| Course Type | Course Code | Name of Course | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DE | NGPD503 | **Image Processing and Geographic Information System** | 3 | 0 | 0 | 3 |

| **Course Objective** |
|---|
| 1. Understanding of different satellite digital image<br>2. Processing, enhancement, classification and analysis of satellite digital image<br>3. Understanding different types of raster and vector data and their integration in GIS<br>4. Different application of remote sensing and GIS |
| **Learning Outcomes** |
| • Processing and analysis of Satellite digital Image and integration of different vector and raster data in GIS, and application of remote sensing and GIS. |

| Unit No. | Details of Lectures | Lecture Hrs. | Outcome |
|---|---|---|---|
| **1.** | Structure of Remote Sensing Images: Characteristics of digital image, pixel, digital number, resolution, Bands/layers. Level of data, Metadata, Data formats BIL, BSQ and BIP and type of data products: Fast format, super structure, GeoTIFF, HDF, CDF, MPH/SPH/DSR, SDTS. | **6** | Understanding raw satellite data |
| **2.** | Image Processing technique as applied to Satellite image data restoration, Pre-processing, Atmospheric corrections, image registration/ geo-referencing/ geometric correction, re-sampling, projection system, reduction, magnification, radiometric calibration, estimation of thermal image using Plank's law, contrast enhancement (linear and non-linear), histogram equalization, rationing, filtering in spatial and frequency domain and edge enhancement, convolution filtering : low-pass, high-pass filtering: mean, mode, zero-sum kernel: Pewitt, Sobel, Laplacian, user defined kernels etc. | **12** | Corrections applied to satellite image data and image enhancement |
| **3.** | Special transformation, principle component analysis and vegetation indices. Principle of thematic information extraction and image classification processes, supervised and unsupervised classification, principle of change detection, and image differencing. Hyper-spectral image analysis, Image Fusion. | **10** | Satellite digital image analysis |
| **4.** | Fundamentals of Geographic Information System (GIS): GIS-definition, terminology, functional elements of GIS, data structure, composition of raster and vector data model. Data acquisition, data input, data processing, | **8** | Detail concept of GIS |

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|---|---|---|---|
| | data management system, product and report generation. | | |
| **5.** | Interpretation and application of remote sensing and GIS in mineral, ground water, hydrocarbon and environmental management. Key elements of visual interpretation. Fundamental of geological interpretation of satellite imagery based on terrain and image elements. Identification and mapping of rock types including mapping of faults/folds and joints and other curvilinear and circular features as applicable for mineral and oil exploration. Photo linear, curvilinear and circular features and their significance, geological guides for mineral and oil exploration including surface alteration. Remote sensing applications in water resources and environmental impact assessment studies. | **6** | Different applications of RS and GIS |
| | **Total** | **42** | |

**Textbooks**


1. B. Bhatta.(2010) Remote Sensing and GIS. Oxford University press
2. Rafael C.G. and Woods R.E.(1992) Digital Image Processing


**Reference books**


1. John R. Jensen Digital Image processing: A Remote Sensing Perspective, Prentice- Hall, 2004
2. Floyd F. Sabins, Remote sensing: principles and interpretation