Department of Environmental Science & Engineering
Guru Jambheshwar University of Science & Technology,
Hisar-125001

M.Tech in Geo-Informatics

Under Self Financing Scheme

Name of M.Tech. Programme	**Geo-Informatics (w.e.f session 2018 onwards)**

Distribution of Total Credits

Program Core(PC)	Program Elective(PE)	Open Elective(OE)	Total Credits
65	**8**	**3**	**76**

Semester-wise Schedule

Semester-I

Sr.No	Course No.	Title	Type	L-T-P	Credits	Maximum Marks
1	GIM -701	Introduction to Geo-Informatics, Space science and Principals of Remote Sensing.	PC	3-1-0	4	100
2	GIM -702	Fundamentals of Geographic Information System (GIS)	PC	4-1-0	5	100
3	GIM -703	Principals of Cartography and Surveying	PC	3-1-0	4	100
4.	GIM -704	Introduction to Earth Systems	PC	3-1-0	4	100
5.	GIM -705*	Basics of Geo-Mathematics, Geo-Statistics and Computer programming Languages.	PC	2-1-0	0	000
6.	GIM -706	Lab-I (Remote Sensing, Cartography & Surveying)	PC	0-0-6	3	100
7.	GIM -707	Lab-II (Geographic Information System)	PC	0-0-6	3	100
8.	GIM -708	Lab-III (Earth systems)	PC	0-0-6	3	100
9.		Audit Course I (Any one)*		2-0-0	0	100
Total					**26**	

Semester-II

1.	GIM -709	Principals of Photogrammetry	PC	3-1-0	4	100
2.	GIM -710	Digital Image Processing	PC	3-1-0	4	100
3.	GIM -711	Information & Communication, GPS Technologies and Applications	PC	3-1-0	4	100
4.	GIM -712	An Introduction to Geo-Informatics applications in natural resources management	PC	3-1-0	4	100
5.	GIM -713	Advanced Remote Sensing and GIS	PC	3-1-0	4	100
6.	GIM -714	Lab-IV (Digital Image Processing)	PC	0-0-6	3	100

6.	GIM -715*	Lab-V Computer Programming Languages and softwares	PC	0-0-6	0	100
7.	GIM -716	Lab-VI Photogrammetry and Global Positioning System	PC	0-0-6	3	100
8.		Audit Course II (Any one)*		2-0-0	0	100
Total					**26**	

Semester-III						
1.	GIM-717	Soft Skills, Geoinformatics Project Planning and management and Research Methodology	PC	2-1-0	0	000
2.	GIM-718	**Geo-Informatics in Geo-Resources**	PE	3-1-0	4	100
3.	GIM-719	**Geo-Informatics in Bio-Resources**	PE	3-1-0	4	100
4.	GIM-720	**Geo-Informatics in Disaster Management**	PE	3-1-0	4	100
5.	GIM-721	MOOC Courses (Available on SWAYAM website from time to time)	PE	3-1-0	4	100
6.	GIM-790	Credit Seminar	PC	0-0-0	1	100
5.	GIM-791*	In-plant training (S/US)	PC	0-0-0	0	000
6.	GIM-800	Dissertation Part-I	PC	0-0-6	3	100
7.		Open Elective	OE	3-0-0	3	100
Total Credits					**16**	
Semester-IV						
1.	GIM-800	Dissertation- Part-II	PC	0-0-18	09	100
Total Credits					**09**	

*****Qualifying and non-credit course

Note:

(i) In-plant training (6 weeks) to be undertaken at the end of 2nd semester, the report of which has to be submitted before commencement of the 3rd semester.

(ii) Students will have to take Two PE (out of GIM-718, 719,720 & 721) in 3rd Semester. Open Elective Course has to be taken from the list of Open Elective Courses proposed. Students have to take one audit course in 1st Semester and one in 2nd Semester out of above mentioned list of audit courses proposed by AICTE.

(iii) Each paper will be evaluated internally 30% (Two minor tests) and externally 70% (Major Test).

(iv) Each unit of each course should be covered within 12-15 lectures.

Course Code: GIM-701
Introduction to Geo-Informatics, Space Science and Principles of Remote Sensing

4 Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Geo-Informatics: Meaning and scope of Geo-Informatics, Components of Geo-Informatics, Introduction to Space, Solar System, Earth - Orbit, Rotation, Time, Satellite orbits. Introduction, Definition, History and stages in remote sensing technology, Advantages of Remote Sensing over conventional methods of survey and inventorying, interdisciplinary nature and relation with other disciplines, over view of Remote sensing in India and in other countries.

Unit-II

Remote sensing process: Physics of Remote Sensing - Energy Sources, Electromagnetic Radiation (EMR): EMR Spectrum and its properties, EMR wavelength regions Black body radiation& radiation laws; Plank's Law, Stephen Boltezman law, Wien's displacement law, Kirchoffs Law), Energy Interaction with Atmosphere –Scattering, Absorption, Refraction, Atmospheric Windows, Energy interaction with earth surface features - (Absorption, Reflection, Transmission). Spectral signatures, EMR Interaction with Earth materials: Spectral signature concepts – spectral reflectance and emittance – specular reflection and non-specular reflectance – Albedo of materials – EMR interaction with rocks, minerals, vegetation and water – Factors affecting spectral reflectance of materials. Instruments used to study the spectral reflectance – spectrophotometer –spectro-radiometer.

Unit-III

Remote Sensing Systems: **Platforms:** -Remote Sensing Platforms, Space and orbits, Keppler's law of motion, Orbiting Mechanisms of Satellites, Satellite positioning systems; satellites for Land, Ocean, and atmospheric studies. Basics of Telemetry Tracking and Commanding stations of satellites. **Sensors**: Types of sensors used in R S and their geometry; Photographic and Non-photographic Sensors, Active and Passive Remote Sensing, across track and along track sensors, Optical sensors, Panchromatic, Multi-spectral, Hyper-Spectral and Super-Spectral sensors, Optical Remote Sensing Resolutions: Spectral, Spatial, Temporal and Radiometric Resolutions, photograph v/s image, Image data characteristics, data selection criteria.

Data Acquisition –Ground Station, Signal Detection, Recording, Scanning Mechanisms, Effects of Climate and weather conditions on satellite images, Satellite data products and types. Satellites sensors with technical specifications: IRS satellite series, Landsat series,

SPOT series, IKNOS,Quick-bird, Modis, Radarsat, NoAA, Terra, and others latest Earth Resource Satellites, Brief introduction to Weather and Communication Satellites.

Unit-IV

Image Interpretation: Generation of B/W, True colour and False Colour Composites (FCC), scales of the data products, annotation of satellite data products. Introduction to image Interpretation, Basic principles of Image Interpretation, Decoding of Different Imageries, Elements of Image Interpretation, Techniques of image Interpretation, Visual verses digital Interpretation, Interpretation Keys. Factors affecting image interpretation; Use of image interpretation keys; Basics of Artificial intelligence; Effects of weather on images i) Clouds, ii) Surface winds, iii) Penetration of smoke plumes etc. Remote Sensing Data Products and their procurement.

Ground Investigation in support of Remote Sensing: Uses of ground data, Ground truth instruments and spectral signature, interpretation and calibration of GTR observations, test sites, accuracy assessment.

