

Semester I

Paper 101: Fundamentals of Remote Sensing

Unit 1: Introduction to Remote Sensing

15 Lectures

- 1.1 Concept and Scope of Remote Sensing: Definitions, Process and Characteristics of Remote Sensing System, Advantages and limitations.
- 1.2 Concept of Electromagnetic Radiation (EMR): Wavelength-frequency-energy relationship of EMR, EMR Spectrum and its properties, EMR wavelength regions and their applications
- 1.3 Atmospheric windows, Interaction of EMR with matter, Spectral signatures.
- 1.4 Remote Sensing Scenario in Indian Context

Unit 2: Platforms, Sensors, Orbits

15 Lectures

- 2.1 Introduction: Sensor materials, Sensor System - Framing and Scanning System, Whiskbroom scanners, Push-broom scanners, Side Looking scanner
- 2.2 Types and Characteristics of Sensor: Imaging and non-imaging sensors, Active and passive sensors, Resolution of Sensors - Spectral, Spatial, Radiometric & Temporal, Scale, Mapping unit, Multi-band concepts and False Colour Composites
- 2.3 Remote Sensor Platforms and Satellite Orbits: Ground, Airborne and Space borne Platforms, Orbital Characteristics – Coverage, Passes, Pointing Accuracy, Geostationary, sun synchronous, shuttle orbit. Semisynchronous orbit (Molniya orbit) and Quasi-zenith satellite orbit
- 2.4 Historical development of satellites, Indian satellites

Unit 3: Aerial photography

15 Lectures

- 3.1 Historical Development and Fundamentals of aerial photography, Vertical and Oblique aerial photography, Classification of Aerial Film Cameras, Digital cameras, components of aerial Cameras, Camera Calibration, Photogrammetric Applications and Products
- 3.2 Scale, Geometry and Ground Coverage of Aerial Photographs, Area calculation & Flight Planning.
- 3.3 Binocular and Stereoscopic vision, Conditions for Stereovision, Photographic overlap, Image Parallax, Height determination from stereo pairs - Parallax Equation, Ground Control.
- 3.4 Co-ordinate Systems used in Photogrammetry, Relief distortion and Tilt distortions, Rectification, Ortho Rectification, Height determination from single photograph, Planimetric map compilation, Digital Elevation Model (DEM), Digital orthophotos.

Unit 4: Surveying and Global Positioning System

15 Lectures

- 4.1 Validation of data: importance of field survey, collection of ground truth, introduction to conventional field survey techniques: plane and geodetic surveying (Traversing, Triangulation and Levelling), Topographic, Cadastral, Engineering and Hydrographic surveys.
- 4.2 Surveying Instruments: Principles of using Plane Table, Principles of Prismatic Compass, Theodolite traversing, Utility of Total Station
- 4.3 Global Positioning System: Introduction, Satellite constellation, GPS signals and data, Geopositioning-Basic Concepts. NAVSTAR, GLONASS, Indian Regional Navigational Satellite System (IRNSS), Control Segment, Space Segments, User Segment, GPS Positioning Types- Absolute Positioning, Differential positioning

4.4 GPS Surveying Methods and Accuracy: Methods-Static & Rapid Static, Kinematic-RealTime Kinematic Survey- DGPS-GPS Data Processing and Accuracy, Factors AffectingGPS Accuracy, Reference Station: Selection of Reference Station, Reference Station Equipment: GPSreceiver, GPS antenna. Radio and its types, Radio Antenna

References:

1. Joseph, G. (2004): Fundamentals of Remote Sensing, Universities Press, Hyderabad, India
2. Lillesand, T. M., Kiefer, R. W. and Chipman, J. W. (2008): Remote Sensing and Image Interpretation, John Wiley & Sons, New Delhi
3. Sabins, F. F. (1996): Remote Sensing: Principles and Interpretation, W. H. Freeman and Company, San Francisco
4. Jensen, J. R. (2005): Introductory Digital Image Processing, Prentice Hall, New Jersey
5. Drury, S. A. (2001): Image Interpretation in Geology, Blackwell, Oxford
6. Campbell, J. (2002): Introduction to Remote Sensing, Taylor & Francis, London
7. Anji Reddy, M. (2008): Textbook of Remote Sensing and Geographic Information System, B.S. Publication, Hyderabad