Paper No- 13: Remote Sensing and GIS

Topic

Photogeology (4 Lectures)

Types and acquisition of aerial photograph.
Scale and resolution.
Principles of stereoscopy, relief displacement, vertical exaggeration, distortion.
Elements of airphoto interpretation.
Identification of sedimentary, igneous and metamorphic rocks and various aeolian, glacial, fluvial and marine landforms.

Remote Sensing (4Lectures)

Concepts in Remote sensing.
Sensors and scanners, Satellites and theircharacteristics.
Data formats- Raster and Vector

Digital Image Processing (16 Lectures)

Image Errors, Rectification and Restoration, FCC.
Image Enhancement, Filtering, Image Ratioing.
Image classification and accuracy assessment.
GIS integration and Case studies-Indian Examples.

GIS (10 Lectures)
Datum, Coordinate systems and Projection systems.
Spatial data models and data editing.
Introduction to DEM analysis.

GPS (2 Lectures)

Concepts of GPS; DGPS & RTK GPS.
Integrating GPS data with GIS.
Applications in earth system sciences.

Project Titles (extendable):

- Preparation of base map using aerial photo interpretation.
- Georeferencing the toposheet and satellite data to study various changes.
- Satellite image enhancement and indices calculation for various themes like vegetation, soil, water and glacial studies.
- Creating Land Use map from satellite data and study land use changes.

- Applications on DEM for morphometric analysis studies.

12 rounds of student presentations will be arranged in Groups on different topics covered under Theory

Practicals: (12 L)

Aerial Photo interpretation, identification of sedimentary, igneous and metamorphic rocks and various aeolian, glacial, fluvial and marine landforms.

Introduction to DIP and GIS softwares. Digital Image Processing exercises including

- Analysis of satellite data in different bands and interpret various objects on the base of their spectral signature
- Creating a FCC from raw data
- Registration of satellite data with a toposheet of the area
- Enhancing the satellite images
- Generating NDVI images and other image ratio and its interpretation
- Classification of images.
- DEM analysis: generating slope map, aspect map and drainage network map and its applications

Suggested Books:

1. Demers, M.N., 1997. *Fundamentals of Geographic Information System*, John Wiley & sons. Inc.
2. Hoffmann-Wellenhof, B., Lichtenegger, H. and Collins, J., 2001. *GPS: Theory & Practice*, Springer Wien New York.
3. Jensen, J.R., 1996. *Introductory Digital Image Processing: A Remote Sensing Perspective*, Springer- Verlag.
4. Lillesand, T. M. & Kiefer, R.W., 2007. *Remote Sensing and Image Interpretation*, Wiley.
5. Richards, J.A. and Jia, X., 1999. *Remote Sensing Digital Image Analysis*, Springer-Verlag.