ಮಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
MANGALORE UNIVERSITY
(Accredited by NAAC)

ಕ್ರಮಾಂಕ/ No. : MU/ACC/CR 22/2023-24/A2

ಕುಲಸಚಿವರ ಕಛೇರಿ
ಮಂಗಳಗಂಗೋತ್ರಿ – 574 199
Office of the Registrar
Mangalagangothri – 574 199
ದಿನಾಂಕ/Date:10.10.2023

NOTIFICATION

Sub: Revised syllabus of M.Sc. Geoinformatics Programme
Ref: Academic Council approval vide agenda
No.: ಎಸಿಸಿ: ಶೈ.ಮ.ಸಾ.ಸ.2:13(2023-24) dtd 04.10.2023.

*****

The revised syllabus of M.Sc. in Geoinformatics programme which is approved by the Academic Council at its meeting held on 04.10.2023 is hereby notified for implementation with effect from the academic year 2023-24 and onwards.

Copy of the Syllabus shall be downloaded from the University Website (www.mangaloreuniversity.ac.in)

REGISTRAR

To

1. The Registrar (Evaluation), Mangalore University.
2. The Chairman, PG BOS in Geoinformatics, Dept. of Marine Geology, Mangalore University.
3. The Chairman, Dept. of Marine Geology, Mangalore University.
4. The Superintendent (ACC), O/o the Registrar, Mangalore University.
5. The Asst. Registrar (ACC), O/o the Registrar, Mangalore University.
6. The Director, DUIMS, Mangalore University – with a request to publish in the Website.
7. Guard File.

Mangalore University
Accredited by the NAAC
Department of Marine Geology
Geoinformatics Programme
Mangalagangothri-574199

Revised Syllabus for MSc Programme in Geoinformatics from the academic year 2023-24

Preamble

The syllabus prepared earlier during 2020 has been revised during the annual BoS Meeting held on 14th September 2023 by solving problems faced by both students as well as faculty members with regard to the allotment of missing workload in the fourth semester and some inconsistencies of credits and marks between the MSc Marine Geology and Geoinformatics programmes. Nevertheless, the main contents of the syllabus have not been altered. This syllabus not only enriches knowledge of the current status of information to students, but also helps to them to avoid labouries conditions of data analysis. This course helps students to employment after the completion of the course, research positions.

MANGALORE UNIVERSITY

DEPT. OF MARINE GEOLOGY

MASTER OF SCIENCE IN GEOINFORMATICS

STRUCTURE OF THE PROGRAMME

Semester	Paper Theory/Lab	Instruction hrs/Week Lectures/ Practicals	Duration of Exams (hrs)	Marks			Credits
				IA	Exam	Total	
First Semester: Five Hard Cores and One Soft Core							
GIH 401	Cartography	4	3	30	70	100	4
GIH 402	Remote Sensing and Photogrammetry	4	3	30	70	100	4
GIH 403	Geographical Inf. System (GIS)	4	3	30	70	100	4
GIS 404	Fundamentals of Earth Sciences	3	3	30	70	100	3
GIP 405	RS and Photogrammetry (L)	8	4	30	70	100	4
GIP 406	Earth Science (L)	8	4	30	70	100	4
Semester Total		**31**	**20**	**180**	**420**	**600**	**23**
Second Semester: Two Hard Cores, Four Soft Cores and One Open Elective							
GIH 451	DBMS and Spatial Statistics	4	3	30	70	100	4
GIH 452	Digital Image Processing	4	3	30	70	100	4
GIS 453	Advanced GIS	3	3	30	70	100	3
GIS 454	Applied Geomorphology and Geo-Environmental Science	3	3	30	70	100	3
GIP 455	Geomorphology and Geostatistics (L)	6	3	30	70	100	3
GIP 456	GIS and DBMS (L)	6	3	30	70	100	3
GIE 457	Geoinformatics	3	3	30	70	100	3
Semester Total		**29**	**21**	**210**	**490**	**700**	**23**
Third Semester: Two Hard Cores, Five Soft Cores and One Open Elective							
GIH 501	RS & GIS in Marine Resources and Coastal Zone Management	4	3	30	70	100	4
GIH 502	RS & GIS in Land and Water Resources	4	3	30	70	100	4
GIS 503	RS & GIS in Urban Planning and Disaster Management	3	3	30	70	100	3
GIS 504	RS & GIS in Agriculture and Forestry	3	3	30	70	100	3

GIS 505	Computer Programming	3	3	30	70	100	3
GIP 506	DIP and Comp Programming (L)	6	3	30	70	100	3
GIP 507	RS & GIS in Water and Marine Resources (L)	6	3	30	70	100	3
GIE 508	Geoinformatics of Coastal Environments	3	3	30	70	100	3
Semester Total		**32**	**24**	**240**	**560**	**800**	**26**

Fourth Semester							
GIP 551	Field Work and Field Report	8	-	-	100	100	4
GIP 552	Dissertation	24	-	-	300	300	12
GIP 553	Viva-voce	-	-	-	100	100	4
Semester Total					**500**	**500**	**20**
Grand Total						**2600**	**92**

Note: GI = Geoinformatics, H = Hardcore, S = Soft core, P = Practical/Project Work, and E = Elective. *****Not included for CGPA calculation.

Total Credits from all the Four Semesters:

Semester Credits	Hard Core (H)	Soft Core (S)	Elective (E)	Practical/Project Work (P)	Total credits
First	12	03	--	8 (H)	23
Second	08	06	3*	6 (S)	23
Third	08	09	3*	6 (S)	26
Fourth	--	--	--	20(H)	20
Total	28	18	6*	28 (H) + 12 (S)	92

Total Credits from all the Four Semesters = 23 + 23 + 26 + 20 = 92
Total Hard Core Credits = 28 (T) + 8 (P) + 20 (Project) = 56 = 60.86%
Total Soft Core Credits = 18 (T) + 12 (P) = 30 = 32.60%
*Open Elective Credits = 6 = 6.52% (**Not to be considered for CGPA calculation**)

FIRST SEMESTER

GIH 401: CARTOGRAPHY

Unit 1	**Introduction to Cartography and Ancient Cartography:** Evolution of Cartography, Modern Cartography and Applications, Definition of Maps. Outlines of Map Projections.	06 hrs
Unit 2	**Cartographic Themes and Types of Maps:** Introduction to Cartographic themes. Cadastral and Chorographical maps. Representation of Choroschematic maps, and Chorochromatic maps. Introduction to Population diffusion and the importance of Dot and Multi Dot maps. Map Scale and Types.	06 hrs
Unit 3	**Topographic Maps:** Introduction to Topographic maps. Identification of Symbols and Interpretation of Central Themes. Spatial Information and Marginal Information of Topographic maps. Recovery of Spatial Information from Topographic maps. Concept of 'Central Theme' and examples. Retrieval of Secondary Data.	06 hrs
Unit 4	**Hydrographic Charts**: Introduction to Hydrographic Charts. Marginal Information and Depth Information of Hydrographic Charts. Scales of Hydrographic Charts. Recovery of Spatial Information from Hydrographic Charts.	06 hrs
Unit 5	**Cartographic models**: Inductive and Deductive Models, Model Flow Charting, Model Implementation and Verification. Principles of Design and GIS Output, GIS Project design and Management.	06 hrs
Unit 6	**Remote Sensing Satellites used for Cartography.** **Digital Cartography:** Web Cartography, 3D Simulation and Visualization	06 hrs
Unit 7	**Thematic Mapping:** Geomorphology, Slope, Elevation, Stream Network, Drainage Patterns, Resources and Bathymetry. **Representation of Thematic Data:** Application of Histograms, Pie Charts, Wind Roses, Ray Diagrams**.** Contour Maps. Choroschematic mapping.	06 hrs
Unit 8	**Population Density:** Grid pattern distribution of population, Dot mapping, Multi Dot mapping and Settlement Mapping. **Multi-dated Thematic Mapping:** Shoreline Changes, Forest Cover Changes, Population Diffusion/Urban Growth mapping.	06 hrs

