Interdisciplinary Department of Remote Sensing and GIS Applications

M.Sc. (Remote Sensing & GIS Applications)

Semester IV

Session 2016-17

Credit 4

Paper-13

Application of Remote Sensing in Natural Resources

Unit-I

Types of natural resources: renewable and non-renewable. Renewable: wind, solar, water, forest, soil, Non-renewable: minerals, oil and gas, coal. Status and potential of renewable and non-renewable resources in India. Case studies and examples.

Unit-II

Soil classification, Soil types and Spectral signatures. Major soil types of India. Factors affecting Soil erosion, degradation and fertility. Application of remote sensing in soil type mapping, erosion assessment and degradation. forests, water. Degradation of natural resources (soil, forest, coal, water, minerals etc.) with specific reference to India. Causes and remedial measures in natural resources degradation. Government policies vis-a-vis natural resources. Case studies and examples from India.

Unit-III

Water resources depletion in India. Causes of water resources depletion. Application of remote sensing and GIS in monitoring and degradation of surface water resources. Spectral signatures of water and mapping water quality. Case studies and examples from India.

Unit IV

Forest resources of India. Degraded and non-degraded forest. Identification of forest categories on satellite data. Coal fields in India. Application of remote sensing in coal exploration-monitoring land and water degradation resulting from expansion of coalfields. Case studies and examples from India.

BOOKS RECOMMENDED:

Anji Reddy, M. 2004 : Geoinformatics for environmental management. B.S. Publications
**Interdisciplinary Department of Remote Sensing & GIS Applications**

**M.Sc. (Remote Sensing & GIS Applications)**

Session: 2016-2017

**Semester-IV**

Contact hours: 28  
Credits 2

**Paper-14**

**Hyperspectral Remote Sensing**

**UNIT I**


**UNIT II**

Atmospheric Interactions; Amount of Atmospheric Reflection; Amount of Atmospheric Absorption, Amount of Atmospheric Scattering, Atmospheric Transmission; Hyperspectral sensors; Hyperspectral data processing; Applications in geology: the VIS-SWIR range, the TIR range.

**UNIT III**

Information Extraction from hyperspectral Data, Data Vs information, Classification Style/Intent, Supervised and Unsupervised Classification, Feature Extraction, Whole pixel analysis - Spectral angle mapper, Spectral feature fitting; Sub-Pixel analysis – Linear spectral unmixing, Matched filtering.

**UNIT IV**


**Books Recommended:**


**Interdisciplinary Department of Remote Sensing & GIS Applications**

*M.Sc. (Remote Sensing & GIS Applications)*

Session: 2016-2017

**Semester-II**

Contact hours: 28  
Credits 2

**Paper 15**

**Digital Terrain Modeling**

**UNIT I:** Definition - Digital Terrain Model (DTM), Digital Elevation Model (DEM) and Digital Surface Model (DSM), Mathematical and Digital Models of the Land Surface; Digital Elevation Data Sources and Structures; DTM/DEM Production Methods; DEM Interpolation Methods; Early DEMs; Availability of Global and Regional DEMS.

**UNIT II:** Error and Uncertainties in DEM/DTM - Typology of Error (gross errors or blunders, systematic errors and random errors), Describing Errors (RMSE, ME and S); Sources of Error in DEMs (method of source data generation, processing and interpolation and terrain representation); Error Models; Error Propagation; Visualization of error; Error Correction and Fitness for Use; Optimization of DEM Resolution; DEM/DTM interpretation.

**UNIT III:** DEMs for Geomorphometric Analysis; Flow Direction Algorithms (D8, D∞); Surface derivatives (Slope, Aspect, Curvature, Hill Shade, Contours and Drainage); Basin Morphometry; Overview of Software Packages Used in Terrain Modeling - Terrain Modeling in ESRI Packages Terrain Modeling in SAGA, Terrain Modeling in MicroDEM, Terrain Modeling QGIS, Terrain Modeling in GRASS.