Reference Books

1. American Society Of Photogrammetry, 1983: Manual Of Remote Sensing (2nd Edition), ASP Falls Church, Virginia

2. Curran, P. 1985 : Principles Of Remote Sensing, Longman, London.

3. Lillisand, T.M. And P.W.Kiefer, 1986: Remote Sensing And Image Interpretation, John Wiley & Sons, New York.

4. Sabins, F.F.Jr., 1978: Remote Sensing Principles And Interpretation, Freeman, Sanfrancisco.

5. Drury S.A, 1990: A Guide To Remote Sensing - Interpreting Images Of Earth, Oxford Science Publications, Oxford.

6. Floyd M. Henderson; Principles & Applications of Imaging Radar, John Wiley & Sons, N.Y.

7. Alexay Bunkin & Konstantin Volia.K, - Laser Remote Sensing of the Ocean Methods & Publications. John & Wiley & Sons, N.Y.

8. PJ Curran. Physical aspects of Remote Sensing.

Course Code: GIM-702
Fundamentals of Geographic Information System

5 Credits (4-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit – I

Basic Concepts of spatial information, Philosophy, History and definition of GIS, interdisciplinary relations, applications areas. Spatial Concepts**:** introduction to space, Spatial awareness, Euclidean space, Set based geometry of space, Topology of space, Network spaces, Metric spaces, Spatial elements - point, line, area, surface and network- spatial patterns, spatial data relationships, topological relationships and geometrical relationships, proximal, directional relationships Fundamentals of Data Storage, Information Organization and Data Structure Basic File Structures, Spatial and Non-spatial Databases, Advantages of Database.

Types of Databases, Hierarchical systems, Network systems, Relational systems, 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, associated errors in data capture, Conversion from Other Digital Sources, Attribute data input and management, Edge matching, Creating digital data, generating data from existing data, Metadata standards and formats, different kinds of geospatial data, Detecting and Evaluating Errors, Data Quality Measurement and Assessment, Digital output options. Data retrieval and Data compression.

Unit-II

Vector & Raster data query, Geographic visualization; Local operations, Zonal operations, Distance measure operations, Spatial auto correlations, 2D, 2.5D, 3D, DEM, STM, SEM generation, Spatial Modeling, Combining data; Terrain mapping, Finding and quantifying relationships; Techniques of interpolation, Vector data base, Topological Relationships; Creation of Topology.

Basic Spatial Analysis, Integration and Modelling: Logic operations, general arithmetic operations, general statistical operations, geometric operations, query and report generation from attribute data, geometric data search and retrieval, complex operations of attribute data, classification, reclassification, integrated geometry and attributes, overlay, buffer zones, raster data overlay, integrated data analysis. Distant Measurement. **Advanced Analysis and Modelling:** Spatial reference systems, trend surface analysis, Network and Raster

connectivity operations, Spatial interpolation and proximity operations, fuzzy analysis, GIS analytic models, Digital Terrain models

Unit-III

Spatial data editing: Importance of Error, types of error, sources of error, Locational errors editing, Digitizing errors and editing, Topological errors and editing, Errors resulting due to natural variation from original measurements. Errors arising through processing, errors arising from overlay and boundary intersections. Errors resulting from rasterizing a vector map. Errors associated with overlaying two or more polygon networks. Nature of boundaries. Statistical nature of boundaries. Combining attributes from overlaid maps. Accuracy, Precision and data quality, Data Processing: Updation, corrections, modifications, scale changes, Coordinate thinning, geometric transformations and map projection transformations, conflation sliver removal, edge matching, interactive graphic editing, rubber sheeting.

Unit-IV

Spatial Data Classification methods: Multivariate analysis, Allocating individuals to existing classes, Expert systems for GIS. **Data Quality and Standards :** Definition of data quality, components of geographic data quality – lineage, positional accuracy, attributes accuracy, temporal accuracy, logical consistency and completeness; assessment of data quality. Accuracy, precision, error and uncertainty. Sources and types of errors, error propagation and error management; Geographic data standards components and types of GIS standards, international GIS standards, interoperability of GIS, quality control.

Reference 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.
3. Burrough, Peter A. and Rachael McDonnell,1998, ' Principles of Geographical Information Systems' Oxford University Press, New York.
4. 2Magwire, D. J., Goodchild, M.F. and Rhind, D. M. Ed. 1991,'Geographical Information Systems: Principles and Applications', Longman Group, U.K.
5. Leicka. A.: GPS Satellite Surveying, John Wiley & Sons, use. New York
6. agarwal, Pragya: Self-organizing maps: Applications in Geographic Information Scince, John Wiley & Sons, 2008
7. Balram, Shivanand. Collaborative Geographic Information system- Idea group publishing, 2006.
8. Nick, Mount.: Innovations in GIS, Representing, modeling and visualizing the natural environment, crc-2009.

Course Code: GIM-703
Principals of Cartography and Surveying

4 Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

History of Cartography, Basic Concept of cartography, Categories of maps, Interpretation of Topographic maps, Cartographic databases, Data measurement, Cartographic design issues, Colour and pattern, Cartographic visualization, Cartography today. Models for digital cartographic information - Map digitizing. Cartographic design - Color theory and models - Color and pattern creation and specification - color and pattern - Typography and lettering the map - Selection and generalisation principles – Symbolisation-Map compilation, Methods of map composing - Demography and statistical mapping. Dot, isopleth and choropleth mapping, Map characteristics. cartographic materials. Base maps and thematic maps; Map legend symbols &; border information Design and layout of maps, Cartographic problems of mapping the earth with horizontal and vertical controls

Unit-II

Earth-Map relations- Concept of Map Projections, need and utility of map projections, Grouping of map projections: conical, cylindrical, Zenithal Projections Types: Mercator, Transverse Mercator, Polyconic, Lambert, Orthomorphic, UTM Projections and their comparison and their properties - Scale - Reference and coordinate system - Transformation - Basic transformation - Affined transformation. Choosing a Map Projection, Map Projection transformation, Analysis and visualization of distortion,

Visualization of geospatial data: Design aspects, Multiscale and geometric aspects of scale, Dissemination of (visualized) geospatial data, Data products, users and uses of products, various issues in map visualization. Cartography as graphic means of Communication. Theory of Visual perception-Visual variables. Graphic elements- Clarity and legibility contrast,

Unit-III

Principles of Surveying, Classification of Surveying, Introduction to various traditional surveys – Chain Surveying: Instruments, Sources of errors – Compass Surveying: Theory of Magnetic Compass, Problems and errors in compass survey. Fundamentals of Geodesy: Definition and scope of Geodesy, Earth, Geoid, and Ellipsoid of rotation, Reference surfaces and coordinate systems in Geodesy, Indian Geodetic System and Everest Spheroid, World Geodetic System 84(WGS 84). coordinate system in geodesy. Geodetic coordinates and

Natural coordinates. **Satellite Geodesy:** Introduction – Normal orbits, Equation of motion and laws of Kepler, geometry of elliptic orbit, line orbit in space, perturbed orbit, Lagrange and Gaussian Planetary equations, Gravitational perturbation, Doppler surveying.

Unit-IV

Digital Cartography and Map production: Digitization and scanning method, Techniques and procedure for digitizing-Vector and Raster, Data output, Screen display system, File organization and formats, Rectification of digital maps, Softwares for digital mapping, Web Cartography- Hardware and software components of digital mapping systems, Introduction to cartographic softwares like Arc-Gis, Autocad, Coral Draw etc. Modern techniques in map production - Design and development of Dynamic and interactive mapping - animation - navigation system - simulation - interactive cartography - map as interface - Expert systems and Web Maps - Electronic Atlas - Topographic model generalisation, Map revision-Map accuracy, Trends for future developments. Cartographic mapping system in India-Village level-Cadastral Maps to National Level.

Reference books

1. Keates, J.S. (1973): Cartographic Design and production, London, Longman

2. Rampal, K.K. (1993): Mapping and Compilation, Concept Publishing Co.,New Delhi

3. Anson, R.W. & Ormeling, F.J. (1993), Basic Cartography, Vol. 1, 2nd ed., Elsevier
4. Applied Science, Publishers, London.

