M.Sc., GEOINFORMATICS CHOICE BASED CREDIT SYSTEM SYLLABUS SEMESTER SCHEME

SEMESTER		PAPER	INSTRUCTIONS HRS/WEEK	Duration of Exam (hrs)	MARKS			Credits
					INTERNAL ASSESSMENT	Exam	Total	
I SEMESTER	GI 401	DATA ACQUISITION & DATA PROCESSING	4	3	30	70	100	4
	GI 402	COMPUTER SCIENCE & WEB DESIGNING	4	3	30	70	100	4
	GI 403	REMOTE SENSING PHOTOGRAMMETRY	4	3	30	70	100	4
	GI 404	PETROLOGY AND STRUCTURAL GEOLOGY	4	3	30	70	100	4
	GI 405	COMPUTERS: SOFTWARE & HARDWARE- ROCK IDENTIFICATION LAB	8	4	30	70	100	4
	GI 406	REMOTE SENSING & PHOTOGRAMMETRY-LAB	8	4	30	70	100	4
		SEMINAR & FIELD WORK	2	-	50	-	50	2
							SEMESTER TOTAL	26
II SEMESTER	GI 451	DATA BASE MANAGEMENT SYSTEM & SPATIAL STATISTICS	4	3	30	70	100	4
	GI 452	APPLIED GEOMORPHOLOGY & GEOENVIRONMENTAL SCIENCES	4	3	30	70	100	4
	GI 453	APPLICATION OF GIS TO GEOINFORMATICS	4	3	30	70	100	4
	GI 454	CARTOGRAPHY	4	3	30	70	100	4
	GI 455	CARTOGRAPHY, COMPUTER APPLICATIONS & DBMS LAB	8	4	30	70	50	4
	GI 456	GEOGRAPHIC INFORMATION SYSTEM & REMOTE SENSING-LAB	8	4	30	70	50	4
		SEMINAR & FIELD WORK	2	-	50	-	50	2
							SEMESTER TOTAL	26
III SEMESTER	GI 501	PAPER GI-501 GEOINFORMATICS OF COASTAL ENVIRONMENTS (Elective Paper)	4	3	30	70	100	4
	GI 502	APPLIED GEOINFORMATICS: EXPLORATION OF PETROLIFEROUS, PLACER AND KIMBERLITE TERRAINS	4	3	30	70	100	4
	GI 503	MARINE GEOINFORMATICS	4	3	30	70	100	4
	GI 504	WATER RESOURCES & EXPLORATION FOR GROUND WATER	4	3	30	70	100	4
	GI 505	GEOINFORMATICS AND URBAN DEVELOPMENT, WATER RESOURCES-LAB	8	4	30	70	100	4
	GI 506	MARINE GEOINFORMATICS-LAB	8	4	30	70	100	4
		SEMINAR & FIELD WORK	2	-	50	-	50	2
							SEMESTER TOTAL	26
IV SEMESTER	GI 551	PROJECT WORK 22 (IA+DISSERTATION& VIVA) (MARKS IA 100+ DISSERTATION 350+ VIVA 100) (36 HOURS OF PROJECT WORK PER WEEK), CREDITS 22					SEMESTER TOTAL	22
							GRAND TOTAL	100

SYLLABUS-M.Sc GEOINFORMATICS

CBCS PATTERN (SEMESTER SCHEME)

I SEMESTER

PAPER GI 401 DATA ACQUISITION & DATA PROCESSING

UNIT-1

Definition of data and information, historical evolution and need for information, Basic Concepts of Spatial Data and aspatial data, spatial information (6 Hours)

Primary data: Map data, data from aerial photos, satellite data, surveys. (7 Hours)

Secondary data: Source of secondary data, advantages and limitations of secondary data. (6 Hours)

UNIT-II

Spatial data: Vector and Raster data format. Advantage and disadvantage of vector data and Raster data. (11 Hours)

Extraction of data: From Toposheets, aerial Photos, Satellite Data (Hard copy & Digital Data products, thematic maps) (12 Hours)

UNIT-III

Data capture: (6 Hours)
Digitization and Scanning, Digitization Tablet, Scanners-Flat bed Scanner, Drum Scanner, limitations of Scanned data

Attribute Data: Source of attribute Data (need, methodology and relevance), Data input, Data Storing and Data Structuring. (8 Hours)

UNIT-IV

Analog and digital data, analogue to digital data conversion. (8 Hours)

BIBLIOGRAPHY

Burnside, C. D 1985, *Mapping from aerial Photographs* . Collins , New York

Lillie T. M. & Kiefer R. W, 1994 Remote Sensing & Image Interpretations .*John Wiley And Sons*, New York

Reeves, F. A 1997, Maps & map making. The Royal Geographic Society , London

Burogh, P. A 1986, *Principles of Geographic Information Systems for Land resource assessment* . Claredon Press, Oxford. 44-53.

