UNIT-I

1. Basic Concepts
   Definitions; Introduction to RS; Necessity and Importance; and Application and Scope.

2. Electromagnetic Radiation
   Introduction; Solar Radiation; Electromagnetic Spectrum; Interaction of EMR with the atmosphere; Atmospheric Windows; Scattering and Transmission; Specular and Diffuse surfaces; Reflectance and Absorption in RS.

3. Sensors
   Spectral Constraints; Spectral hands for Sensors; Multispectral Instruments; Photon, Infrared and Thermal Detectors; Photo multipliers; Charge Coupled Devices; Multispectral Line Scanners; Photographic Systems; Sensors for Ultra-violet Region; Visible Region; Infra-red Region; Microwave region. Classification of Sensors - Multispectral Scanner (MSS); Thematic Mapped™; Electro-optical Sensors; Linear Array; Push-broom Sensors; Thermal Scanners; Passive Microwave Scaltcrometers; RADAR; SLAR; and SAR. Application of Laser: Gamma-radiation; Microwave in RS.

4. Data Acquisition Platforms
   Remote Sensing Platforms; Multiconcept in acquiring RS Data; Characteristics of Space Platforms; and Airborne platforms

5. Data Formats for Digital Satellite Imagery
   Band Sequential Format; Band Interleaved by Line Format; Run-length, Encoding Format.

6. Data Products
   Computer compatible tapes; Hard Copy Oul-put; Generation of B/W and FC'Cs; Generally Supported Scales of the Data Products; Information about Annotation of the Products.

UNIT- II

7. Digital Image Processing
   Introduction to Image Analysis; Ground truth; Conversion of Data into Information. Initial Statistical Extraction; Universal and Multivariate Statistics; Histogram and its Significance in RS. Digital Data Processing; Introduction : Missing Scan lines; Destripping Methods; Geometric Correction and Registration; Atmospheric Corrections; Illumination and View angle Effects; Enhancement Techniques; Human visual system; Linear, Histogram Equalization - Gaussian and other Contrast Enhancements; Pseudo colour Enhancement; Edge Enhancement; Image Transformation - Arithmetic Operations; Empirically Based Image Transforms; Principal Component Analysis; Discriminant Analysis; Hue. Saturation and Intensity Transfer; Fourier Transform; Fast Fourier Transform; Vegetation Indices; Filtering Techniques- Introduction: Low Pass Filters; High Pass Filters; Edge Detection; Frequency Domain Filters; Point and Neighborhhood Operation; Image Processing Display Systems; Software for Image Processing; Definition of a Gray Level Image.
8. Analysis and Interpretation Techniques

Introduction; Visual Analysis and Interpretation; Digital Analysis and Image Processing; Image Classification; Morphological Approaches for Boolean Images and Grey Level Images: Introduction; Concepts of Rrosion, Dilatation, Opening. Closing, Edge Detection; Classification, Geometrical, Unsupervised, Supervised; Training Simple Selection. Parallelepiped Classifier. Centroid Classifier, Maximum Likelihood Method, Hybrid Methods, Decision-Tree Classifier; Incorporation of non-spectral features like texture; Use of External Data; Contextual Information; Feature-Sub feature Study; Classification Accuracy.

9. Application of Remote Sensing in the Appraisal and Management of Natural Resources


10. Role of RS in the Detection of Temporal Changes


UNIT - III

GEOGRAPHIC INFORMATION SYSTEM

11. Fundamental Concepts of GIS

Introduction, Various Definitions of GIS. Ordinary' Mapping to Geographic Information Systems; GIS Architecture (CIS Subsystems); Components of a GIS; The Four Ms; GIS Workdow; Fundamental Operations of GIS; Levels of Use of a GIS; Objective of GIS; The Theoretical Framework of a GIS; Accuracy in a GIS; Data Exploration; Thematic Layering; Levels of Measurement in CIS; Categories of GIS; Topology.

12. GIS Data Models

Introduction; GIS Data Types; Spatial Data Models; Vector Data Model; Raster Data Model; Image Data; Vector GIS and Raster GIS —Advantages and Disadvantages; Attribute Data Models; Digital Elevation Model; DEM and Geographical Information Systems; Applications of DEM; Data Structure for Continuous Surface Model.

13. Data Acquisition

Data Acquisition in GIS ; Analog Maps; Aerial Photographs; Satellite Imagery; Ground Survey; Global Positioning System; Reports and Publications; Digitizers (for Vector Data Input); Scanners (for Raster Data Input); Digital Mapping by Aerial P hologram merry; Remote Sensing with Satellite Imagery-Rasterisation; Vectorisation; Advanced Technologies for Primary Data Acquisition; Digital Mapping by Aerial Photogrammetry; Digital Data Acquisition; Data Processing; Digitizing Issues; Functions of GIS; Spatial Data Relationships; Topology; Comparison of Analog Map Vs Digital Map.

14. GIS Spatial Analysis
Computational Analysis Methods. Visual Analysis Methods. Data storage-vector data storage. attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data,

15. Application of GIS
Introduction; Some Applications of GIS; GIS Application Areas and User Segments; Custom CIS Software Application; Important GIS User Interface Issues; Geographic Visualization; Geographic Query Languages; Guidelines for the Preparation of a GIS: Application of GIS for Land Use and Housing Management; Application of GIS in the Assessment of Physical Transformation of an Urban Area; Land use/Land cover in water resources. Surface water mapping and inventory. Rainfall - Runoff relations and runoff potential indices of watersheds, Flood and Drought impact assessment and monitoring. Watershed management for sustainable development and Watershed characteristics

UNIT – IV

SATELLITE POSITIONING SYSTEM

16. The Science of Navigation
Navigation Definition; Navigation-System Overview; Coordinate frames, Sensors, Mechanization equations. Navigation-error sources, Error analysis and correction; Types of Inertial Systems; Positioning Systems; Complementary Filters.

17. Coordinate Frames and Transformations
Coordinate Frame Definitions; ECEF coordinate systems; Points and Vectors; Vector Transformations; Rotating Reference Frames.

18. Systems Concept
Continuous-Time Systems; Discrete Time Systems; State-Space Analysis; Systems with Random Inputs.

19. Discrete Linear and Nonlinear Kalman Filtering Techniques
Weighted Least Squares (WLS); Kalman Filter; Performance Analysis; Implementation Issues; Numeric Issues; Suboptimal Filtering,

20. Inertial Navigation
Accelerometers; INS Mechanization Equations; INS Error Equations; INS Augmented Error State Equations; The Earth Geoid and Gravity Model; Single-channel error models; Initialization Techniques; Lever-arm compensation.

21. The Global Positioning System
GPS System Overview; The Mathematics of the GPS; Solution of the Pseudorange Equations; GPS Error Sources; Geometric Dilution of Precision; Two-Frequency Receivers; Carrier-Phase Observables; Differential GPS; DGPS Implementation Protocol

NOTE
Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question

TEXT BOOKS
2. Remote Sensing and its applications by LRA Karayana, University Press 1999

REFERENCE BOOKS
7. Remote Sensing ; Digital Image Analysis, Richards, Sold at Universal Bookshop, New Delhi-29