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1. Andy Mitchell, The ESRI Guide to GIS Analysis, Modeling Our World: ESRI Press, (2000), 12-15.
2. Bonham – Carter G.F., Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York, 1994, 1-34.
3. Burough, P.A., and Rachael A., Mec Donnell. Principles of Geographic Information System, Oxford University Press-1998, 22-39.
4. Demmers, M. N. 2000. Fundamentals of GIS, Willey Student Edition 1-498
5. Fraser Taylor., P.A., Geographic Information System – The Microcomputer and Modern Cartography, Pergamon Press, 1991, 6-14.
6. Heywood, Carnelin and Carven, 1998. An Introduction to Geographic Information System. Prentice Hall, 22-61.
7. Keaies, J. S. Cartographic design and Production London, Longman group, 1973. 2-45.
8. Les Worell, (Ed) 1990. Geographic Information System, Development and Applications, Belbaven Press. 11-24.
9. Lillesand T. M. and Kiefer, R. W. Remote Sensing and Image Interpretation. John Wiley & Sons Inc (2000). 8-33.
10. Longley, P. A., Maguire, D. J., Goodchild, M. F and Rhind, D. W; GIS Principles, Techniques, Applications and Managements, Longman Scientific and Technical, 2001, 22-44.
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14. Singh R. L., Elements of Practical Geography Publ. Kalyani Publishers, New Delhi (1995).
15. Thomas G. Lan Arc View 3D Analyst ESRI Press (2000). 12-32.

GIH 402: REMOTE SENSING AND PHOTOGRAMMETRY

Unit 1	**Introduction:** History and concept of Remote Sensing, Electromagnetic Spectrum, Energy Interaction with atmosphere and earth surface features. Basic concepts of visible, Optical, Thermal (Infrared), and Microwave Remote Sensing. Platforms and Sensors. **Optical Remote Sensing:** Principles of Optical Remote Sensing, spectral reflectance of earth's features indifferent wave length regions, multispectral concepts of remote sensing, scanners, applications of optical Remote Sensing, Indian Remote Sensing Programme and Important Indian Satellites.	06 hrs
Unit 2	**Thermal Remote Sensing:** Principles of thermal remote sensing, black body, radiant temperature, radiation from Earth's objects, thermal conductivity, thermal capacity, thermal inertia, thermal diffusivity, thermal radiometers, scanners, calibration of scanners, mapping with thermal scanners, Imaging Spectrometer, Applications of Thermal Remote Sensing.	06 hrs
Unit 3	**Hyper Spectral Remote Sensing:** Introduction to Hyperspectral Remote Sensing, Sensors/Imaging Spectrometers, Hyperspectral Satellite Systems, Hyperspectral Image Analysis Techniques including Correction.	06 hrs
Unit 4	**Microwave Remote Sensing & RADAR Remote Sensing***:* Concept and principles of Microwave Remote Sensing, SLAR, SAR and Scaterometer, Application of Microwave Remote Sensing. Outlines of Radar Image Interpretations. **Image Interpretation:** Visual and Digital Interpretation techniques-Basic concepts of visual interpretation, tone, color, texture, pattern, shape and contextual features. Basic Principles of Digital Image Processing.	06 hrs
Unit 5	**Principles of Aerial photography; Geometry of aerial photography:** Fundamentals of photogrammetry and aerial photography: History, aerial cameras, aerial films and processing. Types of aerial photos. Fundamentals and geometry of aerial photographs, Scale, Advantages and disadvantages of small scale and large scale aerial photographs.	06 hrs
Unit 6	**Relief and tilt displacements,** mosaics and types of mosaics, stereoscopic vision and stereoscopes, image displacement due to relief, concepts of stereo-photogrammetry, normal vision, depth perception and vertical exaggeration. **Planning for aerial photographs**, flight procedures, planning and execution of photographic flights, radiometric characteristics. Elements of aerial photo interpretation: tone, color, texture, pattern, shape, size and associated features, geotechnical analysis and convergence of evidence.	06 hrs
Unit 7	**Principles and Applications of Aerial Photography:** Aerial photo interpretation in resource evaluation–geology, delineation of geological structures, mineral exploration, geomorphology, geological structure.	06 hrs
Unit 8	Digital photogrametry and interpretation techniques: definition, creation of digital images, automatic measurements, automatic surface modeling, aerial triangulations, digital photogrammetric workstation.	06 hrs

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1. Avery T.E., and G.L. Berlin, 1985. Interpretation of Aerial Photographs, 4th Ed, Bergess, Minneapolis, Minn, 34-98.
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3. Bruno Marcolongo and Franco Mantovani, 1997, *Photogeology, Remote sensing Applications in Earth science*, Oxford and IBH Pub. Co Pvt. Ltd., New Delhi, 12-108.
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6. Lilliesand T.M. & Kiefer R.W. 1994, Remote Sensing and Image Interpretation, John Wiley & Sons, New York, 56-78.
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9. P. M. Mather, *Computer Processing of Remotely Sensed Images- An Introduction*, John. Wiley and Sons, 1999.
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17. Siegel, B.S. and Gillespie, A.R. 1994. (eds). *Remote sensing and Image Interpretations*, John Wiley and Sons, New York.
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19. Thomas M. Lillesand and Raiph W. Kiefer, 2000. *Remote sensing and Image Interpretations*, John Wiley and Sons, New York, 4th Edition, 24-254.
20. Verbyla, D. 1995. *Satellite remote sensing for natural resources*; Lewis Publishers, Boca Rotaon, FL.
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22. Wolf, P. R. 1983. *Elements of Photogrammetry*, 2nd Ed, Mc Graw-Hill, New York.