PAPER GI 402 COMPUTER SCIENCE & WEB DESIGNING

UNIT-1

Basics of Computers: (9 hours)
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.

Information Super Highway: (8 hours)
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, moderns, Internet.

UNIT-2

Web design: (9 hours)

HTML: Basic & advanced HTML, Types of tags, Document creations, Linking, Creating Link List, handling Images, tables and, style sheets. Types of tags, Creating hypertext links. Formatting the text (example). Creating Image Links. Outlines of Python . (6 Hours)

UNIT-3

Microsoft Power Point: (3 hours)
Introduction to Microsoft Power Point. Functions and Exploring Power Point Views. Creating a Presentation. Delivering and Printing a Presentation. Animations and Slide Show applications to Geoinformatics.

Microsoft Excel: Application Environment to Geoinformatics. (5 hours)
Functions of Microsoft Excel. Starting Microsoft Excel. Excel Work Environment. Changing the Size of a Workbook and Excel Window. Cell and Cell address. Standard Toolbar. The Formatting Toolbar. The Formula Bar. Components of an Excel Workbook. Moving Data, Copying Data, Relative Cell Addressing, Absolute Cell Addressing. Formulas using Numbers. Simple graphs. Functions and Applications of Microsoft Excel to Geoinformatics.

UNIT-4

Outlines of 'C' and Introduction to C++. (30 hours)

BIBLIOGRAPHY

Beekman, G. 1999, Computer Confluence: Exploring Tomorrow's Technology. Addison-Wesley, Reading, MA. (3rd. ed.

Beekman, G. George Beckman 2000 Tech Nation. Online. Internet. [March 14,]. Available WWW:http://www.computerconfluence.com/about/tech.htm

Cheryl SchmidtComplete 1998, Computer Repair Textbook, Scott Jones, 22-48.

Dix, A., Finlay, J., Abowd, G., and Beale, R. 1999. Human-Computer Interaction. Prentice-Hall, Herts. UK. 67-89.

Goldberg, M. W. CALOS: Feb, 1997), First Results From an Experiment in Computer-Aided Learning for Operating Systems, in Proceedings of the Twentyeighth SIGCSE Technical Symposium on Computer Science Education. ACM Press. 48-52.

Goldberg, M. W. WebCT and First Year Computer Science June, 1997: Student Reaction to and Use of a Web-Based Resource in First Year Computer Science, in Proceedings of the ACM's ITiCSE Conference on Integrating Technology into Computer Science Education. ACM Press. 127-129.

Shelly Cashman 2000, Course Technology. About Shelly Cashman Series. Online. Internet. [March 14,]. Available WWW: Http://www.scseries.com/about_sc.cfm

Shneiderman, B. 1998.Designing the User Interface:Strategies for Effective Human-Computer Interaction. Addison-Wesley, Reading, MA. 3rd.ed., 65-87.

Willis H. Means 1987A content analysis of six introduction to computer science textbooks ACM New York, NY, USA, 403 - 413

PAPER GI 403 REMOTE SENSING & PHOTOGRAMMETRY

A. REMOTE SENSING

UNIT-I

Introduction (1 Hour)
History and concept of Remote Sensing, Electromagnetic Spectrum, Energy Interaction With atmosphere, Hydrosphere, Biosphere and Lithosphere. Basic concepts of visible, Optical, Thermal (Infrared), and Microwave remote Sensing. Platforms and Sensors.

Optical Remote Sensing (4 Hours)
Principles of Optical remote sensing, spectral reflectance of earth's features in different Wavelength regions, multispectral concepts of remote sensing, Scanners, applications of optical Remote Sensing.

