PG DIPLOMA IN GEOINFORMATICS COURSE (Duration 1 year)

Number of subjects in each semester

1. The Diploma course will be 3 Semester duration each covering a period of 4 months.
2. Each Semester will have 5 theory papers and 5 laboratory classes / practicals.
3. Each subject will be of 3 theory classes of 50 minutes duration with a credit of 3-0.
4. Each laboratory class will be of 3 hour duration with a credit of 0-2.
5. The total credit for each semester will be 5x3= 15 for theory classes and 5x2=10 for lab classes, i.e. a total of 25 credits.
6. The third Semester will be of 10 credits. The student will have to carry out Project work of 8 credits in this Semester and have to submit a project report at the end of the Semester. A student has also to appear for a Grand Viva-voce at the end of 3rd Semester. The maximum marks for viva is 100 with a credit of 2. The maximum marks for project report is 400 with a credit of 8 as stated.

Marks and examinations

1. In each Semester there will be 3 class tests of 15 marks, the best score of two class tests marks (out of a maximum marks of 15+15=30) scored by a student will be counted for addition to the end semester theory paper marks of 60.
2. Students will be required to give a seminar presentation at the end of a semester with a report write up on any topics assigned to them. The topic will be assigned by the class teacher on the respective theory topic. The maximum marks for this presentation is 10.
3. The total mark for a theory paper will be 100 i.e. 60 for end Semester written examination + 30 for class test + 10 for Seminar.
4. Each laboratory / practical paper will carry maximum marks of 100.
5. The maximum marks for each paper will be 100 for theory and 100 for practical.
6. The marks will be converted in to a 10 point grade as per the following rules.

Theory paper			Practical		
Marks	Grade	Grade point	Marks	Grade	Grade point
90% and above	EX	10	90% and above	EX	10
80% to 89%	A	9	80% to 89%	A	9
70% to 79%	B	8	70% to 79%	B	8
60% to 69%	C	7	60% to 69%	C	7
50% to 59%	D	6	50% to 59%	D	6
35% to 49%	P	5	35% to 49%	P	5
Below 35%	F	0	Below 35%	F	0

P stands for pass

7. A student has to score a minimum of 6 Semester Grade Point Average (SGPA) and pass in all subjects, both theory and practical in order to qualify for the next semester.
8. A student failing (Grade F) in one or more theory papers in a semester but securing a minimum of 6 SGPA will have to clear the paper in which the student has failed by reappearing in a separate test(s) on payment of an additional fees of Rs. 500 per paper failed for which the tests will be carried out by the respective subject teacher.
9. A student has to pass the laboratory classes in one chance and no reexamination will be allowed in laboratory class.
10. Failure in more than two subjects in a semester or obtaining less than 6 SGPA in a semester even while passing in all subjects (Grade P) will debar a student to continue the course.
11. The grading system of project and viva-voce will be as that of the practical.

PG DIPLOMA IN GEOINFORMATICS COURSE (Duration 1 year)

Calculation of Semester Grade Point Average (SGPA) and Cummulative Grade Point Average (CGPA).

$$\text{SGPA} = \frac{\sum_{n=1}^{n=5}(\text{no. of credit in theory} \times \text{grade obtained} + \text{no. of credit in lab} \times \text{grade obtained})}{25}$$

$$\text{CGPA} = \frac{\sum_{i=1}^{i=3}((\text{SGPA of i th Semester} \times \text{no. of credits of i th Semester})}{60}$$

In order to be eligible for the Diploma in Geoinformatics a student has to pass in all subjects, both theory and practical as well as project and viva-voce and secure a CGPA of 6.0.