GIH 403: GEOGRAPHICAL INFORMATION SYSTEM

Unit 1	**Basics of Geographic Information System**: Definition, components, packages, capabilities and purpose of GIS. History of Geographic Information System, Development of GIS as information and decision-making system, Overview of GIS Architecture.	06 hrs
Unit 2	**Definition**: Maps and spatial information, Components of GIS, maps and spatial data. Thematic characteristics of spatial data, other sources of spatial data-sensors, survey data, air photos, satellite images and field data.	06 hrs
Unit 3	Functions and Advantages of GIS: Introduction, Functions of GIS, application areas of GIS, Advantages of GIS, Uses and limitations of GIS.	06 hrs
Unit 4	GIS Data Models: Introduction, Spatial, Thematic, and Temporal Dimensions of Geographic Data. Spatial entity Spatial data Models: Introduction and types, Spatial Resolution. Raster Data Models: Raster Data Formats – netCDF4, HDF, Geo TIFF, ESRI grid, IMG. Raster data structure - Cell-by-cell raster encoding, Run-length raster encoding, Quad-tree raster encoding. Advantages/Disadvantages of the Raster data Model.	06 hrs
Unit 5	Vector Data Models: Definition, basic types of vector data model – Point, Line and Polygon. Vector Data Models Structures: Spaghetti Data Model, topological data model. Spatial Analysis: Types of analysis- point data, line data and polygon data. Data Extract – Clip, Select, Split and Table select. Overlay analysis – Erase, Identify, Intersect, Spatial join, Union etc. Proximity analysis – Buffer, Multiple Buffers, Thiessen Polygon, point distance. Conversion from vector to raster data. Advantages / Disadvantages of the Vector Model. Vector Data Formats – shape file, AutoCAD DXF, Geo Media, GML and DLG.	06 hrs
Unit 6	**Concepts of 3D models:** Digital Elevation and Terrain Models (DEM & DTM), Generation and structure of DEM/DTM and their applications. Geospatial Triangulated Irregular Network (TIN) model, slope, aspect, hill shade. **Digitization:** Editing and Structuring of Map Data. Mode of digitization, editing, topology creation and structuring map data. Data Quality and Sources of Errors. Nature of geographic data, sources of errors in GIS data base, data quality parameters, handling errors in GIS.	06 hrs
Unit 7	**Fundamentals of GPS:** Introduction, space segments, user segments and control segments. Observation principle and signal structure, accuracy of GPS measurements, point position in gang relative positioning, methods of surveying with GPS, Static and Kinematic positioning, navigation with GPS, differential GPS, navigational receivers.	06 hrs
Unit 8	**Applications of GIS in India:** Outlines of Applications in Facility and Utility Management, Natural Resource Management, Natural Disaster Management, Coastal Zone Management, Hydrology, Atmosphere, Health and energy. Application of Open source GIS, Bhuvan, Google Earth, Geo-server and Map-server.	06 hrs

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1. An Introduction to Geographic Info. System by Heywood, Carnelin and Carven, Prentice Hall, 1998.

2. Bonham – Carter G.F., Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York, 1994.
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7. Les Worell, (Ed) 1990. Geographic Info. System, Development and Applications, Belbaven Press.
8. Longley, P. A., Maguire, D. J., Goodchild, M. F and Rhind, D. W; GIS Principles Techniques, Applications and Managements, Longman Scientific and Technical, 2001 (very Expensive Book).
9. Maguire, D. J. Goodchild, M. F. and Rhind, D. W. GIS-Principles and application, Longman Scientific and Technical, 1991.

GIS 404: FUNDAMENTALS OF EARTHSCIENCES

Unit 1	Introduction**:** Formation of the earth, composition of earth crust, mantle and core. Plate tectonics, Major and Minor plates, continental drift and ocean floor spreading.	08 hrs
Unit 2	Mineralogy: Introduction to important Rock forming Minerals.	08 hrs
Unit 3	Outlines of Igneous Rocks: Intrusive and Extrusive igneous rocks, Granite, diorite, gabbro, pegmatite, peridotite, dolerite, basalt, andesite, dacite, obsidian, pumice, rhyolite, scoria and tuff etc.	08 hrs
Unit 4	Outlines of Metamorphic Rocks: Contact and regional matamorphism, Important metamorphic rocks: Gneiss, Schist, Quartzite, Granulites, Marble, Slate, etc.	08 hrs
Unit 5	Outlines of Sedimentary Rocks: Origin of sediments. Breccia, Conglom-erate, Sandstone, Limestone, Shale, Morphology & Origin of Laterites.	08 hrs
Unit 6	Structural Geology: Primary and Secondary Structures. Folds, Faults, Joints & Unconformities.	08 hrs

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1. Mukerjee, P.K. 1997, A Text book of Geology. The World Press Pvt. Ltd, 1-638.
2. Allen, J. R. L, 1969. Physical Processes of Sedimentation; New York, American Elsevier, 3-36.
3. Straller, A. N. 1976, *Principles of Earth Sciences*, Harper & Row, 269-315.
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11. Windley, B. F. *The Evolving Continents*, John Willey & Sons, 1-385.

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GIP 405: REMOTESENSING AND PHOTOGRAMMETRY (LAB H)

1.	Aerial mosaics, compilation, annotation, scaling and preparation of Photo index, Photo base determination and numerical problems on aerial photographs.
2.	**Spectral reflectance:** Plotting of Spectral Reflectance Curves, Rocks, Soil, Vegetation and Water.
3.	**Visual Analysis:** Study of aerial photographs under pocket and mirror stereoscopes and interpretation of satellite images (Black & White and FCC images). Interpretation of satellite data products (visual image interpretation and digital image analysis). Handling Image Processing Software Packages like: ERDAS, ENVI etc. and Generation of thematic maps.
4.	**Elements of Aerial Photo:** Study of Stereo pairs of aerial Photos. Flight planning, Determination of scale and slope. Outlines of parallax measurement.

GIP 406: EARTH SCIENC (LAB H)

Petrology	
1.	Megascopic study of common rock forming minerals.
2.	Identification of igneous, sedimentary and metamorphic rocks (hand specimen).
3.	Study of mega structures, textures and mineralogy of igneous rocks.
4.	Study of mega structures, textures and mineralogy of sedimentary rocks.
5.	Study of mega structures, textures and mineralogy of metamorphic rocks.

SECOND SEMESTER

GIH 451: DATA BASE MANAGEMENT SYSTEM (DBMS) AND SPATIAL STATISTICS

Unit 1	**Data and data base**: Organization of data base, Components of Data Base Management Systems. Files: key, file directories and file storage. Data retrieval and Data Security, Basics of Database models: Entity-relationship model, Flat File system, Network Data model. Concept of Data Mining and Data Warehousing.	06 hrs
Unit 2	**Structured Query Language (SQL)** **Relational and Hierarchical Data Models:** Relational Algebra, Projection operators, Selection operators (Arithmetic & Logical operators), Set unions, Set differences, Cartesian product. Record Storage & primary File Organization, Buffering of Blocks, Hashing Techniques, Index Structures for Files. Transaction Processing Concepts, Data Base Recovery Techniques, Data Base Security Authorizations, Functional Dependencies and Normalization for Relation Data bases.	06 hrs
Unit 3	**C Programming:** Overview of C, Constants, Variables and Data types. Managing input and output operations. Decision Making Statements: Branching (simple if, else, nested if else, else if ladder) and looping statements (while, do while, for loops). Arrays: One-dimensional, Two-dimensional arrays, declaring and initializing arrays.	06 hrs
Unit 4	**Spatial Statistics:** Measures of Central Tendency: Mean, Median and Mode and their Applications in GIS and Remotely Sensed Data interpretation.	06 hrs
Unit 5	**Correlation Co-efficient** and its application to GIS and Remotely Sensed Data.	06 hrs
Unit 6	**Cluster Analysis:** Introduction to Cluster Analysis. Interpretation of Q-mode and R-mode Clusters with reference to Spatial Data. Application of Cluster Analysis to Spatial Data.	06 hrs
Unit 7	**Factor Analysis:** Outlines of Factor Analysis. Interpretation of Factors for Spatial data.	06 hrs
Unit 8	**Statistical Packages:** Introduction to Statistical Packages. Introduction to SPSS Package. Functions of SPSS. Graphic out-put of processed data using SPSS. Application of SPSS to Geoinformatics. Case studies using SPSS. Use of SPSS in spatial data analysis. Designing of Cluster Analysis and Dendrograms related to Geoinformatics data.	06 hrs

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1. K. Majumdar & Bhattacharya. P, 1999. Database management Systems. Tata McGraw-Hill Pub.
2. Korth H. F & Silberschatz, A. 1986. Database Systems Concept , McGraw-Hill, New York
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4. Martin. J, 1977. Computer Database Organization, Prentice-Hall, New Jersey.
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6. Daniel and S. Wilks, 1995. Statistical Methods in the Atmospheric Sciences.
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10. Krumbein, W. C. and Graybill, F. A. 1965. An Introduction to Statistical Models in Geology.

