SYLLABUS FOR

MASTER OF SCIENCE IN REMOTE SENSING & GIS

Four Semester Course Under Choice Based Credit System

JIWAJI UNIVERSITY, GWALIOR

2022-2024

CORE COURSE : REMOTE SENSING AND GIS
Semester I Paper –I

RT - 101 FUNDAMENTALS OF REMOTE SENSING

(Credits – 3 , Theory Lectures)

Unit – I

1.1	Remote Sensing – history & development, definition, concept and principles
1.2	Energy Resources, radiation principles, EM Radiation and EM Spectrum
1.3	Black body radiation, Laws of radiation
1.4	Interaction of EMR with atmosphere and Earth's surface

Unit – II

2.1	Platforms – Types and their characteristics
2.2	Satellites and their characteristics – Geo-stationary and sun-synchronous
2.3	Earth Resources Satellites -LANDSAT, SPOT, RESOURCESAT, CARTOSAT, , IKONOS, QUICKBIRD, GEO EYE, SENTINEL satellite series
2.4	Meteorological satellites – INSAT, NOAA, GOES

Unit –III

3.1	Sensors – Types and their characteristics, Across track (whiskbroom) and Along track (pushbroom) scanning
3.2	Optical mechanical scanners – MSS, TM, LISS, WiFS, PAN
3.3	Concept of Resolution – Spatial, Spectral, Temporal , Radiometric
3.4	Basic concept and principles of Thermal , microwave and hyperspectral sensing

Unit – IV

4.1	Basic principles, types, steps and elements of image interpretation
4.2	Techniques of visual interpretation and interpretation keys
4.3	Multidate, multispectral and multidisciplinary concepts
4.4	Instruments for visual interpretation

Unit – V

5.1	Remote Sensing Data Products and their procurement
5.2	Ground Truth Collection – Spectral Signatures
5.3	Commonly used Ground Truth equipments - use of Radiometers
5.4	Display Forms – Computer printouts, Thematic maps

Suggested Readings

Campbell, J.B.2002: Introduction to Remote sensing. Taylor Publications
Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall.
Joseph George,2003 : Fundamentals of remote sensing. Universities Press
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Sabbins, F.F., 1985: Remote sensing Principles and interpretation. W.H.Freeman and company

CORE COURSE :REMOTE SENSING AND GIS
Semester I Paper –II

RT– 102AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY

(Credits – 3 , Theory Lectures)

Unit – I

1.1	Introduction to aerial photography – Basic information and specifications of aerial photographs
2.2	Planning and execution of photographic flights
2.3	Aerial cameras – Types and their characteristics
2.4	Aerial film negative and its processing- completion of photographic task

Unit –II

2.1	Introduction – Definition and terms in Photogrammetry
2.2	Types of aerial photographs
2.3	Geometry of Aerial Photographs
2.4	Introduction to digital photogrammetry-Orthophotos and digital orthophotography

Unit – III

3.1	Orientation of aerial photographs, Aerial mosaics
3.2	Scale of aerial photographs and its determination
3.3	Stereovision and stereoscopes
3.4	Stereoscopic parallax and Parallax equations

Unit - IV

4.1	Making measurements from aerial photographs, Measurement of height from Aerial Photograph
4.2	Relief displacement of vertical features and its determination
4.3	Vertical exaggeration and slopes – Factor affecting vertical exaggeration and its determination
4.4	Elements of photointerpretation , Symbols and colour schemes used in photointerpretation

Unit – V

5.1	Principles of stereo photogrammetry
5.2	Geometric distortion in Image and their causes
5.3	Rectification - GCP image registration
5.4	Simple plotting Instruments – simple and stereoplotters

Suggested Readings:

Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.
Miller, v.C., 1961: Photogeology. McGraw Hill.
Moffitt, F.H. and Mikhail, E.M., 1980. Photogrammetry, Harper and Row,
Paine, D.P.,1981: Aerial Photography and Image Interpretation for Resource Management. John Wiley.
Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern,.
Rampal K.K. 1999: Hand book of aerial photography and interpretation. Concept publication

CORE COURSE :REMOTE SENSING AND GIS
Semester I Paper –III

RT– 103CARTOGRAPHY AND GLOBAL POSITIONING SYSTEM

(Credits – 3 , Theory Lectures)

Unit – I

1.1 Introduction to cartography, nature and scope of cartography
1.2 Digital cartography - elements of digital cartography Relation between digital cartography, RS & GIS
1.3 Conventional mapping VS Digital mapping
1.4 Scale, reference and coordinate system

Unit – II

2.1 Cartographic transformations and reasons for transforming cartographic data
2.2 Map Projection – concept and classification
2.3 Azimuthal, cylindrical , conical and rectangular projection system
2.4 Choice of map projection – Satellite image and map projection

Unit – III

3.1 Mechanics of map construction - Principles of drawing, Base materials -Instruments
3.2 Cartographic design - map design principles, symbolisation and lay out
3.3 Study of different types of maps, Survey of India national series maps, layout and numbering of topographical maps
3.4 Thematic maps and base maps