Subjects in each Semester

First Semester

Sl.	Code	Subject & Credit
1.	**DGI 101**	Principles of Remote Sensing - (3-0)
2.	**DGI 102**	Principles of Geographic Information Systems (GIS) – (3-0)
3.	**DGI 103**	Cartography & Digital Mapping – (3-0)
4.	**DGI 104**	Basics of Global Positioning System(GPS) – (3-0)
5.	**DGI 105**	Fundamentals of Calculus, Vectors, Matrices & Statistics (3-0)
6.	**DGI 191**	Remote Sensing Lab – (0-2)
7.	**DGI 192**	GIS Lab
8.	**DGI 193**	Cartography Lab – (0-2)
9.	**DGI 194**	GPS Lab
10.	**DGI 195**	Programming Lab – (0-2)

Second Semester

Sl.	Code	Subject & Credit
1.	**DGI 201**	Spatial Database, Analysis and Modeling – (3-0)
2.	**DGI 202**	Digital Image Processing – (3-0)
3.	**DGI 203**	Geoinformatics in Disaster Management – (3-0)
4.	**DGI 204**	Applications of Geoinformatics – (3-0)
5.	**DGI 205A**	Geoinformatics in Water Resources Management – (3-0) Or
6.	**DGI 205B**	Geoinformatics in Resource Management – (3-0) Or
7.	**DGI 2075C**	Mission Projects in India – an overview – (3-0)
8.	**DGI 291**	Database Analysis Lab
9.	**DGI 292**	Digital Image Processing Lab – (0-2)
10.	**DGI 293**	Disaster Management Lab – (0-2)
11.	**DGI 294**	Applications of Geoinformatics Lab – (0-2)
12.	**DGI 295A**	Water resources Management Lab – (0-2) OR
13	**DGI295B**	Resource Management Lab – (0-2)

Third Semester

Sl.	Code	Subject & Credit
1.	**DGI 381**	Project Work (0-8)
2.	**DGI 382**	Grand Viva Voce (0-2)

Sessions & Classes

1. The academic session will start from 2nd week of July or as advertised at the time of seeking the applications and will be over in the 2nd week of following June.
2. The theory classes will be from 10-30 AM to 1PM (10.30 – 11.20, 11.20 – 12.10, 12.10 – 1.00) and the lab class will be held from 2 pm to 5pm.

PG DIPLOMA IN GEOINFORMATICS COURSE (Duration 1 year)

SYLLABUS

FIRST SEMESTER

1. DGI 101 Principles of Remote Sensing - (3-0)

Definition of Remote sensing, Advantages and limitations, Remote sensing process, Electromagnetic Radiation (EMR): EMR Spectrum and its properties, EMR wavelength regions and their applications, Atmospheric windows, Interaction of EMR with matter, Spectral signatures, Resolutions: Spectral, Spatial, Temporal and Radiometric

Fundamentals of aerial photography, Vertical and Oblique aerial photography, Aerial cameras, Photogrammetry; Basic concepts of scale, object height and length, object area and perimeter, grayscale tone/color of objects, Photo interpretation techniques, Stereo photogrammetry and stereovision, Parallax bar and its applications.

Photographic System: Cameras, Sensor classification: Active and Passive, along track and across track scanners, Infrared Scanners, Thermal Sensors and Microwave Sensors

Introduction to Thermal Infrared Radiation Properties: Kinetic Heat, Temperature, Radiant Energy and Flux, methods of transferring heat, Thermal properties of terrain: Thermal Capacity, Thermal conductivity, Thermal Inertia, Thermal Infrared Multispectral scanners, Thermal IR Remote sensing examples

Passive Microwave Sensors, Active Microwave Sensors, Side looking RADAR, Scatterometer

Orbits of satellite, Keppler's laws of motion, IRS Series of Satellites, LANDSAT, SPOT, IKONOS, QUICKBIRD, MODIS, RADARSAT, NOAA, TERRA, MOS and ERS, Brief introduction to Weather and Communication Satellites

Spectral Signature and its Response: of Soil, Vegetation and Water, Basics of visual interpretation of satellite images

Hyper-spectral remote sensing

TEXT BOOKS

1. Jensen, J.R., "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi, 2000
2. George Joseph, "Fundamentals of remote sensing", Universities press (India) Pte Ltd., Hyderabad, 2003

REFERENCE BOOKS

1. Sabins, F.F. Jr., 'Remote Sensing – Principles and Interpretation", W.H. Freeman & Co., 2002 Edition.
2. Reeves, Robert G., "Manual of Remote Sensing, Vol. I, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia, USA
3. Lillesand, Thomas M. and Kiefer, Ralph, W., "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York, 2000
4. Rampal, K.K., Handbook of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi, 1999

2. DGI 102 Principles of Geographic Information Systems (GIS) – (3-0)

Basic Concepts about spatial information, Philosophy and definition of GIS, features, pictures, variables: points, lines, areas, Position on the earth; Basics of map.