5. Anson R.W. and Ormeling, F.J., “Basic Cartography for students and Technicians”, Vol. I, II and III, 3rd Edition, Elsevier Applied Science Publishers, 2004.

6. Arthur H. Robinson, “Elements of Cartography”, 7th Edition, John Wiley and Sons, 2004.

7. John Campbell, “Introductory Cartography” 3rd Edition, Wm.C. Brown Publishers, 2004.

8. Menno-Jan Kraak and Ferjan Ormeling,”Cartography Visualization of Geospatial Data”, 2nd Edition, Pearson Education, 2004.

9. R.W. Anson and F.J. Ormeling, “Basic Cartography for Students and Technicians” Vol. I, II and III, 2nd Edition, Elsevier Applied Science Publishers, 2002.

10. 4.Menno, Jan Kraak and Allan Brown, “Web Cartography Developments and Prospects, Taylor and Francis, 2001

11. Misra, R.P. and Ramesh, A. Fundamentals of Cartography, McMillan Co., New Delhi.

12. Singh, R.L and Dutt, P.K. Elements of Practical Geography, Kalyani Pubnlishers, New Delhi.

13. R.Singh & Kanujia. Map work and practical geography, Central Book Depot, Allahabad

Course Code: GIM-704
Introduction to Earth systems

4Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Atmosphere - scope, origin and nature, composition & vertical division of the atmosphere. Meteorological parameters and their measurements - pressure, temperature, wind, precipitation, humidity, and radiation. Geographical, seasonal and vertical distribution of temperature, pressure, wind and precipitation. Solar and terrestrial radiation: Distribution in clear, cloudy and average conditions. Global warming and climate change.

Unit-II

Fundamental concepts of Geomorphology: Denudational Geomorphology- Process of Weathering – Chemical and Mechanical. Types of Landforms: Geomorphic processes and landforms: Techtronic Landforms-faults, folds, volcanoes and associated land forms, Rock Cycle Aeolian/Wind geomorphic process and associated land forms,

Unit-III

Fluvial Cycle, rivers and associated land forms, glaciers and associated land forms, Karst topography, Mass wasting and erosion, Dynamic Oceans and associated costal land forms. Physical Geography **of India:** Physiography, drainage, climate, soils Natural resources- The Himalayas, Ganga-Brahmaputra Plains, peninsular India, Precambrian shield, the Gondwana rift basins, Deccan Plateau, climatic conditions with special reference to seasonal distribution and variation of temperature, humidity, wind and precipitation, climate zones of India, Agricultural geography of India, Population - its distribution and characteristics, urbanization and migration, Environmental problems and issues.

Unit-IV

Soil & Regolith: Soil forming processes, soil forming factors, Soil profile, Soil components, Pedogenic regimes. Classification of soils up to order level.

List of Text Books

1. Structural Geology by Billings, M. 1984
2. Earth History & Plate Tectonics by Carl K. Seyfert, Leslie A. Sirkin
3. Geology of India & Burma by M.S. Krishna 6th, Ed.
4. General Climatology by H.J. Critchfield
5. Physical Geology by Arthur Holmes
6. Physical Geography by Stahler

Course Code: GIM-705*
Basics of Geo-Mathematics, Geo-Statistics and Computer programming Languages.

0 Credits (2-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Mathematics: Set Theory, Sets and Subsets, Universal set, Operations on Sets; Division in the integers: Matrices: Matrix algebra, Definition, Square matrix, Identity Matrix, diagonal Matrix, Scalar multiple of a matrix, Addition of matrices, Subtraction matrices, multiplication of Matrices, Transpose of matrix. Review of linear algebra, Operations, determinant, inverse. Solving linear equation. Eigenvalues and eigenvectors.

Unit-II

Geo-statistics: Introduction to Spatial Statistics, Measurement Scales: Nominal, Ordinal, Internal, Ratio. Descriptive Statistics: Numerical description of Data; Measures of Central tendency (the Mean, Median and Mode Geometric mean and Harmonic Mean, moving averages.); Frequency polygon and frequency curve, Histograms, Distributions and density. Measures of variations: Measuring the variation in Standard Deviation, Population Variance, Sample Variance, Significance of Standard Deviation, Range, Quintile deviations, Mean deviation, Standard deviation and variance, Coefficient of variations, Analysis of Variance (ANOVA).

Theory of Sampling - Meaning of a sample, Sampling technique, Universe, static and parameters. Sampling distribution, standard error. Different sampling techniques like scruple random sample, standard random sample, systematic, cluster and multi-storage sample. Collections of data: characteristic of Statistical data, primary and secondary data sources, scale of measurement, Population, Sample, geographical and diagrammatic representation of data, Frequency distribution.

Unit-III

Exploratory Data Analysis, Co-varience, Correlation Analysis, Karl Pearson's Coefficient of Correlation, Statistical inference, Significance of tests, Hypothesis testing (t and F test), Simple Regression Analysis. Linear and nonlinear regression, Introduction to linear programming, problem solving using graphical methods,

Probability theory: Trial, events, mutually exclusive events, Theorem of total probability, Additions and multiplication laws, Basic problems on these laws. Random variable and

probability: Concept of random variables and probability distribution, Discrete and continuous random variable, Sample space and events.

Unit-IV

Introduction to Visual Basic and programming

References Books

1. Statistics by S.P. Gupta
2. Statistical theory and methods by Sanchetic and Kapoor
3. Statistics by S.C.Gupta
4. Elhance, D.N. – Fundamentals of Statistic, Kitab Mahal Allahabad, 1972
5. Gregory, S – Statistical Method and the Geographer, Longman, London, 1963
6. Cole, J.P. & Kind, C.A.M. – Quantitative Methods in Geography, John Willey & Sons, New York, 1968.
7. Kafka,F & G.Simpson – Basic Statistics, Oxford & I.B.H. Publishing Co.,Calcutta, 1971.
8. Jones, P.A. – Field Work in Geography, Longman, London, 1968
9. Johnston, R.A. Multivariate Statistical Analysis in Geography, Longman, London,1978
10. Visual Basic and Programming, Black Book.

Course Code: GIM-706: LAB-I
Remote Sensing, Cartography and Surveying

3 Credits (0-0-6)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70

Remote Sensing

Study of Ground Truth Radiometers (GTR), study of reflectance of selected objects using GTR, plotting diurnal variations in reflectance, Study of satellite imagery, border information and marking reference system; Familiarizing various satellite image formats Study of infrared radiometer. Use of spectro-radiometer – production and analysis of spectral reflectance curves; Use and analysis of Densitometric data for a given image; Familiarizing Digital Satellite Images-Spectral Reflectance values, Resolution, Study Identification of features of a given area in panchromatic, multi spectral, hyper spectral images, Study of satellite imagery in different bands and visual interpretation; Study of thermal image interpretation of various features and drawing of isotherms; Study of Radar (microwave), Thermal imagery and interpretation of features; Interpretation of cultural details from IRS and SPOT imagery; Preparation of Map using satellite image FCC.