Unit – IV

4.1 Representation of natural and cultural features, relief representations
4.2 Map digitization and Map Compilation
4.3 Fair drawing and editing of maps
4.4 Map reproduction process

Unit – V

5.1 Global Positioning System (GPS) – Fundamental concepts
5.2 GPS system elements and signals, Indian Regional Navigational Satellite System (IRNSS), GAGAN
5.3 GPS measurements and accuracy of GPS, Classification of GPS receivers
5.4 DGPS – Introduction, Principle and Working of DGPS

Suggested Readings:

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Mishra R.P and Ramesh A. 1989 : Fundamentals of Cartography. Concept publishing company
Nag P. and Kudrat M. 1998: Digital Remote Sensing. Concept Publication
Rampal K.K. 1993: Mapping and compilation. Concept publication
Robinson A.,Morrison, J.L.,Muehrcke P.C., Guptil S.C. 2002 : Elements of Cartography. John Wiley
Taylor,D.R.F. 1985: Education and Training in contemporary cartography, John Willey

CORE COURSE :REMOTE SENSING AND GIS
Semester I Paper –IV

RT–104 DIGITAL IMAGE PROCESSING

(Credits – 3 , Theory Lectures)

Unit – I

1.1 Introduction to digital image processing- Concept of digital image, steps in DIP
1.2 Image processing systems –hardware and software considerations
1.3 Digitization of photographic image , converting digital image to visual form image
1.4 Digital image data formats, Image data storage and retrieval

Unit – II

2.1 Radiometric correction of remotely sensed data
2.2 Geometric correction of remotely sensed data
2.3 Image registration – definition principle and procedure
2.4 Basic statistical concept in DIP and use of probability methods in DIP

Unit – III

3.1 Image enhancement Techniques - an overview
3.2 Contrast Enhancement - Linear and non linear, Histogram equalisation and Density slicing
3.3 Spatial filtering and Edge enhancement
3.4 Multi image manipulation – addition, subtraction and Band ratioing

Unit - IV

4.1 Principal Component Analysis
4.2 Enhancement by using colours – advantages, Types of colour enhancements
4.3 BGR – coding and generation of FCC's
4.4 Image transformation – Intensity Hue Saturation (HIS)

Unit – V

5.1 Pattern recognition and image classification, Unsupervised classification – advantage, disadvantage and limitations, Isodata, K-mean
5.2 Supervised classification - training site selection , Classifiers used in supervised classification – Minimum distance to mean, Parallelepiped, maximum likelihood
5.3 Classification accuracy assessment
5.4 Hyperspectral data processing and image analysis

Suggested Readings:

Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gibson,P.J. 2000: Digital Image Processing. Routledge Publication
Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
Joseph George, 2003 : Fundamentals of remote sensing. Universities Press
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Nag P. and Kudrat M. 1998: Digital Remote Sensing. Concept Publication
Pratt.W.K. 2004: Digital Image processing. John Wiley
Sabbins, F.F., 1985: Remote sensing Principles and interpretation. W.H.Freeman and company

CORE COURSE :REMOTE SENSING AND GIS
Semester I Paper –V

RL–105 PRACTICAL- I IMAGE INTERPRETATION AND PHOTOGRAMMETRY

(Credits – 3 ,Practical)

- Study of satellite image, Border information and marking Reference System
- Analysis of spectral reflectance curves
- Stereo Test and Orientation of Aerial Photograph
- Determination of photo scale
- Use of parallax bar, determination of heights
- Preparation of photo line index
- Identification of features on single vertical aerial photographs
- Visual interpretation of satellite images and aerial photographs
- Interpretation of different resolution IRS satellite images – LISS III, PAN and WiFs
- Interpretation of cultural details from IRS image

CORE COURSE :REMOTE SENSING AND GIS
Semester I Paper –VI

RL– 106PRACTICAL II CARTOGRAPHY, GPS AND DIP (DIGITAL IMAGE PROCESSING)

(Credits – 3 ,Practical)

- Study of SOI topographic sheets
- Calculation of Map Numbering System
- Base map preparation
- Handling of GPS, data collection and integration of GPS Data

Following tasks to be done using ERDAS image processing software:

- To load digital data and to convert image data
- Display of B&W and FCC using ERDAS
- File management- raster layer and layer information
- Image enhancements – spectral, radiometric and spatial
- Look up table and histogram manipulation
- Low pass filters, High pass filters, band ratioing, Principal Component analysis
- Geometric correction and mosaicing of image
- Vector functions – attribute querry
- Data import and export
- Georeferencing and geometric coreection
- Unsupervised classification
- Supervised classification
- Use of model maker
- Map Composition

CORE COURSE :REMOTE SENSING AND GIS
Semester I Paper –VII

RS - 107 SEMINAR

(Credits – 1, Tutorial)

The seminar is intended to provide the students with the opportunity to search information on current topics related to their concerned subject. All students pursuing MSc degrees will be required to offer their findings orally in a 20-minute presentation to the faculty members of the School/Centre and students during the semester. This presentation will be followed by a question and answer session. The students will also submit a written version of the seminar to the Head of the School/Course Coordinator.