GIH 452: DIGITAL IMAGE PROCESSING

Unit 1	**Introduction**: Digital images, Sources of errors; Image Pre-processing- Atmospheric, Geometric and Radiometric corrections, Noise removal, Resampling techniques. Image Enhancement Techniques. Contrast enhancement: Linear and Non-Linear Logarithmic contrast enhancement, Edge enhancement, Density slicing, Principal Component Analysis; IHS Transformation, Spatial filtering, Low and high frequency band ratioing and band combination.	06 hrs
Unit 2	**Image and Digital Images:** types of images and acquisition, simple image model, Sampling and reconstruction, uniform sampling and quantization.	06 hrs
Unit 3	**Digital Image Analysis:** Digital data, Image File formats, Image Rectification and Restoration.	06 hrs
Unit 4	**Image enhancement techniques:** Raw, Processed Images, Contrast Manipulation, Spatial feature Manipulation, Multi-Image Manipulation.	06 hrs
Unit 5	**Contrast Manipulation:** Grey Level Thresholding, Level Slicing, Contrast Stretching- Concept of Digital Number.	06 hrs
Unit 6	**Spatial feature Manipulation:** Convolution, Edge Enhancement, Concept and Use of Fourier Analysis in Digital Image Analysis.	06 hrs
Unit 7	**Multi-Image Manipulation:** Spectral Ratioing, Principle and Canonicle Components, Vegetation Components/Indices - Infrared Index, Simple Ratio, Perpendicular Vegetation Index (PVI), Moisture Stress Index (MSI), EVI, TVI, NDVI and NDWI.	06 hrs
Unit 8	**Digital Image Classification:** Classification scheme; Supervised classification, Training sites selection and statistical information extraction; Discriminant functions; Maximum Likelihood classifier, Euclidian distance, Mahalanobis distance; Unsupervised classification, classification accuracy assessment, Error Matrix.	06 hrs

References

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2. Duda, R.o. and Hart P.E. (1973). Pattern Classification and Scene analysis. Wiley
3. Fu, K.S. (1974). Syntactic Method in pattern recognition. Academic.
4. Drury, S. A. (1987). Image Interpretation in Geology, Allan & Unwin - Publ. Ltd, 23-67.
5. Kenneth R, Castle man, (1979). Digital Image Processing, Prentice Hall, 24-98.
6. Lillies and T.M. & Kiefer R.W. (1994). Remote Sensing and Image Interpretation, John Wiley & Sons, New York, 56-78.
7. R .A. (1995). Techniques for Image processing and classification in Remote Sensing, Academic Press. New York.
8. Siegel, B.S. and Gillespie, A.R. (1994). Remote Sensing and Image Interpretations, John Wiley and Sons, New York.
9. Remote Sensing and GIS, B Bhatta Oxford University press.

GIS 453: ADVANCED GIS

Unit 1	**GIS Data and Analysis:** Spatial Analysis:-Classification, Overlay analysis, Proximity Analysis, Polygon Neighborhoods, Data analyzing operations in GIS, Buffering and neighboring functions, integrated data, raster and vector overly method, problems of vector and raster overlay, spatial interpolation GIS for surface analysis and network analysis.	06 hrs
Unit 2	**Introduction to modeling in ArcGIS Concepts of 3D models:** Suitable Site selection – Simple overlay analysis, multi-criteria analysis, View shed analysis, Flood analysis, Sun shadow volume analysis, Using Model Builder. Grid based spatial analysis – local, focal, zonal, and global function (Neighborhood analysis).	06 hrs
Unit 3	**Topology and network analysis:** Topology – Types of Errors, Editing and Error Rectification, Types of Topology, Modeling topological Relationships, Network connectivity rules, Finding Shortest Route, Creating Geometric network, creating and building a network dataset. Applications of network analysis. Geovisualization; GIS classification methods, Image Classification.	06 hrs
Unit 4	**Spatial Statistical Modeling**: Identification of Central feature, directional distribution, mean center, median center, linear directional mean, standard distance, hot-spot analysis, correlation, raster calculator and Boolean operation. Geostatistics - Pattern Analysis, Measures of Arrangements & dispersion, Spatial Auto Correlation, Kriging.	06 hrs
Unit 5	**Decision Support Systems** (DSS): Concepts of decision making, systems and modeling, Need for DSS. Concepts of multicriteria decision making.	06 hrs
Unit 6	**Web GIS**: Definition, concept and history of Web GIS, components of web and internet GIS, advantages and limitations of web GIS. Web mapping: Static and interactive web mapping, open GIS web map server. Geographic Markup Language - principles and characteristics, commercial web mapping programs. Functions of Web GIS: Display of general information for the public, display of planning information, interactive display of spatial information, sharing and distribution of spatial data as well as management of spatial data. Open Source GIS and its components.	06 hrs
Unit 7	Open source GIS platforms, software, Libraries - GRASS GIS, Cloud GIS, QGIS, Application of Open source GIS, Arc GIS.	06 hrs
Unit 8	Applications of GIS in various fields of Geoinformatics.	06 hrs

References

1. Bonham – Carter G.F. (1994). Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York.
2. Burough, P.A. and Rachael A. McDonnell (1998). Principles of Geographic Information System, Oxford University Press (Indian Print).
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5. Heywood, Carnelin and Carven (1998). An Introduction to Geographic Information System by, Prentice Hall.
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8. Longley, P. A., Maguire, D. J., Goodchild, M. F and Rhind, D. W. (2001). GIS Principles Techniques, Applications and Managements, Longman Scientific and Technical (very Expensive Book).
9. Maguire, D. J. Goodchild, M. F., and Rhind, D. W. (1991). GIS- Principles and Application, Longman Scientific and Technical.