Fundamentals of Data Storage, Information Organization and Data Structure Basic File Structures; Tabular Databases; Advantages of Databases, Types of Databases- hierarchical systems, network systems, relational systems and Object-oriented database systems (OODS), Data Models-Entity Relationship model, Relational Model, Data Structures; Raster Structures, Vector Structures.

GIS Data Requirement, sources and collection, Methods of data capture-scanning, digitization and associated errors, Conversion from Other Digital Sources, Attribute data input and management, Edge matching, creating digital data - remote sensing; generating data from existing data ; Metadata ;Different Kinds of geospatial data, , Detecting and Evaluating Errors, Data Quality Measurement and Assessment, digital output options.

Image storage formats, Data retrieval, Data compression, NSDI,GSDI; geographic information in decision making; human resources and education; Interactive data exploration, Vector & Raster data query, Geographic visualization;

Raster data and structure, Local operations, Neighborhood operations, Zonal operations, Distance measure operations, Spatial auto correlations, DEM generation, Spatial Modeling, combining data; terrain mapping finding and quantifying relationships; spatial interpolation;

Vector data base , Topological Relationships; Creation of Topology and Error Correction; Accuracy and Precision; The Importance of Error, Accuracy, and Precision, types of error, sources of error, data quality, Spatial interpolation, Overlay Operations and Buffering, Neighborhood functions Distant Measurement , Map Manipulation, Network analyses,

GIS and Remote Sensing data Integration, Thematic Mapping , GIS and Integration of other types of data, Virtual GIS and SDSS, Project design and management, need assessment.

TEXT BOOKS

1. Kang-tsung Chang 2002,'Introduction to Geographic Information Systems' Tata McGraw Hill, New Delhi.
2. C.P.Lo and Albert K.W.Yeung 2005 "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India,New Delhi.

REFERENCE BOOKS

1. Burrough, Peter A. and Rachael McDonnell,1998, ' Principles of Geographical Information Systems' Oxford University Press, New York.
2. 2Magwire, D. J., Goodchild, M.F. and Rhind, D. M. Ed. 1991,'Geographical Information Systems: Principles and Applications', Longman Group, U.K.

3. DGI 103 Cartography & Digital Mapping – (3-0)

Basic Concept of cartography, Categories of maps, Interpretation of topographic maps, Cartographic databases, data measurement, cartographic design issues, colour and pattern, map lettering, map compilation, map scale, Generalization, symbolization, dot, isopleth and choropleth mapping, multivariate and dynamic mapping, map production, methods of map composing and printing,

Basic Assumptions of projection system, Map Projections, Grouping of map projections: conic projection, cylindrical projection, Zenithal, Projection Types: Mercator, Transverse Mercator, Polyconic, Lambert, Orthomorphic, UTM Projections and their comparison, Choosing a Map Projection, Map Projection transformation, Analysis and visualization of distortion,
Visualization of geospatial data: Design aspects, Multiscale and geometric aspects scale, dissemination of (visualized) geospatial data, data products, use and users of products, Various issues in map visualization.

Computer Cartography, the nature of Data, Database and Data structures, Data Input: Method of data capture, digitisation and scanning method, Techniques and procedure for digitising, Vector and Raster; Data output: Screen display system, file organization and formats, rectification of digital maps, software for digital mapping.

TEXT BOOKS

1. Keates, J.S. (1973): Cartographic Design and production, London, Longman
2. Ramesh, P. A. (2000): Fundamentals of Cartography, Concept Publishing Co., New Delhi.
3. Rampal, K.K. (1993): Mapping and Compilation, Concept Publishing Co.,New Delhi.
4. Anson, R.W. & Ormeling, F.J. (1993), Basic Cartography, Vol. 1, 2nd ed., Elsevier Applied Science, Publishers, London.