CORE COURSE :REMOTE SENSING AND GIS
Semester I Paper –VIII

RA - 108 ASSIGNMENT

(Credits – 1, Tutorial)

Each student is required to submit a hard copy of a topic related to the subject concerned assigned to him as assignment (at the beginning of the semester) to the Head of the School/Course Coordinator during the semester.

CORE COURSE: REMOTE SENSING AND GIS
Semester I Paper –IX

RV - 109 COMPREHENSIVE VIVA-VOCE

(Credits – 4, Virtual Credit)

At the end of the each semester there will be a comprehensive viva-voce test

CORE COURSE :REMOTE SENSING AND GIS
Semester II Paper –I

RT -201THERMAL AND MICROWAVE REMOTE SENSING

(Credits – 3 , Theory Lectures)

Unit-I

1.1 Thermal radiation principles, thermal process and properties
1.2 Characteristics of thermal IR images and Factors affecting thermal images
1.3 Interaction of thermal radiation with terrain elements
1.4 Multispectral thermal data

Unit- II

2.1 Thermal image and qualitative interpretation,
2.2 Semiquantitative analysis
2.3 Temperature mapping with thermal scanner data
2.4 Applications of thermal sensing

Unit-III

3.1 Introduction to microwave remote sensing – Concept and principle, backscattering ,cross section Wavelength, incidence angle, aspect angle.
3.2 Interactions between radar and surface materials - complex dielectric properties, roughness polarization
3.3 Passive microwave sensors
3.4 Active microwave sensors

Unit – IV

4.1 Side looking radar system
4.2 Geometric characteristics of Side looking radar images
4.3 Synthetic aperture radar
4.4 Transmission characteristics of radar signals and other radar image characteristics

Unit – V

5.1 Radar image interpretation
5.2 Fundamentals of radar interferometry
5.3 LIDAR – working principle, scope and applications
5.4 Applications of microwave remote sensing

Suggested Readings

Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Joseph George,2003 : Fundamentals of remote sensing. Universities Press
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Sabbins, F.F., 1985: Remote sensing Principles and interpretation. W.H.Freeman and company

CORE COURSE :REMOTE SENSING AND GIS
Semester II Paper –II

RT -202 GEOGRAPHICAL INFORMATION SYSTEM

(Credits – 3 , Theory Lectures)

Unit -I

1.1 Introduction to GIS – definitions, concept and history of developments in the field of information systems
1.2 Computer fundamentals for GIS
1.3 Hardware and software requirements for GIS
1.4 Coordinate System and Projections in GIS – Conic, cylindrical and planner

Unit – II

2.1 Data structure and formats
2.2 Spatial data models – Raster and Vector
2.3 Data inputting in GIS
2.4 Data base design - editing and topology creation in GIS, Linkage between spatial and non spatial data

Unit – III

3.1 Spatial data analysis – significance and type, Attribute Query, spatial query
3.2 Vector based spatial data analysis
3.3 Raster based spatial data analysis
3.4 Buffer analysis

Unit – IV

4.1 Data quality and sources of errors
4.2 Integration of RS and GIS data
4.3 Digital Elevation Model
4.4 Network Analysis in GIS

Unit – V

5.1 Data analysis and modeling in GIS– types of GIS modeling
5.2 Decision support systems
5.3 Introduction to Python programming language and its uses in GIS
5.4 Recent Trends in GIS – AM/FM, Virtual 3D GIS, OLAP, Internet GIS, Open GIS

Suggested Readings

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Chang.T.K. 2002 : Geographic Information Systems. Tata McGrawHill
Heywood.I, Cornelius S, CrverSteve. 2003: An Introduction to Geographical Information Systems. Pearson Education
Ram Mohan Rao. 2002: Geographical Information Systems. Rawat Publication.
Skidmore A.2002: Environmental modeling with GIS and Remote Sensing. Taylor and Francis
Tar Bernhardsen. Geographical Information Systems. John Wiley.
Wise S.2002: GIS Basics. Taylor Publications

CORE COURSE :REMOTE SENSING AND GIS
Semester II Paper –III

RT -203 REMOTE SENSING IN GEOSCIENCES

(Credits – 3 , Theory Lectures)

Unit – I

1.1 Remote Sensing in geology – an overview
1.2 Basic concept of geomorphology, earth surface process and resultant landforms
1.3 Spectral characteristics of rocks and minerals
1.4 Drainage patterns – types and its significance in geologic interpretation

Unit -II

2.1 Interpretation of drainage patterns trough aerial photographs and satellite images
2.2 Interpretation of fluvial landforms
2.3 Interpretation of glacial and coastal landforms
2.4 Interpretation of eolian and volcanic landforms