Unit 1	Concepts of modern Geomorphology: Geomorphology and its applications in natural resources inventory. Geomorphology and its applications to Geoinformatics.	06 hrs
Unit 2	Geomorphic Environments: The Fluvial systems, Coastal and Marine geomorphology. Fluvial, Aeolian, Glacial, Karst and Dune Environments. Mid Oceanic. Ridges, Ocean Floor Topography. Geomorphology and GIS in exploration of the natural environment. Impact of Slope, Badlands, Pediments, Streams in Geomorphic Evolution.	06 hrs
Unit 3	Geomorphic controls on the groundwater resources of Coastal, Island and Hinter land terrains. Geomorphological factors to be considered while selecting the solid waste disposal sites. Solid waste management and its impaction on local and regional geomorphology. Geo-hazards and geomorphic controls. Application of Remote Sensing and GIS in quantitative and Quantitative interpretations of 'risk area mapping' including forest fires, floods, earthquakes and Tsunami effected terrains.	06 hrs
Unit 4	General Introduction: Definition of Environment, Environmental Pollutant, Environmental Pollution, Environment–Handling, Hazardous substance.	06 hrs
Unit 5	Environment Management Plan: Concepts and use of EMP in coastal and marine environments.	06 hrs
Unit 6	Environment Impact Assessment Act: Definition, use and implementation for specific areas such as Marine Environments, Ports, Harbours, Recreation, Water Quality Standards for class SW-I waters, SW-II, SW-III, SW-IV, SW-V.etc., Noise Standards.	06 hrs
Unit 7	Coastal Regulation Zones: Concept of coastal Regulation Zones. Classification of Zones, Criteria of Zonation and Evolution of CRZ norms. Application of cartography, Remote sensing and GIS in mapping of Coastal Regulation Zones.	06 hrs
Unit 8	Anthropogenic and Natural Environmental Hazards: Reconnaissance mapping of Landslides and use of DEM. Use of GIS and Remote sensing in detection of water– spread areas including monitoring flood scenarios. Use of high resolution satellite data (IKONOS) and other digital data products in assessing damage due to earthquakes, forest fires, flooding, etc. Impacts of Open-cast Mining and monitoring through multi-dated Remote Sensing and GIS techniques.	06 hrs

References

1. Ahmad, Y. J and Sammy, G. K. 1985. *Guidelines to Environmental Impact Assessment in Developing Countries*. Hodder &Stoughten, London. 26-82.
2. Anonymous, 1992. *Overseas Development Administration-manual of Environmental Appraisal*. ODA, London- II Edition. 8-16.
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GIP 455: GEOMORPHOLOGY AND GEOSTATISTICS (Lab S)

	Geomorphology
1.	Morphometry of drainage basins. Analysis of drainage patterns and orientation structure.
2.	Preparation of DEM from topographical maps, ASTER and SRTM data.
3.	Preparation of Aspect, Shaded relief, and Slope maps from DEM.
4.	Interpretation of longitudinal and cross-valley profiles.
5.	Generation of geomorphologic maps showing fluvial, coastal/marine, denudational, volcanic and glacial land forms.
6.	Exercises related to measurements of runoff dynamics and sediment dynamics.
	Geostatistics
1.	Quartiles, Deciles and Percentages
2.	Measures of Dispersion
3.	Skewness and Kurtosis
4.	Students T test
5.	Regression and Multiple linear regression
6.	**SPSS**: Introduction to SPSS. Use of SPSS in creating a database. Applications of SPSS in Correlation Co-efficient. Use of SPSS in Linear Regression. Modeling and Prediction. Application of SPSS in GIS data modeling.

GIP 456: GIS AND DBMS (Lab S):

	GIS
1.	Geo-referencing – image rectification based on co-ordinate system. Onscreen digitization
2.	GIS and Remote Sensing data integration: Integration of vector and raster data (linking of spatial and non-spatial data)
3.	Extraction of Thematic maps: preparation of thematic layers-on screen from toposheets, images - Road, Settlement, Drainage, LU/LC etc.
4.	Map composition and presentation of results. Overlay and proximity analysis-clip, erase, intersect, union, buffer.
5.	Edge matching/spatial adjustment. Calculation of slope in degrees and percentages. Calculation of area, perimeter and distance using Arc GIS.
6.	Creation of 3D maps: TIN, Hill shade, Slope, and Aspect with Arc GIS.
	DBMS
1.	Outlines of DBMS and Applications of DBMS in Geoinformatics.
2.	Introduction to SQL and its application in GIS.SQL Queries (Alter, Insert, Update, Delete).
3.	Designing database: Creation of tables, inserting values in to the tables, updating the existing Value, modifying the structure of the database, Use of Drop and delete commands. Use of Numeric, Aggregate, Date, Conversion and character functions.
4.	C programming: Applications of C program in Geoinformatics.

GIE 457: GEOINFORMATICS (Open Elective**)**

Unit 1	**Definition:** of data and information, historical evolution and need for information, Basic Concepts of Spatial Data and aspatial data, spatial information. Sources of spatial data-survey data, air photos, satellite images and field data.	6 hrs
Unit 2	**Scope and Importance:** of Geoinformatics; Basic concepts of Remote Sensing; aerial photography and satellite remote sensing. Indian Space Program and Indian Remote Sensing Satellites.	6 hrs
Unit 3	**Principles of Thermal and Microwave Remote Sensing:** Introduction, Black body Radiation, Temperature Radiations from the earth's surface and Applications of thermal remote sensing. Basic concepts of micro wave remote sensing, Real Aperture Radars and Synthetic Aperture Radars, Microwave sensors. Applications of Microwave Remote Sensing. Visual and digital image analysis techniques.	6 hrs
Unit 4	**Map Concept**: Map features, scale, resolution, accuracy, projection and data base extent. Map Projection and parameters: Geographical co-ordinate system, spheroid and spheres. Types of projection and parameters. Indian geodetic system and Everest spheroid, world geodeticsystem-084(WGS-084).	6 hrs
Unit 5	**Geographic Information System**: Definition, components, packages, capabilities and purpose of GIS. Spatial and non-spatial databases. Data Models: Vector and Raster models. Application and limitations of GIS.	6 hrs
Unit 6	**Fundamentals of GPS:** Introduction, space segments, user segments and control segments, observation principle and signal structure, accuracy of GPS measurements, point positioning and relative positioning, methods of surveying with GPS, Static and Kinematic positioning, navigation with GPS, differential GPS, navigational receivers.	6 hrs
Unit 7	**Geoinformatics and other Information Sciences**: Geoinformatics – Spatial and Non-spatial data Management. Spatial information Technology.	6 hrs
Unit 8	**Applications of Geoinformatics**: Geoinformatics technologies. Applications in Natural Resource Management, Agriculture, Solid Waste Management, Natural Disaster Management, Coastal Zone Management.	6 hrs

References

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8. Land, T. G., 1999. ArcView-3D Analyst. ESRI press.6-23.
9. Michael Zeiler 1999. The ESRI Guide to GIS Analysis, vol. I. ESRI press.4-16.
10. Michael Zeiler, Modeling Our World: The ESRI Guide to Geodatabase Design. ESRI press. 3-7.
11. Prabha Shastri Ranade, 2009. Special *Economic Zones: Global and Indian Experiences*, ISBN: 8131411559, Publ: ICFAI, 324pp.
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13. Wood, C., 1995. Environmental Impact Assessment – A Comparative Review. 1-337.