REFERENCE BOOKS

1. Robinson A.H. & Morrison J.L, (1995) Elements of Cartography, John Wiley & Sons
2. Gregory, S. (1978): Statistical Methods for Geographers, Longman
3. Singh, R.L & Dutt. P.K, "Elements of Practical geography", Students Friends Allahabad
4. Peterson, M.P. (1995) "Interactive and Animated Cartography" Upper Sadde River, NJ: Prentice Hall.

4. DGI 104 Basics of Global Positioning System(GPS) – (3-0)

Introduction of Global Positioning System, Satellite constellation, GPS signals and data, Geo-positioning-Basic Concepts. NAVSTAR, GLONASS

Basic geodesy, Geoid /datum/ Ellipsoid,- definition and basic concepts, Coordinate Systems, Special Referencing system, Map Scale, Scale factors, Indian geodetic System

Control Segment, Space Segments, User Segment, GPS Positioning Types- Absolute Positioning, Differential positioning

Methods-Static & Rapid static, Kinematic-Real time kinematic Survey- DGPS-GPS data processing and Accuracy.

Selection of Reference Station, Reference Station Equipment: GPS receiver, GPS antenna. Radio and its types, Radio Antenna

GPS Application in Surveying and Mapping, Navigation Military, Location Based Services, Vehicle tracking.

TEXT BOOK

1. Leicka. A.: GPS Satellite Surveying, John Wiley & Sons, use. New York
2. Terry-Karen Steede, 2002, Integrating GIS and the Global Positioning System, ESRI Press
3. N.K.Agrawal Essentials of GPS, Spatial Network Pvt Ltd 2004
4. Sathish Gopi , GPS and Surveying using GPS

5. DGI 105 Fundamentals of Calculus, Vectors, Matrices & Statistics (3-0)

Formula from plane elementary algebra and geometry and trigonometry, elements of variables, continuous variables, functions and limits, principle of differentiation, derivative as rate of change, derivative of a function of one variable, general rule for differentiation, interpretation of derivative by geometry, rules for differentiation, differentiation of a sum, differentiation of product and function, power rules, differentiation of inverse function, various applications of derivatives, tangent and normal, maximum and minimum values of a function, successive differentiation, curvature of a circle, formula for curvature, rectangular coordinates.

Constant of integration, indefinite integral, Rules for integrating standard elementary forms, constant of integration, geometrical significance of constant of integration, Definite integral, calculation of areas, volumes, integration as a process of summation, ordinary differential equation and solution

Matrices, and determinants, properties of matrices, evaluation of determinants, product, sum and differences of matrices, adjoint and inverse of a matrix, linear homogeneous equations and solutions, eigen values and eigen vectors.

Vectors and scalars, cross and dot product of vectors, addition and subtraction of vectors

sampling methods; random and systematic method; source of data - primary and secondary, Organization of data - array, frequency, class intervals, histograms, and distribution, Presentation of Data: Tables, Diagrams - Geometric form (bar diagrams, pie-diagrams), Frequency diagrams (histogram, polygon).

Measures of Central Tendency - mean, median, mode, quartiles, Arithmetic mean, Geometric mean, Harmonic mean, Quadratic mean and their interrelated Relations; Moments, Skew ness, Kurtosis, Measures of Dispersion – absolute dispersion (range, quartile deviation, mean deviation, standard deviation), relative dispersion (coefficient of quartile deviation, coefficient of mean deviation, coefficient of variation), Correlation: meaning,

scatter diagram, standard deviation, variance, Measures of correlation – Karl Pearson's method (two variables ungrouped data) Spearman's rank correlation methods.

Probability: Binomial, Normal, and Poisson distribution, Theory of Sampling: sampling distributions of means and proportions, standard errors, confidence interval estimation for population means, standard deviations, difference of means, sums, Time series analysis - moving averages.