Unit - III

3.1 Interpretation of Karst landforms
3.2 Interpretation of structural and denudational landforms – cuesta, hogback , butte, mesa etc.
3.3 Interpretation of landforms related to igneous, sedimentary and metamorphic rocks
3.4 Geomorphological mapping and terrain evaluation

Unit – IV

4.1 General observation in lithological interpretaion- Factors affecting photographic appearance of rocks
4.2 Lithological interpretation of Igneous rocks
4.3 Lithological interpretation of Sedimentary rocks
4.4 Lithological interpretation of Metamorphic rocks

Unit – V

5.1 Structure – Definition, types and structural mapping
5.2 Interpretation of folds, faults, unconformities and lineaments
5.3 Use of thermal infra red and microwave data in geological mapping
5.4 GIS application in Geosciences

Suggested Readings

Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.
Paine, D.P.,1981: Aerial Photography and Image Interpretation for Resource Management. John Wiley.
Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern,.
Miller, v.C., 1961: Photogeology. McGraw Hill.
Ray, R.G., 1969: Aerial Photographs in geologic Interpretations. USGS Prof, Paper 373.
Sabbins, F.F., 1985: Remote sensing Principles and interpretation. W.H.Freeman and company

CORE COURSE :REMOTE SENSING AND GIS
Semester II Paper –IV

RT -204REMOTE SENSING IN MINERAL EXPLORATION AND GEOTECHNICAL ENGINNERING

(Credits – 3 , Theory Lectures)

Unit –I

1.1 Mineral Exporation:- Definition, characteristic features and methods
1.2 Remote Sensing in Mineral exploration - An Overview
1.3 Main types of Mineral Deposits and their surface indications
1.4 Geological guides as observed in Remote Sensing data

Unit – II

2.1 Remote Sensing in Oil Exploration – Features helpful in detection of target areas for oil exploration
2.2 Remote Sensing in Uranium Exploration
2.3 Application of Remote Sensing in Mineral Exploration – Indian Examples
2.4 Mineral Resource Management using GIS

Unit – III

3.1 Fundamentals of geotechnical engineering
3.2 Terrain classification for engineering geological mapping
3.3 Mechanical properties and description of material and masses
3.4 Slope stability: types of slopes, slope failures studies

Unit – IV

Engineering geological terrain evaluation using Remote Sensing data for the following :
4.1 Alignment studies – roads, tunnels, canals etc
4.2 Site selection studies – Dams, bridges, highways, airstrips etc.
4.3 Coastal and harbour studies
4.4 Location of construction materials

Unit – V

5.1 Geotechnical appraisal for Civil engineering activities
5.2 Digital Terrain modeling : Principles, methods and classification
5.3 Digital Elevation Model/Digital Terrain Model generation Techniques
5.4 Military intelligence and regional planning

Suggested Readings

Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.
Paine, D.P.,1981: Aerial Photography and Image Interpretation for Resource Management. John Wiley.
Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern,.
Miller, v.C., 1961: Photogeology. McGraw Hill.
Sabbins, F.F., 1985: Remote sensing Principles and interpretation. W.H.Freeman and company
Skidmore A.2002: Environmental modeling with GIS and Remote Sensing. Taylor and Francis

CORE COURSE : REMOTE SENSING AND GIS
Semester II Paper –V

RL– 205 PRACTICAL- I MICROWAVE REMOTE SENSING AND GIS

(Credits – 3 ,Practical)

- Radar image
- Radar image interpretation
- Computation of brightness temperature from thermal imagery
- Familiarisation with ARC GIS, ENVI, ERDAS and QGIS software
- Georeferencing in ARC GIS
- Digitization and layer creation
- Data input, data editing and topology creation
- Editing the layers (use of snap tolerance, remove overlap, gaps etc.)
- Non spatial data entry
- Linking spatial and non-spatial data
- Create new table, add field to table, add record to table, calculate area, perimeter
- Buffer analysis and Query analysis (Selection by location and selection by attributes)
- Overlay analysis
- Network analysis – Finding the shortest route between two places, finding the optimum path etc.
- Output map generation

CORE COURSE :REMOTE SENSING AND GIS
Semester II Paper –VI

RL–206 PRACTICAL II REMOTE SENSING IN GEOSCIENCES , MINERAL EXPLORATION AND GEOTECHNICAL ENGINEERING

(Credits – 3 ,Practical)

- Visual interpretation of satellite images and aerial photographs to study the following : Geomorphology, lithology, geology and strcuture
- Digital image processing for the study of geomorphology, structure, and lineaments
- Geomorphic mapping
- Lineament mapping
- Structural mapping
- Route location
- Dam site location studies
- Digital Terrain Modeling

CORE COURSE :REMOTE SENSING AND GIS
Semester II Paper –VII

RS - 207 SEMINAR

(Credits – 1, Tutorial)

The seminar is intended to provide the students with the opportunity to search information on current topics related to their concerned subject. All students pursuing MSc degrees will be required to offer their findings orally in a 20-minute presentation to the faculty members of the School/Centre and students during the semester. This presentation will be followed by a question and answer session. The students will also submit a written version of the seminar to the Head of the School/Course Coordinator.