Cartography

Study of different types of maps and scales, Map series, numbering methods, scales of the map series (Old &New), Latitudinal andLongitudinal extents of International maps and topographical maps, Interpretation of topographical maps, Representation of relief features by contours, Profile drawing – Simple, superimposed and composites, Study of Weather maps. Scales: Methods of Representation, Conversions, Map projections: Zenithal, Conical, Cylindrical, Conventional Map Projections, Preparation of base maps visually and digitally using satellite Images and Topo-sheets Reading and Understanding of Cadastral Maps of India. Integration of Cadastral Maps with Satellite images, Reading and understanding of Forest Stock Maps, Reading and understanding of town planning/urban planning maps. Preparation of Base Maps using topographical maps and GPS readings. Preparing infrastructure , Transport network maps, tourist maps, natural resources maps, planning maps. Bar graphs – simple, compound, wind roses, Line graphs – simple and polygraph, Dot method, Choropleth Technique, Isopleth technique, Proportional circles, Sector Diagrams

Course Code: GIM-707: LAB-II
Geographic Information System

3 Credits (0-0-6)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70

Understanding available GIS softwares: ARC/VIEW, ARC/GIS, MAP-INFO, ILWIS, GEO-MEDIA, IGIS, *Understanding Types of geodatabases,* Understand the raster and vector data models, Convert data to raster format and build raster databases, *Understanding Geodatabase Validataion rules, Understanding Geodatabase Subtypes and domains,* Georeferencing scanned map, Managing Projection & Datums, Digitization - Point, Line, Polygon and Surface Data, Building topology - measuring distance and area, *Editing using geodatabase topology* points, lines and polygons Removal of errors – Overshoot & Undershoot, Snapping, Data Collection and Integration, Non-spatial data attachment working with tables, Dissolving and Merging, Clipping, Intersection and Union, Creation of different spatial layers, Symobolizing layers Overlaying with satellite images and Google Earth, Join\Relate layers with External Database, Converting XY Data to GIS format, *Creating geodatabase schemas,* Digital database creation *Loading data into a geodatabase,* Adding attribute data - querying on attribute data, On screen digitization - Data Conversion - Vector to Raster, Raster to Vector, Generation of DEM from contours, spot heights, Vector Analysis - Buffering, Overlay and Network analysis, Raster Analysis - Measurement - Arithmetic overlaying, Logical overlaying, Data Output: Bar charts, Map compilation, Customization and scripting, Designing Cartographic Output Familiarity with DBase Commands including record updating and processing. Theme representation by usage of graphics command resources data maintenance, Theme filling and retrieval and usage. Grid Analysis: working with Grid Arithmetic Operators Selection Operations: TEST, SELECT, CON. Grouping Operations: RECLASS, REGIONGROUP Topographic Operations: SLOPE, ASPECT. Optimal Path Operations: COSTDISTANCE, COSTPATH,

Course Code: GIM-708: LAB-III
Earth Systems

3 Credits (0-0-6)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70

Collection of Meteorological data and analysis, Preparation graphs, diagrams, Change detection.

Identification and Delineation of following earth system features using Satellite Data Products of different spatial and temporal resolutions.

Delineation of Landforms associated with chemical and mechanical weathering, Delineation of Fluvial Landforms, Glacial Landforms, Aeolian Landforms, Coastal Landforms, Orogenic Landforms-Hill, Mountains, Plateaus Tectonic Landforms-Lineament mapping, Structural mapping-faults and folds, Drainage Pattern, Paleo Channels, Natural & Man-Made Wetlands. River course and identifying river migration. On screen delineation of climatic zones, physiographic zones of India using satellite data.

Soil and Water Testing: Understanding working, mechanism and utility of Soil and Water testing laboratory equipments and instruments, Understanding purpose and utility of different Soil and Water Quality testing parameters.

Course Code: GIM-709
Principals of Photogremmetry

4 Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Fundamentals of Photogrammetry Overview and History of Aerial and Satellite Photogrammetry, Anatomy of Eyes and Stereo Vision, Types of photographs; Vertical photographs, Oblique Photographs, Principal point; Scale – overlaps – stereoscopy – concepts. 3D visualization in digital environment, anaglyph, polarization.

Unit-II

viewing and measuring systems, monoscopic and stereoscopic methods – image and object co-ordinates – floating mark – parallax equation, parallax measurement – height information – Tilt –Rectification – Displacement. Vertical exaggeration, Overlap, side-lap. Determination of horizontal ground length, direction and angles from photo coordinates; stereo image (aerial and satellite) mosaics: comparison with maps feature extraction by 2D, feature extraction by 3D, data models, symbol library, feature classification, coding, feature collection, annotation, database attachments, interactive editing, and layer concepts. Advantages of digital photogrammetry, automatic tie point generation, digital photogrammetric softwares.

Unit-III

Analog and Digital Photogrammetry: Concepts of interior, relative, absolute orientation – object, image relation – linearization – Geo-referencing, Interior orientation, Exterior orientation; effect of orientation elements, Aero triangulation – single frame and block triangulation, strip deformation, strip and block adjustment – Pass points, Tie points; Ground control points;– scaling and leveling –map compilation using stereo plotters — Terrestrial photogrammetry – Geometry & products.

Unit-IV

Orthophoto Generation–mapping. Topographic Mapping. Introduction to Non-Topographic and terrestrial mapping applications of photogrammetry in various fields Non-topographic photogrammetry, Lidargrammetry-Orthophoto rectification using LiDAR – Integrated LiDAR and Digital Photogrammetry Techniques – Integration of LiDAR DEM with other spectral data.

REFERENCES:

1. Gottfried Konecny, Geoinformation: Remote Sensing, Photogrammetry andGeographic Information Systems, Second Edition, CRC; 2 edition, 2009.

2. Paul R.Wolf, Elements of Photogrammetry, McGraw-Hill Science, 2001. Karl Kraus, Photogrammetry, Vol 1&II , 4th ed., Dümmler, 1997.

3. American Society of Photogrametry, Manual of Remote Sensing, 2nd ed., Falls Church, Va., 1983.

4. American Society of Photogrametry, Multilingual Dictionary of Remote Sensing and Photogrammetry, Falls Church, VA., 1984.

5. H. M. Wilson, Topographic Surveying, John Wiley and Sons, New York. Wolf, P. R. 1983, Elements of Photogrammetry, 2nd Edition, McGraw-Hill, New York.

6. Rampal KK, 1996, Handbook of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi

Course Code: GIM-710
Digital Image Processing

4 Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Basic concepts of Analog and Digital Photographic Image, Digital image Data formats Advantages and Disadvantages of Analog and Digital Images, Image formats and its characteristics, Visual vs. Digital image processing methods, Image data storage and retrieval, Computer Hardware for digital image processing Introduction to spatial data sources, Digital data acquisition Characteristics of spatial Image data, Basic Statistics used in DIP- **Initial Statistics Extraction** – Univariate and Multivariate, Statistics, Histogram – Contrast modification of Image data, Histogram Equalization, Histogram matching, Density slicing. Quantitative analysis

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 non-linear transformation for geometric corrections, Look-up Tables (LUT) and Image display, Image Reduction & Magnification,

Unit-II

Radiometric and spectral enhancement techniques, Contrast stretching: Linear and non-linear methods, Spatial Filtering-Low Pass Filtering: Image smoothing, High Pass Filtering: Edge enhancement and Edge detection, Gradient filters, Directional and non-directional filtering, Band ratio, Neighborhood Operations, Template Operators, Convolution Operation, , Edge Detection, Line Detection, Texture, Spatial Correlation – The Semivariogram, Shape Detection Types of Vegetation indices, Knowledge Representation Issues and Mappings. Knowledge Acquisition Facility, Basics of Pattern Recognition and Classification. Subject and Object oriented image classification.

Unit-III

Temporal data analysis and Change detection, Spectral discrimination, Signature bank, Parametric and Non-Parametric classifiers, Image Transformation; Fuzzy Functions and logic, Introduction to Neural Networks, Image Transformation – Multi Spectral Transformation of Image Data – Fourier Transformation, Principal Component Transformation, Noise adjusted Principal Component Transformation, Tasseled Cap Transformation, Vegetation. Sampling Theory, Discrete Fourier Transform, Concept of

Spatial Frequency. Image Indices – Arithmetic, Ratioing, Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection –Thresholding – Region Based Segmentation Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms. Image Compression : Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards.

