellite images and aerial photographs. These images provide detailed and up-to-date data of large areas.

Satellite Images

Satellite Types: Earth observation satellites (e.g. Landsat, Sentinel), weather satellites, military satellites.

Imaging Systems: Multispectral, hyperspectral and panchromatic imaging systems.

Application Fields: Agriculture, forestry, urban planning, environmental monitoring, disaster management.

Aerial Photos

Photogrammetry: Technique involving geometric analysis and map making of aerial photographs.

Application Areas: Detailed topographic maps, city planning, infrastructure projects.

3. Processing and Analysis of Remote Sensing Data

Processing and analysis of remote sensing data enables raw data to be transformed into usable and meaningful information.

Data Preprocessing

Geometric Corrections: Removing images from geometric errors and placing them in the correct position.

Radiometric Corrections: Cleaning images from radiometric errors and bringing them to the correct brightness values.

Data Processing Techniques

Classification: Separating images into specific categories (e.g., water, forest, agricultural fields).

Change Detection: Detection of changes between images taken at different times.

Indices: Mathematical ratios used to determine properties such as vegetation, water, soil (for example, NDVI - Normalized Difference Vegetation Index).

Data analysis

Image Analysis Software: Software such as ENVI, ERDAS Imagine, eCognition.

Spatial Analyzes: Analyzing images together with GIS data (e.g. land use change).

4. Integration of GIS and Remote Sensing Data

Integration of GIS and remote sensing data enables more detailed and comprehensive analysis of geographic data.

Integration Methods

Data Layers: Using remote sensing data as GIS layers.

Joint Analyzes: Analyzing GIS and remote sensing data together (e.g., terrain classification and topographic analyses).