CORE COURSE :REMOTE SENSING AND GIS
Semester II Paper –VIII

RA - 208 ASSIGNMENT

(Credits – 1, Tutorial)

Each student is required to submit a hard copy of a topic related to the subject concerned assigned to him as assignment (at the beginning of the semester) to the Head of the School/Course Coordinator during the semester.

CORE COURSE :REMOTE SENSING AND GIS
Semester II Paper –IX

RV - 209 COMPREHENSIVE VIVA-VOCE

(Credits – 4, Virtual Credit)

At the end of the each semester there will be a comprehensive viva-voce test

CORE COURSE : REMOTE SENSING AND GIS
Semester III Paper –I

RT -301REMOTE SENSING IN WATER RESOURCES

(Credits – 3 , Theory Lectures)

Unit I

1.1 Basic concept of water resources: Hydrological cycle, Darcy's law
1.2 Porosity, permeability, transmissibility, Specific yield
1.3 Issues in water resources development, management and utilization
1.4 Spectral characteristics of water and Relevance of RS techniques for hydrological investigations

Unit – II

2.1 Ground water movement and factors affecting ground water occurrence
2.2 Types of aquifers , aquiclude, aquitard and aquifuge and Location of aquifers
2.3 Drainage mapping and Morphometric analysis
2.4 Hydrogeomorphological mapping and preparation of groundwater prospect maps

Unit – III

3.1 Remote Sensing in evaluating hydrogeological features and elements
3.2 Ground water targetting in various terrain types - hard rock terrain and in alluvial terrain
3.3 Water harvesting structures and optimum site selection for rain water harvesting
3.4 Estimation of evaporation and evapotranspiration – interpretation

Unit –IV

4.1 Watershed management- introduction , philosophy and concept and Role of Remote Sensing in watershed conservation, planning and management
4.2 Watershed characterisation and mapping
4.3 Runoff estimates from watersheds
4.4 GIS database for watershed management

Unit – V

5.1 Snow – Snow in visible spectrum, middle infrared and microwave regions, Snow Mapping
5.2 Flood and flood plain mapping and zoning
5.3 Site location for river valley projects
5.4 Water quality monitoring and Hydrogeological modeling using RS and GIS

Suggested Readings :

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Chow, V.t., 1988:Advances in Hydro science McGrawHill
Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Karanth, K.R., 1987: Groundwater Assessment-Development and Management. Tata McGraw Hill.
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.
Miller, v.C., 1961: Photogeology. McGraw Hill.
Paine, D.P.,1981: Aerial Photography and Image Interpretation for Resource Management. John Wiley.
Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern,.
Sabbins, F.F., 1985: Remote sensing Principles and interpretation. W.H.Freeman and company
Todd, D.K., 1980: Groundwater Hydrology. John Wiley

CORE COURSE :REMOTE SENSING AND GIS
Semester III Paper –II

RT -302REMOTE SENSING IN AGRICULTURE SOIL AND LAND EVALUATION STUDIES

(Credits – 3 , Theory Lectures)

Unit -I

1.1 Remote Sensing in Agriculture – An Overview
1.2 Spectral characteristics of crops
1.3 Principles of crop identification and Crop acreage estimation
1.4 Crop yield modeling using Remote Sensing

Unit – II

2.1 Crop condition and stress assessment using RS techniques
2.2 RS and GIS applications in Crop inventory
2.3 Agro-meteorology – its importance and application of RS in agro-meteorology
2.4 Drought assessment and monitoring through Remote Sensing

Unit –III

3.1 Distribution of soil types in India and introduction of remote sensing in soil survey
3.2 Spectral characteristics of soil
3.3 Soil morphology and classification
3.4 Soil and water salinity

Unit –IV

4.1 Relationship of rock types and geomorphology to soil types
4.2 Soil erosion modeling and erosion hazard assessment through Remote sensing
4.3 Soil moisture assessment using RS
4.4 Soil mapping using aerial and satellite remote sensing data

Unit – V

5.1 Land degradation and erosion -degraded soils ,their identification and mapping of degraded lands
5.2 Land use / land cover – Basic concept and classification
5.3 Land use / land cover mapping through remote sensing
5.4 Land evaluation for optimal land use planning

Suggested Readings:

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.
Skidmore A.2002: Environmental modeling with GIS and Remote Sensing. Taylor and Francis

ELECTIVE COURSE (CENTRIC): REMOTE SENSING AND GIS
Semester III Paper - III

RT - 303 REMOTE SENSING IN FORESTRY
(Credits – 3 ,Theory Lectures)

Unit – I

1.1 Forestry – Introduction fundamental concept and Role of RS and GIS in forestry
1.2 Dynamics of forest ecosystem and forest canopy
1.3 Inventory of forest land, Temperate and tropical zones
1.4 Forest Classification, types and their distribution