Unit-IV

Classification: Supervised Classification- Training Stage, classification scheme, Information Class, Spectral Classes, training site Selection, Statistics Extraction, classification Stage, parallelpiped, Minimum distance, Maximum Likelihood, Context Classifications Non-parametric Classification – Linear Discrimination, Support Vector Classifier, Neural Network Approach, Unsupervised Classification – Delineation of Spectral Classes, Similarity metrics and clustering criteria, Iterative Optimization, Single pass Clustering Technique, Agglomerative Hierarchical Clustering, Clustering by Histogram Peak Selection, Clustering Algorithms, isodata clustering, over all accuracy, consumer accuracy, product Accuracy, Omission Errors, commission error, user accuracy, kappa coefficient. Interpretation of Hyper-spectral Image Data, Sub-Pixel spectral image processing: Limitations of standard classifiers. Classification Accuracy Assessment.

Reference Books

Sabins, Floyd F., Remote Sensing: Principles and Interpretation, H. Freeman and C., New York.

Thomas M. Lillesand & Kiefer, Ralph W., Remote Sensing and Image Interpretation, John Wiley & Sons, New York.

Jensen, JR., Remote Sensing of the Environment – An Earth Resources Perspective, Prentice Hall Inc.

Rencz, Andrew N. (Ed), Remote Sensing for the Earth Sciences: Manual of Remote Sensing, 3rd ed., John Wiley & Sons, Inc., New York.

Curran, P., Principles of Remote Sensing, Longman, London.

Campbell, James B., Introductory Remote Sensing: Principles and Concepts, Routledge.

Gibson, P.J., Introduction to Remote Sensing, 2nd ed., Taylor & Francis, London.

Cracknell, A.P. & Hayes, L.W B., Introduction to Remote Sensing, Taylor & Francis, London.

Course Code: GIM-711
Information &Communication, GPS Technologies and Applications

4Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit I

Fundamentals of Computers
Introduction to computers, types of computers, basic components of computer systems- CPU-memory, Input devices-Keyboard, smart cards, Light pen, touch screen, mouse, digitizer. Output devices – Video display devices, flat panel display and printers**. Computer Software.** Overview of Operating Systems: operating system fundamentals, software – system software, application softwares. Overview of Windows; Linux (Windows-Desktop-Control panel -Start menu; Operations on file (new, save, copy, edit, etc).

Unit II

Data Acquisition: Acquisition of Numbers and Textual Data: Input units, internal representation of numeric data, representation of characters, error detecting codes. Acquisition of image data, **Information Security;** An Overview of Computer Security, Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies. **Computer Networks and Internet.** Overview of computer Networks and Internet: computer networks - LAN, WAN, WiFi and their applications, intranet, naming computers connected to internet. Hubs, Bridges, Routers, Gateways, Switches, WAN, ISDN Transmission Technology, Communications protocols and Standards **Some Internet Applications:** Email, Information browsing, WWW, Information retrieval from web.

Unit III

Elements of Satellite Communication: Satellite-description of different ccommunication ubsystems, communication bands, Bandwidth allocation. **Imaging Technologies for Web Publishing:** Image file formats, creating low bandwidth graphics, using color, browser-safe colors, imaging transparency, creating graphical navigation tools, scanning techniques, creating small animations, image mapping, using scalable vector graphics (SVG), and graphical layout and alignment. Fundamentals of creating dynamic, interactive web pages: An introduction to Active Server Pages (ASP) technology, ASP syntax, and introduction to VBScript, the request, response, server, application and session objects, working component, and connecting databases to ASP pages.

Unit IV

Satellite Navigatioin and Global Positioning System: Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, GPS system architecture-Satellite constellation, Geo-positioning-Basic Concepts, Satellite Signal Acquisition, GPS Receiver Operation and Differential GPS. NAVSTAR, GLONASS, Indian Geodetic System, Control Segment, Space Segments, User Segment. GPS coordinate frames, Time references: Geodetic and Geo-centric coordinate systems, GPS time. GPS applications: Defense, civilian, Navigational and Geodetic applications; GPS-GIS integration, GPS applications in surveying, mapping, GIS and land navigation and precision farming; integration with other sensors: GPS in intelligent transportation, fleet management and tracking, Location Based Services, Vehicle-Geo-Locking.

Reference Books

1. Introduction to Information technology by V. Rajaraman, PHI
2. Introduction to Computers by Peter Norton.
3. Web Design, The complete reference, Second Edition- Thomas A. Powel, Tata McGraw Hill.
4. The HTML 4.0 Source book- Ian Graham, John Wiley
5. The XML Specification Guide- Ian Graham and Liam Quin, John Wiley
6. The XHTML 1.0 Web Development Sourcebook- John Wiley and Sons.
7. Web Services Security- Mark O'Neill, et al. Tata McGraw Hill.
8. Terry-Karen Steede, 2002, Integrating GIS and the Global Positioning System,
9. ESRI Press
10. N.K.Agrawal Essentials of GPS, Spatial Network Pvt Ltd 2004
11. Sathish Gopi , GPS and Surveying using GPS9
12. G S RAO, **Global Navigation Satellite Systems,** McGraw-Hill publications,New Delhi, 2010
13. B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, 'GPS – Theory and Practice',
14. Springer – Wien, New York (2001).
15. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software approach', John Wiley & Sons (2001).

Course code- GIM-712
An Introduction to Geo-Informatics Applications in Natural Resources Management

4Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Natural resources: Availability and use, Renewable and non-renewable resources, Need for Resource monitoring and management, Resource conservation and sustainable development. Forest types and categories (Density), Environment and Ecology: Meaning, scope, and concept of environment and ecology, components of environments, Man-land relationship, Hazards- Natural and man-made - droughts, floods, cyclones, earthquakes, landslides, tsunamis. Environmental pollution and deterioration of Flora and Fauna.

Unit-II

Applications in Disaster Management: Mapping and modeling landslide, floods, cyclones forest fire and droughts. Applications in Urban Planning: Mapping of urban sprawl, urban land use, transportation network, infrastructure mapping, and urban sprawl. Applications in Geology and Geo-technical Engineering: Geological mapping, slope stability, drainage/ transport/ communication network analysis and alignment.

Unit-III

Application in Environmental Management: Selection of disposal sites for industrial and municipal wastes, applications in mining, water pollution, preparation of Environment Management Plans (EMP), Environmental Impact Assessment (EIA), selection of potential sites for industrial and infrastructure facilities. Geo-Informatics Models in Resource Management: Forest fire modeling, wild life habitat assessment, modeling soil erosion, land resources development prioritization modeling.

Unit-IV

Resource Management Projects in India: an overview of NNRMS, IMSD/ NRIS, RGNDWM, NUIS, NLRMP, SIS-DP, Wasteland Development, Wetland mapping, Land cover mapping, Functions of DOS (National level and state level),

Reference 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.
4. Robert G. Reeves: manual of Remote Sensing Vol. II American Society of

Photogrammetry and Remote Sensing, Falls Church.
5. Donald A Davidson: Soils and Land use Planning, Longman, London, 1998.
6. Robert W. Colwell. Monitoring of Earth Resources from Aircraft and Spacecraft, NASA, Washington DC.
7. Schultz, G. A. and Engman, E. T. 2000. Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, Germany.
8. Jenson, J.R. 2000. Remote Sensing of the environment – An Earth Resource Perspective, Prentice Hall Inc.
9. P.S. Roy (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing (IIRS), 2000.