THIRD SEMESTER

GIH 501: RS AND GIS IN MARINE RESOURCES AND COASTAL ZONE MANAGEMENT

Unit 1	**Introduction and Classification** to Coastal and Marine Environments Historical Review of Oceanography: HMS Challenger Expedition. Fundamentals of Marine ecology, Bio Resource, coastal bathymetry, properties of seawater.	6 hrs
Unit 2	**Ocean Floor Topography:** Continental margins – Active and Passive, Ocean basin floor, Mid oceanic ridge, Submarine Canyons, Waves, Ekman Spiral, Ekman Transport, Upwelling/Down welling Processes.	6 hrs
Unit 3	**Coastal Environment:** Concepts of Zonation, Rocky Shores, Sandy Shores, Cuspate Beaches, Spits and Beach Ridges, Back Shore Dune Environments.	6 hrs
Unit 4	**Marine Environment:** Mangrove Environments, Island Environments, Tidal Flat Environments, Intertidal Environments, Estuarine Environments.	6 hrs
Unit 5	**Major Currents of the Oceans**: Surface currents, Deep ocean currents, Subtropical gyres. Currents in Indian Ocean – Periodical currents (Summer (SW) and Winter (NE) monsoon currents).	6 hrs
Unit 6	**Remote Sensing and GIS:** Applications in Oceanography and Environmental studies. Data products and their acquisition. Satellites and their payloads useful for ocean related studies. **Satellite Oceanography:** History of Oceanographic Satellites. Satellites and their payloads for the retrieval of various coastal parameters. Technical Characteristics of MODIS-Aqua, Oceansat I & II - OCM/MSMR payloads.	6 hrs
Unit 7	**Retrieval of Oceanic Parameters:** Chlorophyll-a, Dissolved organic substances and Total Suspended Matter. Insitu recovery of Chlorophyll, SST, Wind Speed, Sea Surface Currents, Salinity, and TSM. Instruments used for collecting and analysis of the samples. Concepts of Biophysical Coupling. Prediction models of Sea Surface Temperature.	6 hrs
Unit 8	**Applied Oceanography**: Satellite Oceanography and Satellite data products required to generate Potential Fishing Zones. Use of GIS and Cartography to Map Morpho-eco systems of the Coast. Use of Cartography, GIS and Satellite Oceanography in site selection of Major and Minor Ports and Beach Recreational Environments.	6 hrs

References

1. Andy Mitchell. The ESRI Guide to GIS Analysis, Vol. 1. ESRI Press, 11-21.
2. Balasubramanian, A. Ecology Environment & Pollution, Indira Publishers, Mysore.11-17.
3. Castro, P., and Huber, M. H., 1997. Marine Biology, McGraw-Hill. 19-80.
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7. Michael Zeiler, Modelling Our World: The ESRI Guide to Geodatabase Design. ESRI Press,.
8. Pinnet, P., 1992. Oceanography: An Introduction to the Planet Oceans. West Publ. Co., 513.
9. Richard A. Geyer, Marine Environmental Pollution, Elsevier Oceanography Series, 21-32.
10. Thomas G. Lane., Arc View - 3D Analyst. ESRI, Press, 13-22.

GIH 502: RS AND GIS IN LAND AND WATER RESOURCES

Unit 1	**Land as a natural resource:** Rocks, minerals, soils, oil and gas, coal. Agriculture land and forest.	6 hrs
Unit 2	**Remote sensing and GIS in Land and Water Resources:** Application of Remote Sensing and GIS in the study of Land and Water Resources. Visual and Digital Techniques in Land and Water Resources Investigations. Selection of appropriate software and data products useful in these resources.	6 hrs
Unit 3	**Water Resources:** Introduction, Concepts of surface Water, Hydrological Cycle. World water distribution, watershed management.	6 hrs
Unit 4	**Hydrogeomorphic studies in Water Resources:** Theory of Geomorphic Controls of Water Resources, Concept of Basin Network Analysis. Surface Run off, Slope Analysis, Applications of DEM in Water Resources, Flood mapping, Quantitative studies of drainage basins.	6 hrs
Unit 5	**Groundwater:** Concepts of Groundwater, Vertical Distribution of Ground water, Types of Aquifers, Rock Properties Affecting Ground water Resources, Lineament studies in Water Resources, Groundwater Resources of India with special reference to Karnataka.	6 hrs
Unit 6	**Theory of Groundwater flow:** Darcy's law and its applications. Groundwater potential assessment, ground water prospect zones mapping and ground water information system.	6 hrs
Unit 7	**Water Resources and Watershed Management:** Concept of River Basin Management, GIS applications in water resources development and management. Concept of Natural Recharge, Concepts in Artificial Recharge, and use of DEM in Artificial Recharge.	6 hrs
Unit 8	**Groundwater development and management:** Planning and management of groundwater. Methods of artificial groundwater recharge; rainwater harvesting, problems of over-exploitation of groundwater; water management in rural and urban areas, geological and geophysical methods of groundwater exploration. **Water Quality** Physical and chemical properties of water, quality criteria for different uses, groundwater provinces of India, Groundwater contamination.	6 hrs

References

1. David K. Todd, 1980. Groundwater Hydrology, John Wiley & Sons, 5-85.
2. Keith, P. B, 1973. Thompson et al. (ed) Remote Sensing Water Resources Association, Urban Illineis, 27-86.
3. Linsley, Kohler and Paulhus, 1956. Hydrology for Engineers, Mc Graw-Hill, 56-74.
4. Ragunath, H. M. 1987. Ground Water 2nd, Wiley Eastern, 23-65.
5. Subramanian, V. 2002. Water: Quantity-Quality Perspectives, in South Asia. Kingston Intl. Publishers, 34-57.
6. T. M. Lillesand and R. W. Kiefer, 2000. Remote Sensing and Image Interpretation J. Wiley & Sons, 37-66.
7. Thomas G. Lane, 2000. Arc View 3D Analyst, ESRI, Press, 12-43.

GIS 503: RS AND GIS IN URBAN PLANNING AND DISASTER MANAGEMENT

GIS in Urban Planning		
Unit 1	**Concepts**: Urban, Urbanism, Urbanisation, Regional Concept and Types of Planning process, presentation and preparation Origin and Growth of Urbanisation in the World Urban Problems: Pollution, Slum, Housing, Social wellbeing.	6 hrs
Unit 2	**Application of GIS, GPS and RS: in** Urban and Regional Planning Research Methods in Urban and Regional Studies. Applications of RS and GIS in Socio-economic Information Analysis, Agricultural Information System –Land Holdings–Irrigation, Land Use, Land Reforms.	6 hrs
Unit 3	**RS and GIS Applications:** in Agriculture and Rural Development, Concept of Rural Development–Globalization and its impact on Agriculture and Rural Development. Types of agriculture, Livestock.	6 hrs
Unit 4	**Application of RS and GIS**: in rural problem solving situation–Village Information System and planning. Planning in India–Development policies (Five Year Plans) Geo-informatics for Precision Farming-Importance and relevance to Indian Agriculture.	6 hrs
GIS in Disaster Management		
Unit 5	**Disaster Management**: Concepts of disaster; Types of disaster Natural and manmade: Cyclone, flood, landslide, land subsidence, fire and earthquake. Issues and concern for various causes of disasters. Principles of Disaster Management, Natural Disasters, Hazards, Risks and Vulnerabilities.	6 hrs
Unit 6	**Assessment of Disaster**: Vulnerability of allocation and vulnerable groups. Preparedness and Mitigation measures for various Disasters. Preparation of Disaster Management Plans.	6 hrs
Unit 7	**Issues in Environmental Health, Water & Sanitation,** Earthquake Mitigation, Floods, Fire, Landslides and other natural calamities. Post Disaster Relief & Logistics Management.	6 hrs
Unit 8	**Information systems & decision making tools**. Role of Remote Sensing in Science & Technology. Rehabilitation Programmes. Voluntary Agencies & Community Participation at various stages of disaster management. Role of military and paramilitary forces during disaster. Emergency Support: Functions and their coordination mechanism. Resource and Material Management. Management of Relief Camp.	6 hrs