TEXT BOOKS: SCHAUM series books of calculus, vectors, statistics and matrices

6. DGI 101S Remote Sensing Lab – (0-2)

1. Arial photograph interpretation
2. Visual interpretation of multispectral and panchromatic image
3. Histogram stretching, linear, non linear stretching, histogram equalization
4. Image rectification
5. Image classification, supervised and unsupervised classifications
6. Image fusion
7. Stitching of scenes
8. Change detection from multi-date imagery

7. DGI 102S GIS Lab

1. Analog to Digital Conversion – Scanning methods
2. Introduction to software
3. Digital database creation – Point features, Line features, Polygon features
4. Data Editing-Removal of errors – Overshoot & Undershoot, Snapping
5. Data Collection and Integration, Non-spatial data attachment working with tables
6. Dissolving and Merging
7. Clipping, Intersection and Union
8. Buffering techniques
9. Spatial and Attribute query and Analysis
10. Contouring and DEM
11. Advanced Analyses – Network analyses
12. Layout Generation and report

8. DGI 103S Cartography Lab – (0-2)

1. Construction of different types of scales
2. Construction of different types of map projection: Conical projection, Cylindrical Projection, WGS 84
3. Preparation of UTM grid
4. Base Map
5. Designing and Symbolization
6. Analog to Digital Conversion
7. Analysis of Toposheet
8. Updation of maps from Satellite Imagery.

9. DGI 104S GPS Lab

1. Introduction to GPS and initial setting
2. Creating codes and attribute table for GPS receiver
3. Point Data collection using GPS with different datum
4. Line data collection using GPS and measurements
5. GPS data collection for area calculation
6. GPS Data collection in DGPS mode.
8. Post processing of the GPS data
9. GPS and GIS integrations output preparation

10. DGI 105S Programming Lab – (0-2)

1. Introduction to computers & programming concept
2. Programming using concepts of variables, operators

3. Programming using control structures
4. Programming using functions and arrays
5. Programming using strings
6. Programming using data structure
7. Programming using file handling
8. Creation of forms and using control variables
9. Creating menus in forms
12. Connecting with database
13. Adding maps in VB Projects
14. Adding database of maps in the projects

SECOND SEMESTER

1. DGI 201 Spatial Database, Analysis and Modeling – (3-0)

Introduction to Database System: Definition, purpose, data abstraction, instances, schema, DDL, DML, database manager, database administrator, and basic concepts of entity, relationship and primary key.

Introductory concepts, Basic components of computers, Hardware, Software requirements for GIS Processors, Internet, Operating Systems, Programming languages

GIS and Remote Sensing data, Formats & exchange etc: Image storage formats, Data retrieval & Data compression techniques

Data Structures: Geographical data; spatial & non spatial, geographical data in computers, Data Models: Spatial data Model – (i) Cartographic Map model – Raster structure, Quad tree Tessellation (ii) Geo-relational Model – Vector Data structure, Advantages & Disadvantages of Both

Data base structure: Non spatial: Hierarchical structure, Network structure, Relational Structure, Spatial Data Bases: Hybrid Data Model, Integrated Data Model

Data Quality and Errors in GIS: Nature of geographic data – types of uncertainty in a GIS, Sources of Errors in GIS data base: Obvious sources from natural variations & original measurements, Errors through processing, errors associated with overlaying of polygons, Data Quality parameters: Positional accuracy, Attribute accuracy, Logical consistency, Completeness Lineage

Handling Errors in GIS, Normalization in GIS, Levels of Measurements: Nominal, Ordinal, Ratio and Interval, Advantages of RDBMS over DBMS

TEXT BOOKS:

1. Goodchild, M.F. (1978) - Statistical Aspects of the Polygon Overlay Problems, in Harvard papers on GIS, Ed. G. Dulton, Vol. 6, Addison Wesley and Reading Press.
2. Mary Summer, Computers: Concepts and Uses, Prentice Hall, Englewood Cliffs. New Jersey.
3. Mac Donald, A. 1999, Building a Geodatabase, Redlands CA: ESRI Press.

REFERENCE BOOKS:

1. Sanghavi, Hitesh (1998) Oracle Miracles, Express computers methods, 1998.
2. Bonham Carter G.F (1994) GIS for Geoscientists: Modeling with GIS Pergamon Publications.
3. Samet, H. 1990, The Design and Analysis of Spatial Data Structures, Addison–Wesley.
4. A. Silberschats, Henry F. Korth "Database System Concepts", 3rd Edition, TMH, 1998

2. DGI 202 Digital Image Processing – (3-0)

Concepts about digital image and its characteristics, Spectral, Spatial, Radiometric and Temporal resolution, Visual vs. Digital methods, Image data storage and retrieval, Types of image displays and FCC