Course Code: GIM-713
Advanced Remote Sensing and GIS

4Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Microwave Remote Sensing Introduction - Electromagnetic spectrum of microwave region, Airborne and Space borne radar systems (SLAR, SAR) parameters - Wave length, Polarization, Depression Angle, Look angle. Target parameters - Dielectric Properties, Surface Roughness, Surface Scattering, Volume Scattering, Corner Reflector Resolutions- Range Resolution, Azimuth Resolution, Geometric Characteristics, Speckles, Introduction to Altimeter, Scatterometer, Radiometer, Radargrammetry, LiDAR Remote Sensing and Technology, Radar interferometer; Laser altimetry. Advanced Laser Terrain Mapping.

Unit-II

Thermal Remote Sensing: Basics of Thermal Remote Sensing, Thermal Sensors, Scanners, Interpretation and Advantages of Thermal imageries. Atmospheric transmission, Kinetic and radiant temperature, Thermal properties of materials, Emissivity, Radiant temperature. Thermal conductivity. Thermal capacity, thermal inertia, Apparent thermal inertia, Thermal diffusivity.

Unit-III

Introduction to web GIS, Web Mapping Basics, Web Page Basics, Geospatial Web Services, Geospatial Mashups, Web mapping – static and interactive web mapping, collaborative web mapping. adding and rendering map layers to a Web GIS. Symbolizing layers, classifying continuous variables for choropleth mapping. Building and enabling map services on the GIS server, querying the finished map, zooming in, panning, etc Web Map Servers- WMS-, interoperable systems and non-interoperable systems- Web Feature Servers- Metadata standard, XML, Geographic Markup Language.

Unit-IV

Client/server computing– client/server system partition – layered architecture – advantages and disadvantages of client and server side architecture. Distributed component framework – Web GIS Implementation: Web Map servers and Data servers, Configuration, layering, design of interfaces, Quality of Service and Security Issues in the Development of Web GIS - Performance, Security, Scalability, Mobile GIS.

References

1. Floyd M. Henderson; Principles & Applications of Imaging Radar, John Wiley & Sons, N.Y.

2. Alexay Bunkin & Konstantin Volia.K, - Laser Remote Sensing of the Ocean Methods & Publications. John & Wiley & Sons, N.Y.

3. PJ Curran. Physical aspects of Remote Sensing.

4. Korte,G. B., (2001) The GIS book: 5th Edition, Onward press, Australia. Cartwright, W., M.P. Peterson, G. Gartner (Eds) Multimedia Cartography, Berlm: Springer.

5. Kraak,M., and A.Brown (2001) Web Cartography: Development and Prospects, London: Taylor and Francies.

6. Kraak, M. and F. Ormeling (2003) Cartography: Visualization of Geospatial Data, Delhi: Pearson Education.

7. Ron Lake, David S. Burggraf, Milan Trninic, Laurie Rae, 2004, Geography mark-up language (GML) John Wiley & Sons Ltd.

Course Code: GIM-714- Lab- IV
Digital Image Processing

3 Credits (0-0-6)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70

Understanding Digital Image/spatial image processing Software – ERDAS, ILWIS, Geomatica, e-Cognition etc., Study of Digital Data Products – Characteristics of digital Images, Importing different satellite data products, Reading and Displaying satellite data from BIL, BSQ and BIP Formats, converting hardcopy images to digital format, Generating False Colour Composite (FCC), Extracting area of Interest (AOI), Radiometric Enhancements – LUT Stretch, Histogram construction for digital data, Generating Histogram of various bands, Histogram equalization, Histogram matching, Image filtering, Outputs of linear and non-linear stretch Geometric, Filtered outputs, Ratio images Enhancements – Geometric correction, Resampling techniques. Image Registration and Geo-referencing: Registration of base map, Image to map registration, Image to Image registration. Image Enhancement Techniques: Linear Image Contrast Enhancement techniques, Non Linear Image Contrast Enhancement techniques, Band Rationing, Edge enhancement, High pass & Low pass Filtering techniques, Low Pass Filter: Compression of the high frequency component & enhancement of the low frequency component, High Pass Filter: Compression of the low frequency component and enhancement of the high frequency component, Density slicing, Nearest Neighbourhood analysis, parallopiped analysis. Image Classification Techniques: Unsupervised classification, Re-coding, Supervised classification, Training sites, Accuracy Assessment, K- means, Mahalonobis distance, Euclidian distance, Mosaic of images, Resolution merge/fusion Functions & Operations on digital imagery, Change detection analysis. Import and Export of different image file formats, Import and Export of different vector file formats, Sub-setting of area of interest from the satellite image, mage sub-setting using vector data Example- political boundaries etc. Identification of objects, Visual display, Study of Histogram and layer information, Map composition. Vector functions – attribute quarry, Understanding difference between subject and object oriented image analysis. Principal Component Analysis, Hyper – spectral image analysis, Fuzzy logic classifier, microwave data analysis, Sub-Pixel spectral analysis.

Course Code: GIM-715* -Lab- V
Computer Programming Languages and softwares

0 Credits (0-0-6)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70

Working with Micro Soft Access, programming in c language and Oracle Data Base software.

Course Code: GIM-716 -Lab- VI
Photogrammetry and Global Positioning System

3 Credits (0-0-6)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70

Testing stereo vision, Use of Lens stereoscope and Mirror stereoscope, Marginal Information of aerial photograph, Determination of vertical exaggeration, Orientation of stereo model and marking principle point, fiducial axes and flight line. Use of Parallax Bar for height calculation from aerial photographs and Stereo satellite images, Calculation of scale of the aerial photographs and Stereo satellite images, Computing photo scale using known objects. Computing photo scale using a map of known scale. Computing photo scale using focal length and altitude. Preparation of photo / imagery line index, Preparation of grid; plotting of control points, Preparation of mosaics, steroplotting instruments, Use of planimeter, Dot/square Grid for area calculation Digital photogrammetry – digital image matching and collection of mass points, Construction digital terrain models using stereo photographs and satellite stereo images.

GPS: Surveying with GPS, Software and hardware needs of GPS, Collecting ground control points, Lines, Polygons, Editing points, lines and polygons, Geo referencing using GPS, Exporting to GIS Environs. Field Survey and GPS GIS Integration,

Course Code: GIM-717
Soft Skills, Geoinformatics Project Planning and Management and Research Methodology

0 Credits (2-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Communication: Importance of verbal & Non verbal communication, Personal appearance, Posture, Gestures Facial expressions, Eye contact, Space distancing, **Goal setting:** Immediate, short term, long term, Smart goals and strategies to achieve goals, **Time management:** Types of time, Identifying time wasters, Time management skills. **Leadership and team management:** Qualities of a good leader, Leadership styles, Decision making, Problem solving, Negotiation skills, **Group discussions:** Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader), Group behavior, Analyzing performance, **Job interviews:** Identifying job openings, Preparing resumes & CV, Covering letter, Interview-Types of questions.

Unit-II

Research Methodology: Research Problem-Meaning of research problem-Sources of research problem-Criteria / Characteristics of a good research problem-Errors in selecting a research problem-Methods of Research: Qualitative research and Quantitative research - experimental research, Quasi- experimental research, Surveys, Correlation studies- Action research Developing a Research Proposal: Format of research proposal-Individual research proposal-Institutional proposal-Hypothesis: Meaning-Types of hypothesis. Sampling: Sampling and Population, Techniques sampling selection, Characteristics of a good sample, Sampling errors and how to reduce them Tools and Techniques of Data Collection: Checklist, Data schedule, Observation, Opinionnaire, Interview, Sociometric techniques, Questionnaire, Rating scales, Interview schedules, Reliability and validity of various tools and techniques Research Report: Format of the Research Report, Style of writing the report, References and Bibliography -Evaluation of Research: evaluation Criteria.