References

1. R.J. Chorley and P. Hayget, Socio-economic models in geography, 1967.
2. Lo, F and K. salih, Growth pole strategy and regional development policy, oxford; pergaman press, 1999.
3. Harry W. Richardson, Regional and urban economics, 1979.
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16. Atmosphere, Weather and Climate: An introduction to Meteorology-Narora-S. B. Saunders Co., Philadelphia
17. Physical Geology - A. N. Strahler.
18. Meteorology - William L. Donn (1975) - McGraw-Hill Book Co., New York.
19. An introduction to Dynamic Meteorology - J. R. Holton (1992) - III Ed, Academic Press.
20. R.W. Tank: Focus on Environmental Geology (p. 256).

GIS 504: RS AND GIS IN AGRICULTURE AND FORESTRY

GIS in Agriculture		
Unit 1	**Introduction to Agriculture**: Types of agriculture - Shifting, Subsistence, Extensive, Intensive agriculture, Plantation, Mixed Farming, Commercial Farming, Dry land farming, Wet land farming. Challenges posed to agriculture: Climate Change - Patterns of Temperature and Rainfall, Resource Constraint. Concepts of Agrometeorology: Agro-meteorological stations and automated weather stations.	6 hrs
Unit 2	**Spectral Characteristics of Crop**. Crop Inventory and assessment: Spectral characteristics of crops and Spectral Vegetation Indices; Crop yield modeling and condition assessment. Crop Management: Plant signatures and vitality indicators: Imaging spectroscopy, chlorophyll fluorescence. Cropping pattern & cropping indices analysis, Crop condition and stress assessment, Crop water management. **Crop Monitoring**: Crop area estimation, Crop growth monitoring and Condition Assessment, Crop yield prediction, crop stress detection, Disease identification, Phenological studies.	6 hrs
Unit 3	**Precision agriculture**: Definition, Importance, Components, prospects in Indian agriculture. GPS role in Precision Agriculture. Technologies used in Precision agriculture – Robots, Self-steering tractors, Drones and satellite imagery, Internet of things. Soil Resource Mapping: Soil Quality: Indicators, measurement and assessment, Soil pollution: Soil contamination by heavy metals and Pesticides, Soil Nutrient Management for Precision Agriculture. Irrigation Systems in Agriculture.	6 hrs
Unit 4	**Concept of sustainable Agriculture:** Agricultural Land Use /Land Cover mapping – Visual analysis of satellite data. LULC Mapping and change detection using Remote Sensing Techniques. Impact of LULC change detection on biogeochemical and hydrological cycles. Site suitability for agricultural and horticulture crops. RS and GIS in damage assessment due to cyclone, drought and flood.	6 hrs
GIS in Forestry		
Unit5	Geographical distribution, types, extent and status of vegetation of the World, Asia-Pacific and India. Spectral properties of vegetation and factors affecting spectral reflectance. Spectral vegetation indices, phenology as discriminant for vegetation differentiation and growth.	6 hrs
Unit 6	Forest/Vegetation classification and mapping, Forest inventory and sampling techniques, Growing stock estimation, Biomass estimation, forest management, Fire risk zonation, Land evaluation of forestry, Landscape analysis, Wildlife habitat suitability analysis.	6 hrs
Unit 7	Forest hazards (Deforestation, Degradation and Forest fire), Land and soil degradation, desertification and Pollution (Water, air and soil).	6 hrs
Unit 8	**Remote sensing of forest ecosystem:** Forest change detection using time-series data. Hyperspectral Remote Sensing for species/community delineation, Microwave remote sensing in forestry, LiDAR remote sensing for tree height determination, Biophysical spectral response-based forest canopy density (FCD) mapping. Use of RS and GIS in Forest fire and wildlife habitat assessment. Mapping of forest density and type, issues in forest management. Forest Fire Modeling, Wild Life Habitat Assessment Modeling, Soil Erosion Modeling.	6 hrs

References

Ahmad, Y. J and Sammy, G. K 1985 Guidelines to Environmental Impact Assessment in Developing Countries. Hodder & Stoughten, London. 26-82.

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Wood, C. 1995 EIA: A Comparative Review. Longman. 87-255.

GIS 505: COMPUTER PROGRAMMING

Unit 1	**Basics of Computers:** An introduction to computers, development of computers, Hardware and Software. Fundamentals of Computers – operating systems, input devices, output devices, storage devices-primary, secondary, central processing unit, computer languages, translators.	8 hrs
Unit 2	**Information Super Highway:** Introduction to Internet. Scope of Internet. Equipment required for an Internet Connection. Electronic Mail. Concepts of Information Storehouse. Surfing the Net. Browsing the WWW. Search Engines and their applications. Application of internet to Geoinformatics. Introduction to networks, Local area network devices, topologies, protocols, wide area networks, servers, hubs, nodes, modems, internet.	8 hrs
Unit 3	**HTML (Web design):** Basic & advanced HTML, Types of tags, Document creations, Linking, Creating Link List, handling images, tables and, style sheets. Types of tags, Creating hyper text links. Formatting the text (example). Creating Image Links.	8 hrs
Unit 4	**Outlines of Python:** Introduction. Creating/Opening/Closing a net CDF file, Dimensions, Variables, attributes in a net CDF file. Writing and retrieving data from a net CDF file. Numpy, Scipy, Matplotlib modules/packages.	8 hrs
Unit 5	**Handling of Character strings:** Declaring and initializing string variables. C++ Programming: C++ Tokens, Expressions and Control Structure. Object oriented concepts: classes and objects, Functions: Defining Member functions Inheritance, Polymorphism, operator overloading, Constructors and Destructors, Control structures statements.	8 hrs
Unit 6	**JAVA:** Fundamentals of Objects- Oriented Programming. Overview of Java, Data types, Variables, Constants, Operators and Expressions Decision Making: Branching and looping statements, Classes, Objects and methods, multiple Inheritance, packages, multi-threaded programming, managing errors and exceptions, applets.	8 hrs

References

1. Beekman, G. 1999. Computer Confluence: Exploring Tomorrow's Technology. Addison-Wesley, Reading, MA. (3rd Ed).
2. Willis H. Means 19087A content analysis of six introduction to computer science textbooks ACM New York, NY, USA, 403 - 413
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7. E. Balaguruswamy, Programming in C++
8. E. Balaguruswamy, Programming in Java.