System design considerations, Sources of image degradation – Pre-processing of satellite image, Radiometric and Geometric correction technique, Interpolation methods – linear and nor linear transformation for geometric corrections

Look-up Tables (LUT) and Image display, radiometric enhancement techniques, Spatial enhancement techniques, Contrast stretching: Linear and non-linear methods

Low Pass Filtering: Image smoothing, High Pass Filtering: Edge enhancement and Edge detection , Gradient filters , Directional and non-directional filtering

Band ratio, Types of Vegetation indices, Principal Component Analysis, Multi dated data analysis and Change detection

Basics of of Pattern Recognition, Spectral discrimination, Signature bank, Parametric and Non-Parametric classifiers, Unsupervised classification methods, Supervised classification techniques, Limitations of standard classifiers

TEXT BOOKS:

1) Sabins, Floyd F., Remote Sensing: Principles and Interpretation, H. Freeman and C., New York.
2) Thomas M. Lillesand & Kiefer, Ralph W., Remote Sensing and Image Interpretation, John Wiley & Sons, New York.
3) Jensen, JR., Remote Sensing of the Environment – An Earth Resources Perspective, Prentice Hall Inc.

REFERENCE BOOKS:

1) Rencz, Andrew N. (Ed), Remote Sensing for the Earth Sciences: Manual of Remote Sensing, 3rd ed., John Wiley & Sons, Inc., New York.
2) Curran, P., Principles of Remote Sensing, Longman, London.
3) Campbell, James B., Introductory Remote Sensing: Principles and Concepts, Routledge.
4) Gibson, P.J., Introduction to Remote Sensing, 2nd ed., Taylor & Francis, London.
5) Cracknell, A.P. & Hayes, L.W B., Introduction to Remote Sensing, Taylor & Francis, London.

3. DGI 203 Geoinformatics in Disaster Management – (3-0)

Fundamental concepts of hazards and disasters, their types, and characterization, zonation of hazards, natural and human induced disasters. Disaster and National losses, historical perspective of disasters in India.

Geological Hazards: Landslide, Earthquake, Mining hazards (subsidence, flooding etc.), Volcanic hazards, Groundwater hazards, Glacial hazards

Hydro meteorological Hazards: Flash floods, River floods, Dam burst, Cloud burst, Cyclones, Coastal hazards and Drought

Environmental hazards: Forest hazards (Deforestation, Degradation and Forest fire), Land, soil degradation, desertification and Pollution (Water, air and soil)

Disaster Management: Fundamental concept of Disaster Management, government, NGOs and peoples participation disaster management. Existing organization structure for managing disasters in India. Geoinformatics in disaster mitigation.

TEXT BOOKS

P.S. Roy (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing (IIRS), 2000.

REFERENCE BOOKS

Spatial Technologies for Natural Hazard Management. Proceedings of ISRS National Symposium, Nov. 21-22, 2000, IIT, Kharagpur.

4. DGI 204 Applications of Geoinformatics – (3-0)

Emergence of geoinformatics technology in application areas, understanding potentials of geoinformatics in allied sectors, geoinformatics advantage over conventional techniques. Indian satellite missions with focused applications, Recent trends in geoinformatics applications.

Application in Land Resource: Remote sensing in mapping soil degradation, impact of surface mining on land resources, forest resources.

Application in Water Resources: Remote sensing in hydro-geomorphological interpretation for groundwater exploration, water quality monitoring, reservoir sedimentation, snow cover mapping and modeling approaches.

Application in Disaster Management: Mapping and modeling Landslide hazards, floods, Cyclones Forest fire and drought.

Application in Urban Planning: Mapping urban landuse, transportation network, Utility-Facility mapping, urban sprawl, site selection for urban development, Urban Information System

Application in Geo-technical Engineering: Slope stability and drainage network analysis, Digital Terrain Modeling, Geoinformatics in Dam site selection, Highways, and Tunnel Alignment studies.