Unit-III

Geoinformatics Project Planning and Management.

Definition of plan, project, program and scheme. Functions of planning and management. Components of Geoinformatics project, Geoinformatics project types. **GIS Project Planning-**Project phases and Project life cycle, project stakeholders, system development lifecycle, Software development models, Project initiation, systems planning and methodology, systems analysis and user requirements studies, GIS software evaluation and selection, Hardware considerations and acquisition, Geographic database design – conceptual, logical, and physical data modeling, planning and database issues - screening of project ideas, selection of project based on techno-economic feasibility analysis, project formulation, product and project design, Project proposals, project report preparation. **Project Costs-**Elements of cost, costing techniques, resources planning, cost components of a geo-

informatics project- men, Hardware and software costs, cost of Remote Sensed Data /Imageries, Maintenance cost, organizational cost, service charges, outsourcing cost, pricing the product / service. Cost budgeting. **Project Appraisal-**Project appraisal Methods - Discounting and non discounting techniques, Benefit Cost Ratio, Break Even Point Analysis, Cost and Return simulation, return on investment. **Project Time, Quality and Cost Management**-Project scheduling- network analysis, PERT and CPM techniques, Gant chart, time and cost crashing. Project cost and time control, feed back mechanisms, quality control / quality assurance. Data standards, interoperability, ISO standards.

Unit-IV

Planning A Geo-informatics Project: Government, Corporate Geo-informatics projects, GIS Market/ Enterprise Business, Organizational Involvement, Evaluating Existing Data, Accuracy, Completeness. Maintenance, Software and hardware Selection, Technical Environment, Assessing Costs and Benefits, Pulling the needs and ends together. **Project Scope and Risk Management:** Project scope definition, scope verification, scope change control, risk management planning, project risk identification, quantitative and qualitative risk analysis, risk response planning, risk monitoring and control. Setting-up a **GIS Organisations:** Vision, mission, goals and objectives, organizational chart, organizational approaches- democratic, authoritative, roles and responsibilities of personnel, recruitments, training, motivation, organizational behaviour, conflict resolving, team building, promotion/ demotion. **Management Issues in GIS:** Making GIS efficient, effective and safe to use, data as management issue, GIS as a management tool, impact of broad societal issues. **Trends in GIS:** Enterprise GIS, Corporate GIS, BPO in GIS, Spatial Data Warehouse, Interoperability and Open GIS, NSDI.

REFERENCE BOOKS:

1. Effective Technical Communications' by Rizvi M. Ashraf, McGraw–Hill Publication
2. Developing Communication Skills' by Mohan Krishna & Meera Banerji, Macmillan
3. Creative English for Communication' by N.Krishnaswami & T.Sriraman, Macmillan
4. Professional Communication Skills' by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.
5. Research Methodology . Methods & Techniques : Kothari, C.R.
6. Tests, Measurements and Research Methods in Behavioural Sciences . Singh, A.K.
7. A guide to the Project Management Body Of Knowledge -2000 edition, Project Management Institute, USA
8. The Design and Implementation of Geographic Information Systems, John E. Harmon, Steven J. Anderson by Wiley Publishers ISBN: 0-471-20488-9
9. Geographic Information Systems, abridged by Paul A Longley, Michael F Goodchild, David J. Maguire, and David W. Rhind, second edition, 2005
10. Project Management using PERT / CPM – Weist & Levy, PHI
    Concepts and Techniques of Geographic Information System by C P Lo Albert K W Yeung, 2002, EEEPrantice Hall of India Private Ltd.
11. Project Management PERT / CPM & Precedence Diagramming Moder, Philip, Galgotia
12. UNIDO Guide to Project Appraisal

Course Code: GIM-718
Geo-Informatics in Geo-Resources

4 Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Remote Sensing in Land use and Land cover- an over view, spectral characteristics of different land use and land cover categories**,** Remote Sensing in Human settlement and urban planning – An Overview. Principles of urban area development planning and Urban land use, Data requirement for regional planning and Urban/Sub-urban, Large scale mapping for cadastral database in urban areas, Settlement patterns – Image characterization and recognition, Slum, squatter settlement - detection, interpretation, delineation and analysis,

Urban land use classification, Urban land use mapping and analysis, Residential land use, Commercial land use and Industrial land use, Urban land conservation using remote sensing, Transportation/ road network analysis through RS and GIS, Site selection and suitability analysis for urban development, Urban Sprawl and change detection studies, Highway, canal, sewage alignment, Land use change detection, Utility mapping.

Unit-II

Remote Sensing in geology – an overview, Basic concept of geomorphology, earth, surface process and resultant landforms, Spectral characteristics of rocks and minerals Drainage patterns – types and its significance in geologic interpretation, Interpretation of drainage patterns through satellite images, Interpretation of fluvial, glacial and coastal of eolian and volcanic landforms. Morphometric analysis, Interpretation of landforms related to igneous, sedimentary and metamorphic rocks, Geomorphological mapping and terrain evaluation,.

Unit-III

Lithological interpretation of Igneous rocks, Sedimentary rocks, Metamorphic rocks, Structure – Definition, types and structural mapping , Interpretation of folds, faults, unconformities and lineaments, Studying physiography and landforms relation to water resources, ground water targeting sites. Hydro-geomorphological mapping

An Overview and application of Remote Sensing in Mineral Exploration – Indian Examples, GIS in Mineral exploration - in Oil Exploration – Features helpful in detection of target areas for oil exploration, Geological Engineering Investigations.

Unit-IV

Geo-Stationary and OceanSat satellites its use in Oceanographic studies, Sea Surface Temperature (SST), Assessment of aquatic resources, mapping and monitoring of oil spills, turbulent zones, pollution at coastal zones, coastal landforms, monitoring of coastal landforms, tides and impact on coasts, assessment of vessel movements and on time information generation. Monitoring the fresh, polluted water and cold water coming up to the surface close to the coast, Ocean Color, Assessment of vulnerable costal zones, Cyclones and early warning system methods and models.

BOOKS RECOMMENDED:

Anji Reddy,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.

Anji Reddy, 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

Skidmore A.2002: Environmental modeling with GIS and Remote Sensing. Taylor and Francis

Korte, G. B., (2001) the GIS book: 5th edition, Onward Press, Australia.

Anji Reddy, M., (2001) Remote Sensing and Geographical Information Systems. 2nd edition, Bs.Publications, Hyderabad.

Demers, Michael N., (2000) Fundamentals of Geographic Information Systems, John Willey and sons. Inc. New York.

John A. Matthews (2002) Natural hazards and environmental change, Bill McGuire, Ian Mason.

Andrew Skeil (2002) Environmental Modeling with GIS and Remote sensing, John willey and sons, Inc New York.

John. G. Lyon (2003) GIS for Water Resource and water Shed Management, Taylor and Francis.

Hand book of Applied Hydrology by Ven Te Chow

Groundwater by H.M. Raghunath

Water Resources Engineering by R.K. Linsely & J.B. Franzini

Watershed Management, J.V.S. Murthy - Publishers; New Age International (P) Ltd., New Delhi.

Space Technology Applications for Sustainable Developments at Watersheds, Technical Report, ISRO-HQ-TR-104-95, ISRO, Bangalore.

Watershed Management Project Planning, Monitoring and Evaluation; A Manual for the Asian Region - Asian-US Watershed Project - Forestry for sustainable Development Program. University of Mirnesota, College of Natural Resources, St. Paul Mirnesota, U.S.A.