GIP 506: DIP AND COMPUTER PROGRAMMING (Lab S)

	Digital Image Processing Lab
1.	ERDAS Imagine
2.	Geometric Correction
3.	Radiometric correction
4.	Histogram construction for digital data
5.	Outputs of linear and non-linear stretch
6.	Filtered outputs
7.	Ratio images
8.	Changed detection analysis
9.	Image classification based on digital values
10.	Unsupervised and Supervised classifications.
	Computer Programming Lab
1	Applications of C++ programming in Geoinformatics. Programs to illustrate use of classes, objects in processing/performing Geoinformatics related tasks.
2	HTML: Introduction to WEB and its Applications in Geoinformatics. Creation of web pages. Use of HTML text formatting tags, Hyperlinks, Image stags.
3	Application of Java to Geoinformatics data. Creation of Java programs and applets. Embedding applet tags in HTML.

GIP 507: RS AND GIS IN WATER AND MARINE RESOURCES (Lab S)

	Water Resources Lab
1	Delineation of river catchments on satellite image. Quantification of Lakes/Reservoirs, Water Bodies from satellite data and top sheets.
2	Evaluation of various drainage morphometric parameters for watershed characterization. Identification of Drainage Patterns, Computation of Stream Density, Stream Frequency, Ruggedness Number etc.
3	Creation of flow direction, flow length, flow accumulation in a watershed based on contours using Arc GIS.
4	Generation of Groundwater potential zone mapping, Isohyetal map generation and interpretation, Generation of Theissen polygons, Precipitation contours.
	Marine Resources Lab
1	Instrumentation in In-situ collection of Oceanographic Data: Secchi Disc, Water Samplers, Grab Samplers, Anemometers, D. O., Salinity, pH meter.
2	Construction of Chlorophyll-a, SST, Depth, Salinity, Biomass, Total /Suspended matter, using interpolation techniques in ArcGIS.
3	CRZ mapping using topographic sheets, Hydrographic charts, Air photographs, Digital data products.
4	Mapping of coastal features like riverine, beach, tidal flat, rocky and sandy shore environments from satellite images, topo-sheets and hydrographic charts. Identification & Interpretation of Oceansat, Modis, and other Oceanographic Satellite Images.

GIE 508: GEOINFORMATIS OF COASTAL ENVIRONMENTS (Open Elective)

Unit 1	**Introduction:** Concepts of Geoinformatics. Outlines of Remote Sensing, Air Photo Interpretation, and Geographic Information System. Arial photos and remote sensing of coastal environment.	6 hrs
Unit 2	**Outlines of Indian Satellites**: Indian space Program, Scientific Pay loads from India and abroad, Bhuvan: Description of 3D Satellite Mapping.IRS-P4, Ocean Sat-II: Description and Payloads. IRS-IC/D.A brief note on Hyper spectral Remote Sensing. Resource sat, Cartosat - I & II etc.	6 hrs
Unit 3	**Data and Data products:** List of Data and Data Models. Digital Data Products, Topographic Sheets and Theme Analysis, Hydrographic Sheets, Outlines of the I.H.O. Bathymetric measurements and outlines of Echo-sounders and Multibeam unit.	6 hrs
Unit 4	**Coastal Environments**: Geomorphology of Coasts. Classification of Coastal Environments. Relevance Geology and Geotectonic to the genesis of coasts.	6 hrs
Unit 5	**Spatial Analysis of Coastal Environments:** Collection of Spatial Data from Coastal Environments. Data Interpretation and use of GIS in modeling studies.	6 hrs
Unit 6	**Coastal Regulations and Zones:** Outlines of CRZ-I, CRZ-II, CRZ-III and CRZ-IV. Amendments to the CRZ norms.	6 hrs
Unit 7	**Coastal Development:** Definition and Description of Ports and Harbours. Application of EIA and CRZ to development Ports and Harbours. EIA Norms and Criteria for Recreation and Water sports.	6 hrs
Unit 8	**Coastal Information System:** Concepts of a Coastal Information System. Use of GIS in developing a Coastal Information System. Use of RS and GIS in developing coastal information system.	6 hrs

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1. Áine Ryall 2009. Effective Judicial Protection and the Environmental Impact Assessment Directive in Ireland. Hbk, 1-332.
2. Aradhana, A. 2006. Special Economic Zones: Revisiting the Policy Debate. Economic and Political Weekly, Vol. XLI Nos. 43 and 44, 4-10
3. Aradhana, A. 2009. Genesis, Evolution, and the Changing Role of SEZs in Asia: A Comparative Analysis of Taiwan. Korea and India, Mimeo, Korean Institute of Economic Policy (KIEP) 2-12.
4. Berling, G.L. and Roy, W.W. 1989. Application of Aerial Photographs and Remote sensing Imagery in Urban research and studies. Monticell, 6-33.
5. Bonham- Carter G.F., 1994. Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York, 6-9.
6. Brench, M. C., 1971. City Planning and Aerial information. Harvard Uni., Cambridge.12-45.
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9. Michael Zeiler 1999. The ESRI Guide to GIS Analysis, vol. I. ESRI press.4-16.
10. Michael Zeiler, Modeling Our World: The ESRI Guide to Geodatabase Design. ESRI press.3-7.
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12. Sabine Latteman, 2010. Development of an Environmental Impact Assessment and Decision Support System. 12-23.
13. Wood, C., 1995. Environmental Impact Assessment – A comparative Review. 1-337.

FOURTH SEMESTER

GIP 551: Field Work and Field Report

Field work carried out by the students under the guidance of faculty members will be evaluated by all the concerned teachers. The field report submitted by the students under the supervision of faculty member(s) will be evaluated by the concerned teacher (s).	100 marks

GIP 552: Project/Dissertation

Each student is required to undertake a project work under the supervision of a faculty member. It shall consist of 36 hours of Project work per week and include the entire fourth semester and the students shall carry out their project work either in a software company, GIS application company, Remote Sensing company or any research institution such as NIO, INCIOS, CESS, C-GIST, NCAOR, etc. In house project work with an affiliation of an external company or research institution with and external guide will also be considered for project work in the last (fourth) semester. The project work will be used to provide a dissertation that shall be submitted to the Chairman BoE. For evaluation as per the regulations for Geo-informatics. A viva-voce shall be mandatory as provided in the regulations for Geo-informatics M.Sc. course. After the dissertation work is completed, students shall submit dissertation / thesis based on the results obtained. The dissertation is evaluated by internal and external examiners. The total of the fourth semester shall be of twenty credits only.	300 marks

GIP 553: Viva-Voce

Each student has to present the dissertation work carried out by him/her in front of the examiners (internal and external). His (her) performance will be evaluated based on the knowledge of the dissertation work.	100 marks

--- Semester M.Sc. in Geoinformatics Examination, Month ---Year ----
(CBCS)

Subject code------: Title of the paper

Time: 3 hours **Maximum marks: 70**

I. Define/state **any five** of the following: **5 x 2 = 10**

1) ----------
2) ----------
3) ----------
4) ----------
5) ----------
6) ----------
7) ----------

II. Write short notes on **any five** of the following: **5 x 6 = 30**

8) ----------
9) ----------
10) ----------
11) ----------
12) ----------
13) ----------
14) ----------

III. Write **any three** descriptive notes of the following: **3 x 10 = 30**

15) ----------
16) ----------
17) ----------
18) ----------

Note to the paper setter: please select questions by covering all units of the syllabus

Prof. Govindaraju
Member

Prof. Mohandas Chadaga
Member

Sr. Prof. Shivanna
Member

Dr. K. Priya
Member

Smt. S.M. Yamuna
Member

B.R. Manjunatha
Chairman