SWCE 507 / IDE507 GIS and Remote Sensing for Land and Water Resource Management 2+1

Objectives:
To acquaint students with recent technology of RS and GIS including satellite data analysis, digital image processing and thematic mapping of landuse, surface and groundwater.

Unit-I
Physics of remote sensing, electro magnetic radiation (EMR), interaction of EMR with atmosphere, earth surface, soil, water and vegetation. Remote sensing platform, monitoring atmosphere, land and water resources: LANDSAT, SPOT, ERS, IKONOS, SENTINEL and others, Indian Space Programme.

Unit-II
Satellite Data analysis: Visual interpretation, digital image processing, image pre-processing, image enhancement, image classification and data merging.

Unit-III
Definition: Basic components of GIS, map projections and co-ordinate system, spatial data structure-raster, vector, spatial relationship, topology, geo-data base models, hierarchical network, relational, object-oriented models, integrated GIS database-common sources of error–data quality: Macro, micro and usage level components, meta data, Spatial data transfer standards.

Unit-IV
Thematic mapping, measurements in GIS: Length, perimeter and areas. Query analysis, reclassification: Buffering, neighbourhood functions, map overlay: Vector and raster overlay: Interpolation, network analysis, digital elevation modelling.

Unit-V
Spatial data sources: 4 MGIS approach water resources system, Thematic maps, rainfall runoff modelling, ground water modeling, Analytical Hierarchy Process, Object oriented GIS–AM/FM/GIS, Web Based GIS. Site selection for artificial recharge, reservoir sedimentation.

Practical:
Familiarization with the Remote sensing instruments and satellite imagery. Aerial Photograph and scale determination with stereoscope. Interpretation of satellite imageries and aerial photographs. Determination of Parallaxes in images. Introduction to digital image processing software and GIS software and their working principles. Generation of digital elevation model (DEM) for land and water resource management. Case studies on mapping, monitoring and management of natural resources using remote sensing and GIS.

Course Outcome:
Students will be able to use satellite remote sensing to perform image analysis and classification for developing thematic maps. Able to integrate satellite data with GIS to undertaker course mapping and planning studies.

Teaching Schedule

S.No.	Topic	No. of Lectures
1	Introduction and brief history of RS and GIS, applications of RS And GIS	1

2	Physics of remote sensing. Electro Magnetic radiation (EMR), interaction of EMR with atmosphere, earth surface, soil, water and vegetation	2
3	Remote sensing platforms: Monitoring atmosphere, land and water resources: LANDSAT, SPOT, ERS, IKONOS, SENTINEL and others Indian Space Programme	2
4	Satellite data analysis. Visual interpretation.	2
5	Digital image processing- Image pre-processing, Image enhancement, Image classification, data merging.	3
6	Basic components of GIS- Map projections and co-ordinate system.	2
7	Spatial data sources, Thematic maps	1
8	Spatial data structure: Raster, vectordata, Spatial relationship-Topology	2
9	Geodata base models: Hierarchical, network, relational, object-oriented models. Integrated GIS database	3
10	Data quality, Common sources of error, Macro, micro and Usage Level components, Metadata and Spatial data transfer standards	2
11	Measurement in GIS- Length, perimeter and areas	1
12	Query analysis. Reclassification, Buffering and Neighborhood functions	1
13	Map overlay: Vector and raster overlay	1
14	Interpolation and network analysis	1
15	Digital elevation modelling. Analytical Hierarchy Process. Object oriented GIS, AM /FM/GIS and Web Based GIS	3
16	GIS approach to Rainfall runoff modeling	2
17	GIS approach to Ground water modeling	2
18	Site selection for artificial recharge. Reservoir sedimentation	1
	Total	**32**

List of Practical

S.No.	Topic	No. of Practical
1	Familiarization with the remote sensing instruments and satellite imagery	1
2	Methods of establishing ground truth survey and Comparison between ground truth and remotely sensed data	2
3	Aerial Photograph and scale determination with stereoscope	1
4	Interpretation of satellite imagery and aerial photograph	1
5	Determination of Parallaxes in images	1
6	Demonstration on GPS; Provision of Ground Control by GPS in different mode	1
7	Introduction to digital image processing software	1
8	Introduction to GIS software	1
9	Data input; Data editing and Topology creation-Digitization of point, line & polygon features	
10	SRTM & CARTODEM download from web and Georeferencing of an image	1

11	Delineation of Watershed, DEM generation: slope, Aspect, flow direction, Flow accumulation, Drainage, network & morphometric analysis	2
12	LULC by supervised classification and LULC by unsupervised classification	1
13	Determination of NDVI and SAVI	2
14	Temporal satellite data analysis for vegetation condition, crop water requirement calculation	1
15	Erosion mapping using aerial and satellite Data	1
	Total	**17**

References:

1. Ian H. S. Cornelius and Steve C. 2002. An Introduction to Geographical Information Systems. Pearson Education, New Delhi
2. James B. C. and Randolph H. W. 2011 Introduction to Remote Sensing The Guilford Press
3. Lilles T. M. and Kiefer R. W. 2008 Remote Sensing and Image Interpretation John Wiley and Sons
4. Rees W, W, 2001 Physical Principles of Remote Sensing. Cambridge University Press
5. Paul Curran P. J. 1985 Principle of Remote sensing ELBS Publication
6. Fundamental of Remote sensing George Joseph and C. Jeganathar
7. Principles of RS and Principles of GIS, ITC, Netherland PUBL.
8. Principle of GIS, ITC Netherland Publication
9. Introduction to GIS by Kangtsang Chary hill pub.