Thermal Remote Sensing (4 Hours)
Principle 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, Application of Thermal Remote Sensing.

Hyper Spectral Remote Sensing: (4 Hours)
Introduction to Hyperspectral Remote Sensing Sensors/Imaging Spectrometers, Hyperspectral Satellite Systems, Hyperspectral Image Analysis Techniques including Corrections.

Microwave Remote Sensing & RADAR Remote Sensing (4 Hours)
Concept and principles of Microwave Remote Sensing, SLAR, SAR and Scaterometer, Application of Microwave Remote Sensing. Outlines of Radar Image Interpretations.

UNIT-2

LiDAR Sensing: Definition of LiDAR and modern LiDAR Systems, LiDAR intensity and LiDAR Intensity Image, Application of LiDAR techniques in mapping. (4 Hours)

Image Interpretation (4 Hours)
Visual and Digital Interpretation techniques - Basic concepts of visual interpretation, tone, color, texture, pattern, shape and contextual features. Digital Image Interpretation- Preprocessing operations, Geometric and radiometric corrections, enhancement techniques, spatial filtering, Principal component analysis, and Image classifications, Data merging and GIS integration.

Image Classification: (4 Hours)
Spatial pattern recognition, Temporal pattern recognition, Supervised Classification, Unsupervised Classification, Accuracy assessment, data merging, change detection procedures, multi sensor image.

Image processing Softwares (1 Hour)

UNIT-3

Image and Digital Images, types of images and acquisition, simple image model, Sampling and reconstruction, uniform sampling and quantization . (2 Hours)

Information on image formats. (2 Hours)

Digital Analysis: Image Rectification and Restoration, Radiometric, Atmospheric and Geometric Corrections. (4 Hours)

Image enhancement techniques: Raw, New and Best Images, Contrast Manipulation, Spatial feature Manipulation, Multi-Image Manipulation. (3 Hours)

Contrast Manipulation: Grey Level Thresholding, Level Slicing, Contrast Stretching-Concept of Digital Number. (3 Hours)

Spatial feature Manipulation: Convolution, Edge Enhancement, Concept and Use of Fourier Analysis in Digital Image Analysis. (3 Hours)

Multi-Image Manipulation : Spectral Ratioing, Principle and Canonicle Components, Vegetation Components-TVI & NDVI. (3 Hours)

Intensity-Hue-Saturation Colour Space Transformation, Decorrelation Stretching. (2 Hours)

B. PHOTOGRAMMETRY

UNIT-4

Aerial photo Interpretation and Photogrammetry: Principles of Aerial photo interpretation, Basic elements of Photographs, Aerial mosaic, classification, construction, Flight planning, Geometric elements of Photographs, Planimetric mapping and Photogrammetric plotting, Parallax, Relief Displacement, scale. (5 Hours)

Definition of digital photogrammetric image, creation of digital images. Automatic measurements of fiducially mark, Automatic Photogrammetric point measurements, Digital Photogrammetric Image, Automatic Surface modelling, Digital Photogrammetric Workstation. (5 Hours)

Indian Remote Sensing Programme. (2 Hours)

BIBLIOGRAPHY

Avery T.E., and G.L.Berlin, 1985, *Interpretation of Aerial Photographs*, 4th Ed, Bergess, Minneapolis, Minn, 34-98.

Betnstein, R. 1978, *Digital Image processing for remote Sensing*, IEEb Press, New York, 26-64.

Bruno Marcolongo and Franco Mantovani, 1997, *Photogeology, Remote sensing Applications in Earth science*, Oxford and IBH Pub. Co Pvt. Ltd., New Delhi, 12-108.

Drury, S. A. 1987, *Image Interpretation in Geology*, Allan & Unwin (Publishers) Ltd, 23-67.

Kenneth R, Castle man, 1979, Digital *Image Processing*, Prentice Hall**,** 24-98.

Lilliesand T.M. & Kiefer R.W. 1994, Remote Sensing and Image Interpretation, John Wiley & Sons,New York, 56-78.

Falls Church, 1980, *Manual of Remote sensing* Vol I and II, American Society of Photogrammetry, 4th Ed, 39-58.

Miller and Miller, 1961, *Photogeology*, Mc Graw-Hill Book Company, New York,.