Application in Environmental Management: Selection of disposal sites for industrial and municipal wastes, solid waste management, Environmental Impact Assessment (EIA)

TEXT BOOKS:

1. Schultz, G. A. and Engman, E. T. 2000. Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, Germany.
2. Lillisand, T. M. and Keifer, R. W. 1994. Remote Sensing and Image interpretation', John Willey and Sons, New York, Third Edition
3. Jenson, J.R. 2000. Remote Sensing of the environment – An Earth Resource Perspective, Prentice Hall Inc.
4. P.S. Roy (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing (IIRS), 2000.

REFERENCE BOOK:

1. Spatial Technologies for Natural Hazard Management. Proceedings of ISRS National Symposium, Nov. 21-22, 2000, IIT, Kanpur

5. DGI 205 Geoinformatics in Water Resources Management – (3-0)

Hydrologic Cycle, hydrological parameters, porosity, permeability, specific yield, Types of aquifers.

Watershed Management: Watershed characterization, delineation and codification, watershed problems and management strategy. Geoinformatics approach for watershed prioritization

Remote Sensing in Surface - Subsurface Water Exploration: Application of remote sensing in hydro-geomorphological interpretation for ground water exploration, water quality monitoring through remote sensing.

Water Conservation Projects: Geoinformatics based site selection for river valley projects, surface water harvesting structures: check dam, Nala bunds, subsurface dykes etc.

Operational Applications in Water Resources: Flood prediction, drought evaluation, snow cover mapping, reservoir sedimentation evaluation.

Geoinformatics Models in Water Resources: Geoinformatics based Runoff and hydrological modeling, flood Hazards modeling, snowmelt runoff modeling.

Case Studies: Hydro-geomorphological mapping in Plateau region, Flood prone zone mapping in Indo-Gangetic Plains, Water harvesting initiatives in urban built up lands.

TEXT BOOKS

1. Schultz, G. A. and Engman, E. T. 2000. Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, Germany.
2. Murthy, J. V. S. 1994. Watershed Management in India. Wiley Eastern Ltd., New Delhi.
3. Todd David Keith. 1980. Groundwater Hydrology, John Wiley & Sons, New York, Second Edition.
4. Schultz, G.A. & Engman, E.T., 2000. Remote Sensing in hydrology and water management, Springer-Verlang, Berlin, Germany.

REFERENCE BOOKS

1. Dutta, D., Sharma, J.R. and Adiga, S. (2002). Watershed characterization, development planning, and monitoring- Remote sensing approaches, Tech. Report, ISRO-NNRMS-TR-103-2002.
2. Manual of Remote Sensing, vol-II, Chapter on "Water Resources Assesment". American Society of Photogrammtery.

6. DGI 206 Geoinformatics in Resource Management – (3-0)

Resources classification systems, natural and cultural resources, renewable and non-renewable resources.
Resource Conservation: Remote sensing based Land use- Land cover mapping for resource monitoring and management Sustainable development of natural resources.
Land Resources: Introduction to soil, mineral resources, remote sensing in mapping soil degradation, impact of surface mining on land resources,
Bio-Resources: Remote sensing application in agriculture, forest resources and wildlife habitat assessment. Mapping of forest density and type, issues in forest management.
Water Resources: Remote sensing application in surface and sub surface water resources evaluation, water mining and pollution, issues in water resources management.
Energy Resources: Coal, oil and nuclear energy, non conventional energy resources, future potential and requirement of energy resources. GIS in energy resources management.
Geoinformatics Models in Resource Management: Forest Fire Modeling, Wild Life Habitat Assessment Modeling, Soil Erosion Modeling, Land Resources Development Prioritization Modeling.

TEXT BOOKS

1. Miller, R. W. and Donahue, R. L. (1990): Soils, Prentice-Hall of India
2. Lillisand, T. M. and Keifer, R. W. 1994. Remote Sensing and Image interpretation', John Willey and Sons, New York, Third Edition
3. Simmons, T.G. The Ecology of Natural Resources, Edword Arnold, London, 1974.

REFERENCES

1. Robert G. Reeves: manual of Remote Sensing Vol. II American Society of Photogrammetry and Remote Sensing, Falls Church.
2. Donald A Davidson: Soils and Land use Planning, Longman, London, 1998.
3. Robert W. Colwell. Monitoring of Earth Resources from Aircraft and Spacecraft, NASA, Washington DC.