Unit – II

2.1 Photosynthesis fundamentals
2.2 Spectral characteristics of vegetation
2.3 Temporal characteristics of Vegetation
2.4 Vegetation indices

Unit – III

3.1 Relationship of vegetation to rock types – geobotanical guides for rock and mineral identification
3.2 Vegetation type and density mapping / classification
3.3 Mapping of plant in stress condition
3.4 Forest cover mapping and change detection

Unit – IV

4.1 Microwave data interpretation in thick forest cover area
4.2 Seasonal plant condition and reflectance variation
4.3 Forest fire – identification, forecasting and Risk area mapping
4.4 Remote Sensing in forest damage assessment and disease detection

Unit – V

5.1 Bio diversity characterisation and biomass estimation
5.2 Wildlife habitat mapping
5.3 Role of remote sensing in forest management and forest recreation
5.4 Forest Management Information System (FMIS)

Suggested Readings:

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Franklin S.E. 2001. Remote Sensing for sustainable forest management. Lewis Publication
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.

ELECTIVE COURSE (CENTRIC) :REMOTE SENSING AND GIS
Semester III Paper - IV

RT - 304 REMOTE SENSING IN MARINE SCIENCES
(Credits – 3, Theory Lectures)

Unit -I
1.1 Remote sensing in marine sciences – an Overview
1.2 Interaction of EMR spectrum with water
1.3 Ocean monitoring satellites and Coastal Sensing systems
1.4 Active Microwave Remote Sensing of the Sea

Unit -II
2.1 Ocean Colour mapping
2.2 Remote Sensing in Sea Surface Temperature Mapping
2.3 Remote Sensing in Suspended Sediment Concentration Mapping
2.4 Coastal/marine Bio-resource mapping

Unit -III
3.1 Coastal zone: Definition, Concept and Issues
3.2 Estimation of Wave, Current and Tide parameters by remote sensing
3.3 Coastal landforms analysis and shoreline changes
3.4 Applications of GIS and database design for coastal zone

Unit – IV
4.1 Remote sensing applications in retrieval of wind data and air sea heat exchange
4.2 Sea Level Rise, Sea Surface Temperature, Fishery Forecasting.
4.3 Remote sensing applications in Coastal and Marine environment
4.4 Weather and Climate analysis

Unit -V
5.1 Potential fishing zone (PFZ) - Method and process
5.2 Indicators of Fish Potential
5.3 Potential fishing zone (PFZ) , mapping using NDVI
5.4 Coastal change detection studies through RS & GIS

Suggested Readings :

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.

ELECTIVE COURSE (GENERIC): REMOTE SENSING AND GIS
Semester III Paper - IV

RT - 304 REMOTE SENSING BASIC AND APPLICATIONS

(Credits – 3 ,Theory Lectures)

Unit - I

1.1 Basic concepts and fundamental principles of remote sensing, it's advantages and limitations
1.2 EM Spectrum - Nature , Principles and sources
1.3 Laws of radiation, Black body radiation principles
1.4 Interaction of EMR with atmosphere and Earth's surface
1.5 Spectral response and spectral signature

Unit - II

2.1 Introduction and principles of aerial photographyPlanning and execution of photographic flights
2.2 Geometry of aerial photographs, Types of aerial photographs, scale, vertical exaggeration
2.3 Stereoscopy - Concept, and types of stereoscopes.
2.4 Elements of Photo interpretation.Obscuring factors in photointerpretation .
2.5 Aerial mosaics - Definition, types, uses, advantages and limitations

Unit - III

2.5 Platforms – Types and their characteristics
2.6 Satellites and their characteristics – Geo-stationary and sun-synchronous
2.7 Earth Resources Satellites -LANDSAT, SPOT, IRS, IKONOS satellite series
2.8 Meteorological satellites – INSAT, NOAA, GOES
2.9 Sensors - Introduction and elementary idea about imaging ,non-imaging, active and passive sensors

Unit - IV

4.1 Concept of Resolution – Spatial, Spectral, Temporal , Radiometric
4.2 Basic concept and principles of Thermal , microwave and hyperspectral sensing
4.3 Basic principles, types, steps and Techniques of visual interpretation and interpretation keys
4.4 Multidate, multispectral and multidisciplinary concepts
4.5 Introduction to digital image processing- steps in DIP-Image enhancement Techniquesand Image Classification

Unit – V

5.1 Applications of Remote Sensing in Geosciences
5.2 Applications of Remote Sensing in Environmental Science
5.3 Application of Remote Sensing in Forestry and Agriculture
5.4 Application of Remote Sensing in Land Resources and Soil
5.5 Applications of Remote Sensing, in human settlement studies

Suggested Readings :