P. M. Mather, *Computer Processing of Remotely Sensed Images- An Introduction*, John. Wiley and Sons, 1999.

Pandey S. N., 1987, *Principles and Applications of Photogeology*, Wiley Eastern,.

Ravi. P. Gupta, 1991, *Remote Sensing Geology*, Publisher- Berlin: Sprunger; Vela.

Reddy, A. M., 2006, Remote *Sensing and Geographical Information Systems.* BS Publications, 1-436.

Robert, H. Arnold., *Interpretations of Air Photo and Remotely Sensed Imagery*.

Robert, K. Vincent., *Fundamentals of Geological and Environmental Remote Sensing*.

Sabins, F.F., 1986, *Remote sensing Principles and Interpretations*, 2nd Ed. W.H. Freeman and Company, New York.

Schowengerd R .A. 1995 *Techniques for Image processing and classification in Remote Sensing,* Academic Press. New York.

Siegel, B.S. and Gillespie, A.R. 1994, (eds). *Remote sensing and Image Interpretations*, John Wiley and Sons, New York.

Swain P. H. Davis S.M. (Editor), 1978, *Remote Sensing, The quantitative approach*, McGraw, Hill Book co., New York,.

Thomas M. Lillesand and Raiph W. Kiefer., 2000*Remote sensing and Image Interpretations*, John Wiley and Sons, New York, , 4th Edition, 24-254.

Verbyla, D. 1995, *Satellite remote sensing for natural resources*; Lewis Publishers, Boca Rotaon, FL,.

Rees, W.G. 1990, *Physical Principles of Remote sensing*, Cambridge University Press.

Wolf, P. R. 1983, *Elements of Photogrammetry*, 2nd Ed, Mc Graw-Hill, New York.

PAPER GI 404 PETROLOGY, STRUCTURAL GEOLOGY

UNIT-1

BASICS OF PETROLOGY: (24 Hours)

Formation of Earth: Composition of the Crust, Mantle and Core.

Outlines of Igneous Rocks: Granites, Basalts, Dolerite, Andesite etc.

Outlines of Metamorphic Rocks: Gneiss, Schist, Quartzite, Granulites, Marble, Slate, etc.

UNIT-2

Outlines of Sedimentary Rocks: Breccia, Conglomerate, Sandstone, Limestones, Shales, and Beach Rocks, .

Morphology & Origin of Laterites.

UNIT-3

STRUCTURAL GEOLOGY: Primary and Secondary Structures. Folds, Faults, Joints & Unconformities, Salt Domes, Rift Valleys. (18 Hours)

UNIT-4

SEDIMENTARY ENVIRONMENTS: Origin of Sediments, Sediment Texture and Composition, Sediment Transport and Deposition. Lakes, Rivers, Deltas, Shelf and Deep Sea and Petroliferous Basins. Aeolian Environments and Glacial Deposits. Extraterrestrial environnements- Lunar, Mars etc. (22 Hours)

BIBLIOGRAPHY

Mukerjee, P.K. 1997, A Text book of Geology. The World Press Pvt. Ltd, 1-638.

Allen, J. R. L, 1969. Physical Processes of Sedimentation; New York, American Elsevier, 3-36.

Straller, A. N. 1976, *Principles of Earth Sciences*, Harper & Row, 269-315.

Moorbath, S. 1977. The Oldest Rocks and the Growth of Continents. *Scientific American*, 236-3, 92-104.

Wilson, J. T. 1963, Continental Drift. *Scientific American*, 208-4, 86-100.

Head, J. W., C. A. Wood, and T. A Mutch. 1977, *Geological Evolution of Terrestrial Planets*, 65-19-21.

Reinick, H. E and Singh, I. B. 1973, *Depositional Sedimentary Environments*, Springer-Verlag, England, 3-435.

Linslay R. K, Kohler, M. A. and Paul Hus J. L. H. *Hydrology for Engineers*. McGrow Hill, New York, 23-244.

Christopherson, R. W., 1995, Elemental Geosystems. Prentice Hall, New Jersey, 3-540.

Hyndman, D. W., 1972. *Petrology of Igneous and Metamorphic Rocks*. McGrow Hill, New York, 31-404.

Windley, B. F. *The Evolving Continents*, John Willey & Sons, 1-385.

