# Remote Sensing * - Web course

## COURSE OUTLINE

Introduction, Basic concepts of remote sensing, Energy sources and radiation principles, Energy interactions with atmosphere and earth surface features, Spectral reflectance curves, Polar orbiting satellites, Spectral, radiometric and spatial resolutions, Multispectral, thermal and hyperspectral sensing.

Digital Image Processing - Image restoration, Image enhancement and Information extraction, Image processing software, Digital Elevation Modeling, Sources of digital elevation data, Shuttle Radar Topographic Mission (SRTM) data, DEM for Slope, Aspect, Flow direction, Flow pathways, Flow accumulation, Streams, Catchment area delineation, Remote sensing applications for watershed management, Rainfallrunoff modeling, Irrigation management, Flood mapping, Drought assessment, Environment and ecology, Advanced Topics - Microwave remote sensing, sources of microwave data, Global positioning System (GPS).

## COURSE DETAIL

| Module | Sub-Module | Hours for Sub-Module | Total Hours |
|---|---|---|---|
| **1. Introduction and Basic Concepts** | Introduction, Basic concepts of remote sensing, Airborne and space born sensors, Passive and active remote sensing | 1 | 5 |
| | EMR Spectrum, Energy sources and radiation principles | 1 | |
| | Energy interactions in the atmosphere | 1 | |
| | Energy interactions with earth surface features, Spectral reflectance curves | 2 | |
| **2. Remote Sensing Systems** | Satellites and orbits, Polar orbiting satellites | 1 | 5 |
| | Spectral, radiometric and spatial resolutions, Temporal resolution of satellites | 2 | |

NP-TEL

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**http://nptel.iitm.ac.in**

Civil Engineering

**Additional Reading:**

1. 'Introduction to Remote Sensing - Principles and Concepts' by Paul J Gibson, Routledge - Taylor & Francis, 2000.
2. 'Introduction to Remote Sensing - Digital Image Processing and Applications' by Paul J Gibson and Clare H Power, Routledge - Taylor & Francis, 2000.

**Hyperlinks:**

1. http://civil.iisc.ernet.in/~nagesh/rs_gis.htm

**Coordinators:**

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| | Multispectral, thermal and hyperspectral sensing. | 1 | |
| | Some remote sensing satellites and their features | 1 | |
| **3. Digital Image Processing - Image Restoration** | Geometric corrections | 1 | 3 |
| | Co-registration of Data, Ground Control Points (GCP) | 1 | |
| | Atmospheric corrections, Solar illumination corrections | 1 | |
| **4. Digital Image Processing - Image Enhancement** | Concept of color, Color composites | 1 | 5 |
| | Contrast stretching – linear and non-linear stretching | 2 | |
| | Filtering techniques, Edge enhancement | 1 | |
| | Density slicing, Thresholding, Intensity-Hue-Saturation (IHS) images, Time composite images, Synergetic images. | 1 | |
| **5. Digital Image Processing - Information Extraction** | Multispectral classification, Ground truth collection | 1 | 5 |
| | Supervised and unsupervised classification | 2 | |
| | Change detection analysis, Principal component analysis | 1 | |
| | Ratio images, Vegetation indices | 1 | |
| **6. Digital Image Processing Software** | Image processing software, Multispectral classification algorithms | 1 | 2 |
| | Image processing using MATLAB | 1 | |

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| **7. Digital Elevation Modeling** | Introduction, Sources of digital elevation data, Types of DEM | 1 | 5 |
| | Radar interferometry, Shuttle Radar Topographic Mission (SRTM) data | 2 | |
| | DEM for Slope, Aspect, Flow direction, Flow pathways, Flow accumulation, Streams, Catchment area delineation | 2 | |
| **8. Remote Sensing Applications** | Watershed management | 1 | 7 |
| | Rainfall-runoff modeling | 1 | |
| | Irrigation management | 1 | |
| | Flood mapping | 1 | |
| | Drought assessment | 1 | |
| | Environmental monitoring | 1 | |
| | Other applications | 1 | |
| **9. Advanced Topics** | Microwave remote sensing, sources of microwave data | 1 | 3 |
| | Global positioning System (GPS), GPS for ground truth collection. | 2 | |
| **Total** | | | **40** |

**References:**


1. 'Remote Sensing and Image Interpretation', T.M. Lillesand and R.W. Kiefer, John Wiley & Sons, Singapore, 2002.
2. 'Introduction to Remote Sensing', J.B. Cambell, Taylor & Francis, UK, 2002.
3. 'Remote Sensing - Principles and Interpretation', F.F. Sabins Jr, W.H. Freeman & Co., New York, 1986.
4. 'Remote Sensing - Models and Methods for Image Processing',

R.A. Schowengerdt, Elsevier India Pvt. Ltd., New Delhi, 2006.