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Campbell, J.B.2002: Introduction to Remote sensing. Taylor Publications
Chang.T.K. 2002 : Geographic Information Systems. Tata McGrawHill
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall.
Joseph George,2003 : Fundamentals of remote sensing. Universities Press
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern
Pratt.W.K. 2004: Digital Image processing. John Wiley
Sabbins, F.F., 1985: Remote sensing Principles and interpretation. W.H.Freeman and company
Tar Bernhardsen. Geographical Information Systems. John Wiley.
Wise S.2002: GIS Basics. Taylor Publications

CORE COURSE :REMOTE SENSING AND GIS
Semester III Paper –V

RL –305 PRACTICAL IREMOTE SENSING IN WATER RESOURCES ,SOIL AND AGRICULTURE

(Credits – 3 ,Practical)

- Drainage mapping
- Morphometric analysis
- Hydromorphologeologic interpretation for GW targeting
- Preparation of groundwater potential zone maps
- Land use / land cover mapping
- Identification of degraded lands
- Land utilization mapping
- Soil mapping
- Soil erosion Modelling using RUSLE
- Crop estimation studies

ELECTIVE COURSE (CENTRIC) :REMOTE SENSING AND GIS
Semester III Paper –VI

RL –306 PRACTICAL IIREMOTE SENSING IN FORESTRY AND CORRESPONDING ELECTIVE PAPER

(Credits – 3 ,Practical)

- Identification of forest species from aerial photographs
- Vegetation mapping from satellite images
- Measurement of Canopy Cover through Leaf Area Index (LAI)
- Digital image enhancements for vegetation/forest
- NDVI analysis
- Digital classification for forest cover mapping
- Coastal change detection studies
- Coastal landform studies.
- Shore line mapping and changes

CORE COURSE : REMOTE SENSING AND GIS
Semester III Paper –VII

RSG - 307 SEMINAR

(Credits – 1, Tutorial)

The seminar is intended to provide the students with the opportunity to search information on current topics related to their concerned subject. All students pursuing MSc degrees will be required to offer their findings orally in a 20-minute presentation to the faculty members of the School/Centre and students during the semester. This presentation will be followed by a question and answer session. The students will also submit a written version of the seminar to the Head of the School/Course Coordinator.

CORE COURSE :REMOTE SENSING AND GIS
Semester III Paper –VIII

RA - 308 ASSIGNMENT

(Credits – 1, Tutorial)

Each student is required to submit a hard copy of a topic related to the subject concerned assigned to him as assignment (at the beginning of the semester) to the Head of the School/Course Coordinator during the semester.

CORE COURSE : REMOTE SENSING AND GIS
Semester III Paper –IX

RV- 309 COMPREHENSIVE VIVA-VOCE

(Credits – 4, Virtual Credit)

At the end of the each semester there will be a comprehensive viva-voce test

CORE COURSE :REMOTE SENSING AND GIS
Semester IV Paper –I

RT– 401 REMOTE SENSING IN HUMAN SETTLEMENT ANALYSIS

(Credits – 3 , Theory Lectures)

Unit – I

1.1 Remote Sensing in Human settlement and urban planning – An Overview
1.2 Principles of urban area development planning and land use
1.3 Data requirement for regional planning and Urban/Sub-urban resolutions considerations
1.4 Large scale mapping for cadastral database in urban areas

Unit – II

2.1 Settlement patterns – Image characterisation and recognition
2.2 Rural settlements - detection, interpretation, delineation and analysis
2.3 Urban settlements - detection, interpretation, delineation and analysis
2.4 Slum, squatter settlement - detection, interpretation, delineation and analysis

Unit - III

3.1 Urban land use classification
3.2 Urban land use mapping and analysis
3.3 Residential land use, Commercial land use and Industrial land use
3.4 Urban land conservation using remote sensing

Unit – IV

4.1 Remote sensing in monitoring master plan / new town development area
4.2 Transportation/ road network analysis through RS and GIS
4.3 Site selection and suitability analysis for urban development
4.4 Urban Sprawl and change detection studies

Unit – V

5.1 Methods of population estimation using remote sensing
5.2 Remote sensing applications in regional and district level planning
5.3 Database design & analysis for urban and regional resource mapping
5.4 Urban hazards and risk management through RS and GIS

Suggested Readings :

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.

ELECTIVE COURSE (CENTRIC): REMOTE SENSING AND GIS
Semester IV Paper –II

RT – 402 REMOTE SENSING IN ENVIRONMENTAL SCIENCE

(Credits – 3 , Theory Lectures)

Unit –I

1.1 Ecological, biological aspects of Environment
1.2 Pollution and types of pollution
1.3 Change detection studies with the help of multi temporal data
1.4 Remote Sensing in pollution monitoring

Unit – II

2.1 Water quality mapping and monitoring - Introduction
2.2 Remote sensing in water quality mapping monitoring and management
2.3 Solid waste management – introduction classification and environmental problems
2.4 Remote sensing and GIS in solid waste management

Unit – III

3.1 Mass movements and landslides
3.2 Landslides causes and controls
3.3 Susceptibility of rocks and unconsolidated material to land slide
3.4 Application of Remote sensing in land slide studies