PAPER GI 405 COMPUTERS: SOFTWARE & HARDWARE, ROCK IDENTIFICATION -LAB

UNIT-1

MICROSOFT EXCEL (10 Hours)

Use of Microsoft Excel in creating an Excel Workbook. Common Excel Functions and their applications. Manipulating Data through Excel: Moving Data, Copying Data, Relative Cell Addressing, Copying Values. Deleting Rows and Columns, Inserting Rows, Inserting Columns. Export strategies of data from Excel to other packages (SPSS).

UNIT-2

OPENJUMP (Java Unified Mapping Platform) & PgAdminIII (PostGIS) [Resource Calculation]. Application of OPENJUMP and PgAdminIII in estimation and evaluation of volume etc. (14 Hours)

UNIT-3

MICROSOFT POWER POINT (6 Hours)

Microsoft Power Point: Introduction to Microsoft Power Point. Creating a Power Point Presentation. Exploring Power Point Views. Adding Animation. Importing source material from the Web to the Power Point Environment. Critical Data Linking.

UNIT-4

HARDWARE (6 Hours)

Types and Assembly of Hardware of Computers. Concept and Application of Networking.

SQL Queries (Alter, Insert, Update, Delete). (28 Hours)

UNIT-5

Rock Identification Megascopy: Peridotites, Granites, Kimberlites, Tufa, Basalts, Dolerites, Conglomerates, Limestones, Arenites, Shales, Gneisses, Migmatites, Marbles. (26 Hours)

UNIT-6

Geological Mapping using software: Use of MapInfo in geologic mapping. (12 Hours)

UNIT-7

Geomorphic Mapping: Use of Toposheets, Hydrographic Charts and Air-photo stereo pairs for mapping of Bathymetry, Coastal terrains, Hills, Valleys, Fluvial Networks, Pediments etc. (26 Hours)

PAPER GI 406 REMOTE SENSING & PHOTOGRAMMETRY-LAB

UNIT-1

Mosaics, compilation, annotation, scaling and preparation of Photo index. (12 Hours)

UNIT-2

Analysis of IRS-1C/D Satellite Data Products: Using Software's. (20 Hours)

Spectral reflectance: Plotting of Spectral Reflectance Curves- Rocks, Soil, Vegetation and Water covering. (8 Hours)

UNIT-3

Visual Analysis: Interpretation of Optical, Thermal and Microwave Images. (8 Hours)

UNIT-4

Elements of Aerial Photo: Study of Stereo pairs of aerial Photos. Flight planning, Determination of scale and slope. Outlines of Parallax measurement. (16 Hours)

SEMINAR AND FIELD WORK 2 CREDITS/WEEK

II SEMESTER

PAPER GI 451 DATA BASE MANAGEMENT SYSTEM & SPATIAL STATISTICS

A. DATA BASE MANAGEMENT SYSTEM

UNIT-1

Data and Information: Evolution of Information systems. (1 Hour)

Data and database: Organization of database Components of Database 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. (7 Hours)

Concept of Data Mining and Data Warehousing. (3 Hours)

UNIT-II

Description of ORACLE: Theoretical background. (4 Hours)

Structured Query Language(SQL). (13 Hours)
Structured Query Language (SQL), Query by Example (QBE) Relational Model Concepts, Relational Algebra, Record Storage & Primary File Organization, Buffering of Blocks, Hashing Techniques, Index Structures for Files. Transaction Processing Concepts, Database Recovery Techniques, Data base Security Authorizations, Functional Dependencies and Normalization for Relation Databases, Normal Forms Based on Primary Keys, Boyce – Codd Normal form.

Relational and Hierarchical Data Models: Basic definition & terminology, Projection operators, Selection operators (Arithmetic & Logical operators), Set unions, Set differences, Cartesian product, etc. (5 Hours)

Brief description of ASP.NET and JAVA. (11 Hours)

B. SPATIAL STATITICS

UNIT-III

Measures of Central Tendency: Mean, Median and Mode and their application to GIS and Remotely Sensed Data. (2 Hours)

Correlation Co-efficient and it application to GIS and Remotely Sensed Data. (3 Hours)

Linear Regression and Prediction: Concepts and application to GIS and Remotely Sensed Data. (4 Hours)

UNIT-1V

Cluster Analysis: (4 Hours)
Introduction to Cluster Analysis. Interpretation of Q-mode and R-mode Clusters with reference to Spatial Data. Application of Cluster Analysis to Spatial Data.