7. DGI 207 Mission Projects in India – an overview – (3-0)

Overview of IMSD, NRIS, NNRMS etc.
RGNDWM, Wasteland Development, Recharge, Land cover mapping, Micro-wave projects
Functions of DOS (National level and state level)
Indian Remote Sensing Satellite Programme
National level and State level Mission Projects
Natural Resources Mission Projects – other agencies
Status of Indian Space Programme vis-à-vis Space Programmes of other countries

REFERENCES

1. ISRO and DOS Reports
2. IMSD Report

8. DGI 201S Database Analysis Lab

1. Concept of entity and relationship.
2. Creation of Tables
3. Concept of SQL
4. Performing various actions over table
5. Merging of tables by using primary key
6. Maintaining database

8. DGI 202S Digital Image Processing Lab – (0-2)

1. Introduction to ERDAS IMAGINE Study of the marginal information given on the C.D. Rom/Digital data
2. Import / Export of files using ERDAS IMAGINE Geo-reference of the toposheet and imageries
3. Display, Analysis and interpretation of black & white images and FCC
4. Study of various contrast enhancement techniques
5. Low Pass Filter: Compression of the high frequency component & enhancement of the low frequency component
6. High Pass Filter: Compression of the low frequency component and enhancement of the high frequency component
7. Sub-setting of area of interest from the satellite image
8. Principal Component Analysis
9. Resolution Merging
10. Unsupervised Classification
11. Supervised Classification
12. Map composition

9. DGI 203S Disaster Management Lab – (0-2)

1. Flood prone area mapping using satellite images and ancillary data.
2. Forest fire risk mapping using satellite images and GIS.
3. Landslide mapping and risk evaluation.
4. Multivariate analysis and application of geoinformatics model for landslide hazard zonation
5. Drought prone area mapping using satellite images
6. Spatial variation of climatic data using GIS techniques for drought prediction
7. Terrain mapping in coastal region for coastal hazards prediction
8. Multiple hazard mapping using satellite images and modeling risk in GIS.

10. DGI 204S Applications of Geoinformatics Lab – (0-2)

1. Satellite image based hydro-geomorphological interpretation for ground water targeting. Open cast mining impacts on land resources using satellite images.
2. Mapping flood hazards in a region using satellite images
3. Mapping landslide hazards in a region using satellite images
4. Urban sprawl mapping of a township using satellite images
5. Utility-facility mapping for regional development analysis in GIS
6. Application of Geoinformatics for identification of waste disposal sites.
7. Digital terrain models for selection of dam site and road infrastructure.

11. DGI 205S Water resources Management Lab – (0-2)

1. Delineation of river catchments on satellite image- topographical sheets and their codification as per Watershed Atlas of India.
2. Evaluation of various drainage morphometric parameters for watershed characterization.
3. Hydro-geomorphological mapping for ground water exploration in alluvial terrain.
4. Hydro-geomorphological mapping for ground water exploration in hard rock terrain
5. Flood inundation mapping in alluvial plain areas using satellite images
6. Locating surface water harvesting structures like check dams, de-siltation tanks, and
7. nullah bunds etc. using satellite image
8. Location of high dams and tunnels in hard rock terrain for large irrigation projects

9. Creation of flow direction, flow length, flow accumulation in a watershed based on
10. contours using Arc-View GIS
11. Study of snow covered areas for evaluation of its water resources using satellite images.
12. Rainfall run-off modeling using geoinformatics approach.

12. DGI206S Resource Management Lab – (0-2)

1. LU-LC mapping at level I and Level II using 1:50,000 satellite image.
2. Forest Types Mapping using satellite images.
3. Delineating on satellite image various surface water resources and identify potential sites for WR conservation.
4. Delineation of surface mining zones and impact on land resources of the area using satellite image
5. NDVI and density slicing of digital satellite data for forest density classification.
6. Supervised classification for mapping agriculture and forest resources.
7. Soil erosion modeling using geoinformatics approach
8. Natural resource mapping and change detection study using temporal satellite data

THIRD (PROJECT) SEMESTER (0-10)

1. **DGI301S Project Work** (0-8)
   Individual Project Work will be assigned to every student
2. **DGI302S Grand Viva** (0-2)