**UNIT IV:** Applications of DEMs: Terrain Analysis in Soil Mapping; Landslide and Slope Stability Analysis; Terrain Analysis in Hydrology; Landscape Studies; Landuse Classification and Predictive Vegetation Mapping; Effect of Data Source, Grid Resolution and Flow Routing on Topographic Attributes; Future Directions for Terrain Analysis.

**Books Recommended:**


Remote Sensing and GIS Applications in Geosciences-II

Unit-I
Distribution of Coal fields in India. Application of remote sensing and GIS in coal mining and exploration. Active and abandoned mines-impacts on the local environment. Case studies and examples from India

Unit-II
Oil and gas reserves in India. Terrain parameters and role of remote sensing in Oil and gas exploration. Integration of geological, geophysical and field data for oil and gas exploration.

Unit-III
Major and prominent mineral/ore deposits of Iron, manganese, copper, lead and zinc, aluminium and uranium. Application of remote sensing and GIS in mineral prospecting and exploration. Case studies and examples from India.

Unit VI
Digital image processing techniques in geological studies- lithological, structural, and landform analysis. Integration of remote sensing, field data and attribute data in GIS. Case studies and examples from India.

Suggested Books:

2. Remote Sensing and image interpretation by Lillesand and Keifer
5. Remote Sensing and Geographical Information System by Anji Reddy
6. Principal of Remote Sensing by P.J. Curran
Interdisciplinary Department of Remote Sensing and GIS Applications

M.Sc. (Remote Sensing & GIS Applications)

Session 2016-17

Semester IV

Elective (E-4)

Remote Sensing and GIS Applications in Water Resources-II

Unit-I

Surface water resources and Rainfall run off relationship. Mapping and assessment of surface water resources using satellite data. Location and site selection of water harvesting structures (check dams, percolation ponds, nala bunds etc.) in basins using remote sensing and GIS. Case studies and examples from India.

Unit-II

Strategies for watershed management. Watershed management practices. Application of remote sensing and GIS in assessing health of watersheds. Application of remote sensing and GIS in water logged areas. Case studies and examples from India.

Unit-III

Shrinkage of reservoirs and sediment yield using temporal satellite data Sediment yield index- role of remote sensing and GIS. Case studies and examples. Remote sensing applications in river valley projects.

Unit-IV

Application of remote sensing in drought monitoring and assessment- hydrological drought, agricultural drought and meteorological drought. CAPE and CADA missions of Indian government. Interlinking of rivers: prospects and challenges

BOOKS RECOMMENDED:

Anji Reddy, M. 2004 : Geoinformatics for environmental management. B.S. Publications
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M.Sc. (Remote Sensing & GIS Applications)

Session 2016-17

Semester IV

Elective (E-4)

Remote Sensing and GIS Applications in Land use Planning-II

Unit I:
Land use classification. Spectral signatures of various land use classes. Identification and delineation on satellite images. Land use and land cover differentiation.

Unit II:

Unit III:

Unit IV:
Land use land cover mapping from multi-temporal satellite data. Change detection analysis and change matrix. Drivers of land use change. Global land use land cover changes.

Suggested Books:
RLM-7 (Lab-7) (for paper 13 and E4) (2 credits)

Exercises related to natural resources degradation. Water, soil, forest. Mapping of degraded land, water scarce areas, water logged areas, forest degraded areas. Assessment of natural resources based on temporal data. Exercises on remote sensing and GIS applications in water resources, geosciences and land use.

RLM-8 (Lab-8) (for Papers 14 and 15) (2 credits)


RLM-9 (Lab-9)

Project Oriented dissertation (4 credits)

RLM-10 (Lab 10)

Presentation and Viva voce on project dissertation (2 credits)

Elective (E-4) (4 credits)

Remote sensing and GIS Applications in Geosciences-I
Remote sensing and GIS Applications in Water Resources-I
Remote sensing and GIS Applications in Land use planning-I

Open Elective: (4 credits)

Fundamentals of remote sensing & GIS