Factor Analysis: (3 Hours)
Outlines of Factor Analysis. Interpretation of Factors for Spatial data.

Statistical Package: SPSS 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. (4 Hours)

BIBLIOGRAPHY

K. Majumdar & Bhattacharya. P, 1999, *Database management Systems*. Tata McGraw-Hill Publications.

Korth H. F & Silberschatz, A. 1986, *Database Systems Concept* , McGraw-Hill, New York

Widerhold G, 1984, *Database Design* ,McGraw-Hill, New York

Martin. J, 1977, *Computer Database Organization,* Prentice-Hall, New Jersey.

Sir Maurice Kendall., Alan Stuart and J. Keith., *The Advanced theory of Statistics*, Vol 3, 4th Edition (1943-1960)

Daniel and S. Wilks, 1995, *Statistical Methods in the Atmospheric Sciences*.

Gupta, S. C., 1977.*Fundamentals of Applied Statistics*. Vol 62, No. 3,

Elhance Veena Elhance D. N. and Aggarwal B. M. 1956-1996, *Fundamental of Statistics*.

Davis, J. C. 1973.*Statistics and Data Analysis in Geology.*

Krumbein, W. C and Graybill, F. A. 1965.*An Introduction to Statistical Models in Geology*.

PAPER GI 452 APPLIED GEOMORPHOLOGY & GEOENVIRONMENTAL SCIENCES

A. APPLIED GEOMORPHOLOGY

UNIT-1

Concepts of Modern Geomorphology: Geomorphometry and its applications to Geoinformatics. (2 Hours)

Geomorphic Environments: The Fluvial Systems. Coastal and Marine geomorphology. Aeolian and Dune Environments. M.O.Ridges, Ocean floor Topography. (4 Hours)

UNIT-II

Numerical Geomorphology: Quantification of slope, stream density/frequency, Ruggedness Number, Bifurcation Ratio etc. Use of Cluster and Factor Analysis in Numerical Geomorphology. (6 Hours)

Geomorphology and GIS in exploration of the natural environment. Impact of Slope, Badlands, Pediments, Streams in geomorphic evolution. (6 Hours)

Geomorphic controls on the Groundwater resources of Coastal, Island and hinterland terrains. (6 Hours)

Solid waste management and the impact of local and regional geomorphology.

(2 Hours)

Geohazards and geomorphic controls. Application of Remote Sensing and GIS in qualitative and quantitative interpretations of 'risk area mapping' including forest fires, floods, earthquakes, and Tsunami effected terrains. (6 Hours)

B-GEOENVIRONMENTAL SCIENCES

UNIT-III

General Introduction: Definition of Environment, Environmental Pollutant, Environmental Pollution, Environment-Handling, Hazardous Substance, Occupier-Control of factory, premises etc., Prescribed-Rules and Acts. (4 Hours)

Environment Protection Rules: History and Evolution. EIA in the UK., The Netherlands, New Zealand, Canada, USA etc. The European Directive on EIA. Scoping of Impacts, EIA Report Preparation, EIA Report Review, Decision Making. Mitigation of Impacts.
(4 Hours)

Rapid Environment Impact Assessment Act: Definition and use and implementation.
(3 Hours)

Environment Management Plan: Concept and use of EMP in coastal and marine environments. (4 Hours)

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. (4 Hours)

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. (4 Hours)

UNIT-1V

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 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. (9 Hours)

BIBLIOGRAPHY

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

Anonymous, 1992. *Overseas Development Administration-manual of Environmental Appraisal*. ODA, London- II Edition. 8-16.

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Beanlands G. E. & Dunniker, P. N 1984 An Ecological Frame work for Environmental Impact Assessment, *Journal of Environmental management*. 18:267-277.

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Murthy, K. S. 1988. *National Environmental Policy Act (NEPA) Process*. CRC Press, Boca Raton USA, 1-18.

Ortolano, L. 1993. *Control on Project Proponents and EIA Effectiveness*. *The Environmental Professional*, Vol. 15:350-363.