Vasilis D. Valavanis Geographic Information Systems in Oceanography and Fisheries , Taylor & Francis, 11 New Fetter Lane, London. EC4P 4EE.

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.

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

Watershed Management Project Planning, Monitoring and Evaluation; A Manual for the Asian Region - Asian-US Watershed Project - Forestry for sustainable Development Program. University of Mirnesota, College of Natural Resources, St. Paul Mirnesota, U.S.A.

Course Code: GIM-719
Geo-Informatics in Bio-Resources

4 Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each unit. Each question will be of 14 marks.

Unit-I

Remote Sensing in Agriculture – An Overview, Spectral characteristics of crops, Principles of crop identification and Crop acreage estimation, Crop yield modelling using Remote Sensing, Crop condition and stress assessment using RS techniques, RS and GIS applications in Crop inventory, Vegetation index, Agro-meteorology – its importance and application of RS in agro- meteorology, Land capability classification, Drought assessment and monitoring through Remote Sensing, Soil erosion and erosion hazard assessment through Remote sensing, Soil moisture assessment using RS , Soil mapping using satellite remote sensing data, Land evaluation for optimal land use planning.

Unit-II

Introduction and distribution of forests, Forest types of India, Introduction and concept of forestry, Role of Geoinformaitcs in forestry, Interaction of EMR with vegetation and spectral, characteristics of vegetation, Temporal characteristics of Vegetation, Vegetation indices, Forest cover mapping through RS and GIS, Forest types and forest density mapping, Remote Sensing application in forest cover change detection, Remote Sensing application in mapping of stressed vegetation, Study of association between geomorphology, physiography, rocks and forest types using RS and GIS

Unit-III

Role of Microwave Remote Sensing in forest studies, Biomass estimation by non destructive method, Growing stock estimation using RS and GIS, Remote Sensing application in formulation of forest working plan, Bio diversity studies using RS and GIS Wildlife habitat analysis using RS and GIS, Biological invasion and monitoring of invasive species through RS and GIS, Forest Management Information System (FMIS) using Geoinformatics techniques.

Unit-IV

Introduction to Ecological, biological aspects of Environment, Remote Sensing in pollution monitoring, Water quality mapping and monitoring: - Introduction Remote sensing in water quality mapping monitoring and management, Solid waste management – introduction classification and environmental problems, Remote sensing and GIS in solid waste management, Impact assessment – Basic concepts, Environmental impact assessment (EIA) methods, Environmental analysis and environmental monitoring for sustainable development through RS & GIS, EIA of mining areas and river valley project through Remote Sensing, Environmental Management Plan (EMP), its importance and Role of GIS in preparation of EMP. Environmental impact assessment for Irrigation, Industrial, Airport, Transport and Thermal projects, Assessment of impacts on socioeconomic environment, Encroachment and wetland degradation.

List of Reference Books

Ecology and Environment, P.D. Sharma, Rastogi Publications]

Environmental Science, M. Chandra Sekhar, The HI-TECH Publishers

Environmental Studies, R.Rajagopalan, Oxford University Press

Remote Sensing of the Environment – An earth resource perspective, John R. Jenson, Pearson Education (Singapore) Pvt. Ltd.

Modern Concepts of Ecology, H.D. Kumar, Vikas Publishing House Pvt. Ltd.

Environmental Impact Analysis: A new dimension in decision making, second edition, R.K. Jain, L. V. Urban and G.S. Stacy, published by Van Nostrand Reinhold Company

Pollution Control and Conservation, Kovacs, M.(ed), Ellis Horwood Ltd., Budapest, 1985

Biogeography, Robinson, H. ELBS, London, 1978

Preventive and Social Medicine, Park & Park, Banarasidas

Anji Reddy,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.Skidmore A.2002: Environmental modeling with GIS and Remote Sensing. Taylor and Francis

Course Code: GIM-720
Geo-Informatics in Disaster Management

4 Credits (3-1-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note: 1. Nine (9) questions will be set in all.
2. Question no. 1 will be objective type covering the entire syllabus & Compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will required to attempt five in total, Question no. 1 and four by selecting one from each section. Each question will be of 14 marks.

Unit-I

Geo-Informatics in Disaster Management: Tectonic disasters: Introduction and understanding structure of the earth and plate-tectonic theory: Meaning and types of Tectonic disasters, Geoinformatics for early warning system, Earthquake- post disaster damage estimates-selection of variables-space-time analysis, Geoinformatics for minimizing human/ biotic and abiotic loss/damages, Geoinformatics for post disaster relief plans and communication, Landslides – Location and Demarcation of vulnerable zones and spots using satellite data and communication techniques to the administration.

Unit-II

Cyclones and Flooding: Cyclone: Parameters related to cyclone, Assessment of effects on land and sea, GIS for early warning system and Damage assessment. Flooding: topography, Land use and flooding -space-time integration -GIS based parameters and layers, Flood prone area analysis and management, Risk assessment, Surface water and ground water pollution, and disasters

Unit-III

Disasters due to Weather and Climate - Drought and Desertification: Drought-Types of droughts, Factors influencing droughts, Variable identification – Calculation of heat, water balance and evopotranpiration, Land use /ground water level changes, Delimiting drought prone areas and communication for relief measures, Desertification- processes of desertification, over utilization of water and land resources layer creation, GIS based management strategies.

Unit-IV

Anthropogenic Disasters: Atmospheric Disasters: Introduction to Ozone layer depletion – green house / global warming – Delimiting vulnerable zones for Industrial pollution and acid rain, Snow melt – sea level rise – related problems layer creation. Marine Disasters: oil spill and chemical pollution using micro-wave data, Biodiversity-Disasters: GIS in Ecological degradation, Nuclear disaster and biodiversity loss – parameters, Forest fire, Mining – overlay analysis, GIS in environmental modeling – case studies. Models for relief and reclamation techniques to minimize damages. Communication and administrative models for disaster management. GIS in Health disasters

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.
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
Watershed Management Project Planning, Monitoring and Evaluation; A Manual for the Asian Region - Asian-US Watershed Project - Forestry for sustainable Development Program. University of Mirnesota, College of Natural Resources, St. Paul Mirnesota, U.S.A.
Disaster Management Handbook-Indian Railways publications
Satendra, IFS., Disaster Management in the Hills, Concept Publishing Company, New Delhi.
Kamal Taori, IAS., Disaster Management through Panchayati Raj, Concept Publishing Company, New Delhi.
National Disaster Management Publications, Ministry of Home Affairs, Govt. of India, New Delhi.
Graham Matthews, Yvonne Smith, Gemma Knowles: Disaster Mannagement in archives, libraries and museums. Ashgate Publishing Company, London
Damon P.Coppola, Introduction to International Disaster Management, Oxford Publishing Compay, London.
Ganapathy Palanithurai, Panchayats in disaster: Preparedness and management, Gujarat, Orissa, Andhra. Concept Publishing Company, New Delhi.
Satendra, Vinod K. Sharma, Sustainable rural development for disaster mitigation. Concept Publishing Company, New Delhi.
Randolph Kent, Disaster Preparedness, University of Wisconsin Disaster Management Center.
Galal El Mahdy, Disaster management in telecommunications, broadcasting and computer systems, Wiley, ©2001.
David G. Kibble, Safety and Disaster Management in Schools and colleges: A Training Manual
D. Fulton Publishers, 1998 Original from the University of Virginia
Dave, Gupta, Parmar, Kant,
Harsh K. Gupta, Disaster Managemnt, Indian National Science Academy, Banglore.
Pardeep Sahni; Madhavi Ariyabandu: Disaster risk reduction in South Asia New Delhi : Prentice-Hall of India, 2003.