Unit – IV

4.1 Natural Disasters – introduction
4.2 Concept and types of hazard zonation studies
4.3 Disaster detection/mitigation through RS
4.4 GIS application in geological hazard zonation

Unit – V

5.1 Impact assessment – Basic concepts, Environmental impact assessment (EIA) methods
5.2 Environmental analysis and environmental monitoring for sustainable development through RS & GIS
5.3 EIA of mining areas and nuclear power plants through Remote Sensing
5.4 Environmental Management Plan (EMP), its importance and Role of GIS in preparation of EMP

Suggested Readings :

AnjiReddy,M. 2004 : Geoinformatics for environmental management.B.S. Publications
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.
Skidmore A.2002: Environmental modeling with GIS and Remote Sensing. Taylor and Francis

ELECTIVE COURSE (GENERIC): REMOTE SENSING AND GIS
Semester IV Paper -II

RT - 402 BASICS OF DIP GIS AND GPS

(Credits – 3 ,Theory Lectures)

Unit - I Introduction to digital image processing

1.1 Concept of digital image ,steps in DIP
1.2 Image processing systems –hardware
1.3 Image processing systems –Software
1.4 Digital image data formats
1.5

Unit -II

2.1 Radiometric and Geometric correction of remotely sensed data
2.2 Image enhancement Techniques - an overview
2.3 Pattern recognition and Image Classification
2.4 Unsupervised classification
2.5 Supervised classification

Unit – III

3.1 Introduction to GIS – definitions, concept
3.2 Hardware and software requirements for GIS
3.3 Coordinate System and Projections in GIS
3.4 Data structure and formats
3.5 Spatial data models – Raster and Vector

Unit-IV

4.1 Spatial data analysis – significance and type
4.3 Attribute Query, spatial query
4.3 Vector based spatial data analysis
4.4 Raster based spatial data analysis
4.5 Buffer analysis

Unit – V

5.1 Data quality and sources of errors
5.2 Integration of RS and GIS data
5.3 Fundamental concepts Global Positioning System (GPS)
5.4 GPS system elements and signals
5.5 Classification of GPS receivers

Suggested Readings :

Chang.T.K. 2002 : Geographic Information Systems. Tata McGrawHill
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall.
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Pratt.W.K. 2004: Digital Image processing. John Wiley
Gibson,P.J. 2000: Digital Image Processing. Routledge Publication

CORE COURSE : REMOTE SENSING AND GIS
Semester IV Paper –III

RL - 403 PRACTICAL I REMOTE SENSING IN HUMAN SETTLEMENT AND CORRESPONDING ELECTIVE PAPER

(Credits – 2, Practical)

- Urban land use mapping
- Determination and delineation of settlement – Urban, rural
- Highway, canal, sewage alignment
- Environmental hazard mapping
- Pollution determination studies
- Identification of land slides
- Landslide hazard zonation mapping
- Mapping of mining areas to identify the overburdens and land degradation
- Pollution mapping
- Calculation of land surface temperature and UHI
- Reading and Writing Vector Data Using GDAL/OGR in Python
- Reading and Writing Raster Data using GDAL/OGR in Python

CORE COURSE :REMOTE SENSING AND GIS
Semester IV Paper –IV

RF - 404 MINOR PROJECT - REMOTE SENSING FIELD WORK

(Credits – 4, Practical)

- Familiarisation with GPS Receiver and to know the set up unit
- Initialisation of the system in the field
- To get aquainted with the various functions of the GPS
- Using GPS with map & compass
- Area calculation by GPS
- Navigation by way points
- Navigation by track points
- Transfer of way points
- Map preparation and map upgradation

Prefield preparations

- Preparation of various thematic maps in the lab
- Unsupervised classification in the lab for land use classes

Field work

- Filed validation of the above mentioned themes and maps in the field
- Study of the different signatures for the different land use classes in the field.
- Ground truth collection
- Any other relevant data collection in the field

Post Field work in the lab

- Training site selection for supervised classification
- DEM generation
- Thematic maps correction after the filed checking
- Report submission

CORE COURSE :REMOTE SENSING AND GIS
Semester IV Paper - V

RP - 405 MAJOR PROJECT WORK

(Credits – 8, Practical)

To carry out project work on a problem based on Remote Sensing and GIS application in one of the national Remote Sensing Institutes/laboratories /GIS Companies etc. to get acquainted with various image processing and GIS softwares.Each student is required to carry out an independent project work on a selected topic related to the applications of GIS and/or Remote Sensing, under the guidance of a supervisor and prepare a Project report. Report has to be compiled based on the guidelines specified by the university.

CORE COURSE :REMOTE SENSING AND GIS
Semester IV Paper –VI

RV - 406 COMPREHENSIVE VIVA-VOCE

(Credits – 4, Virtual Credit)

At the end of the each semester there will be a comprehensive viva-voce test