Thornbury,W. D., 2004, *Principles of Geomorphology*, CBS Publ., 5-570.

Wathern, P 1988, *EIA: Theory & Practice*. Unwin Hyman, London, 1-17.

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

PAPER GI 453 APPLICATIONS OF GIS TO GEOINFORMATICS

UNIT-1

Introduction to concepts in Modern GIS. (4 Hours)

Introduction to ArcView, ArcGIS, MapInfo etc. (4 Hours)

ArcGIS: (4Hours)

ArcGIS Applications: Desktop, Server GIS, Mobile GIS, Hosted GIS.

ArcGIS Developer Library: ArcObjects, AAAPLs

ArcGIS Data: Files, Multiple DBMSs, Application servers, ESRI-Hosted Data.

ArcGIS Desktop GIS Tools: Tools for Authoring, Editing, and Analysis.

ArcGIS Extensions**:** Analysis, Productivity, Solution Based Business Analyst, Web Services.

UNIT-II

MapInfo: Introduction to MapInfo Professional. Basics of MapInfo. Support of MapInfo in mapping. Concepts of Thematic Maps, Legends, Dot Maps, Ranged Maps, etc. (4Hours)

Buffering and Objects: Concept of Buffering, Methods and Types of Buffers. Buffering Points, Lines and Polygons. Key applications of Buffering. (2 Hours)

GIS and Territory: Concept of Territory. Combining Selected Objects. Use of Columns, and Creating a Voronoi Polygon. (2 Hours)

GIS and Modelling: Modelling Framework, Structure, Application of Modelling Techniques and Case Studies. (2 Hours)

Sources of data in Geoinformatics: Primary Data sources and Secondary Data Sources. (2 Hours)

UNIT-III

Concepts of JAVA: Declarations & Access Control, Flow Control and Exceptions, Garbage Collection, Language Fundamentals, Operators and Assignments, Overloading Runtime Type, Threads, The Collections Framework, Java Applications: Introduction to Java Applets, I/O and Streams, Introduction to JDBCRemote Method Invocation and their uses in GIS data modelling.

Java architecture overview, Introduction to the JVMJava program structure. Declarations & Access Control: Declare, initialise and construct base types. Classes/methods/variables and associated modifiers. Packages. Constructor methods. Flow Control and Exceptions: Switch statements, Loops and loop options, Proper use of exceptions, Exception recognition, and using assertions. Garbage Collection: Understand garbage collection behaviour and eligibility. Language Fundamentals: Package declarations, Imports, Class/interface/innerclass/variable declarations. Implementing interfaces, Command line arguments, Keywords, Primitives and object types. Operators and Assignments: Understand and determine operators and their effects. Overloading Runtime Type, Threads, Java Applications, Java Applets, and Introduction to JDBC. (32 Hours)

UNIT-1V

GIS Application areas: Application of JAVA to Geoinformatics with special emphasis on GIS. Java architecture overview, Introduction to the JVMJava program structure and it use in GIS interpretations. (8 Hours)

BIBLIOGRAPHY

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

Bonham – Carter G.F., Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York, 1994.

Burough, P.A., and Rachael A, Mec Donnell. Principles of Geographic Information System., Oxford Unversity Press-1998 (Indian Print).

Demers, Michael; Fundamental of Geographic Information System, John Wiley, 1999 (Indian Print)

Fraser Taylor., P.A., Geographic Information System – The Microcomputer and Modern Cartography, Pergamon Press, 1991.

Keaies, J.S. Cartographic design and Production London, Longman group, 1973.

Les Worell, (Ed) 1990. Geographic Information System, Development and Applications, Belbaven Press.

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).

Maguire, D. J. Goodchild, M. F., and Rhind, D. W. GIS- Principles and application, Longman Scientific and Technical, 1991.

PAPER GI 454 CARTOGRAPHY

UNIT-1

Introduction to Cartography (2 Hours)

Ancient Cartography: Evolution of Cartography, Modern Cartography and Applications, Definition of Maps. Outlines of Map Projections. (10 Hours)

Cartographic Themes and Types of Maps

Introduction to Cartographic themes. Cadastral and Chorographical Maps. Representation of Choroschematic maps, and Chorochromatic maps. Concepts of Hydrogeomorphic Maps. Introduction to Population diffusion and the importance of Dot and Multi Dot maps. (7 Hours)

UNIT-2

Topographic Maps: Introduction to Topographic Maps. Spatial Information and Marginal Information of Topographic maps. Recovery of Spatial Information from Topographic Maps. Concept of 'Central Theme' and examples. (5 Hours)

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. (5 Hours)

GPS: Technical Details, Applications of GPS in mapping and position fixing.

(3 Hours)

UNIT-3

Introduction: Outlines and Concept of Geographic Information System. Definition, Objectives and basic concepts, contributing disciplines and technologies. Development of GIS as an information and decision making system. Canada Geographic Information System, Harword Laboratory, Application of GIS in India. (4 Hours)

GIS Data structures, Vector data, Raster data & Spatial Data Models (3 Hours)

Spatial Analysis, Classification, Polygon Neighborhoods, Buffers. (6 Hours)

TIN, Digital Elevation Models: Concepts of 3D models, Triangulated Irregular Network, 3D models, Creation of Legend Type, Application of TIN, Digital Elevation Models.

UNIT-4 (7 Hours)

GIS Modeling: Cartographic models, Inductive and Deductive Models, Model Flow Charting, Model Implementation and Verification. (7 Hours)

Principles of Design and GIS Output, GIS Project design and Management. (5 Hours)

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Bonham – Carter G.F., Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York, 1994. 1-34.

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Michael Zeiler, The ESRI Guide to Geodatabase Design. ESRI Press, (2000). 2-18.

Misra R. P. and A., Ramesh Publ., Prasaranga, Fundamentals of Cartography Mysore University. (1980). 2-34

Singh R. L., Elements of Practical Geography Publ. Kalyani Publishers, New Delhi (1995).

Thomas G. Lan Arc View 3D Analyst ESRI Press, (2000). 12-32.

PAPER GI 455 CARTOGRAPHY, COMPUTER APPLICATIONS & DBMS –LAB

A- CARTOGRAPHY

UNIT-1

Topographic Sheets: Identification of Symbols and Interpretation of Central Themes. Retrieval Secondary Data**.** (12 Hours)

Thematic Mapping of: Geomorphology, Slope, Elevation, Stream Network, Drainage Patterns, Resources and Bathymetry. (12 Hours)

UNIT-2

Population Density: Grid pattern distribution of population, Dot mapping, Multi Dot mapping and Settlement Mapping. (16 Hours)

UNIT-3

Representation of Thematic Data: Application of Histograms, Pie Charts, Wind Roses, Ray Diagrams**.** Contour Map construction of Pressure Gradient, Rainfall, Temperature, Wind velocity. Choroschematic mapping. (16 Hours)

UNIT-4

Multi-dated Thematic Mapping: Shoreline Changes, Forest Cover Changes, Population Diffusion/Urban Growth mapping. (8 Hours)

B- COMPUTER APPLICATIONS

UNIT-I

Introduction to Visual Basics 6. Use Of Visual Basics 6. Applications of Visual Basics. (12 Hours)

UNIT-II

C programming: (8 Hours)
character set, data types, variable constants, operators: arithmetic, logical, bitwise, special operators in C

C# Programming: (10 Hours)
C# Basics, Implementing OOP concepts in C#, Properties, Indexers, Delegates and Events, Windows Forms Basics, Windows forms Controls, Debug, Test, Exception Handling, Assemblies and Reflection, Threading Array list and collections, File Handling in C#.

C ++ Programming: (8 Hours)
Basics of C++, Tokens , Expressions, control structures, Functions of C++, Classes & Objects, Constructors & Destructors, Operator Overloading and type Conversions, Inheritance: Extending Classes, Pointers, Virtual Functions, Polymorphism, Object Oriented Systems & Development, New Features of Ansi C++ Standard

UNIT-III

Oracle: (10 Hours)
Physical and logical structuring in Oracle
Queries

SPSS (6 Hours)
Introduction to SPSS. Use of SPSS in creating a data base. Application of SPSS in Correlation Co-efficient. Use of SPSS in Linear Regression, Modelling and Prediction. Application of SPSS in GIS data modelling.

UNIT-1V

Application of Java to Geoinformatics data. (4 Hours)

Introduction to WEB and its Applications in Geoinformatics. (6 Hours)

C- DBMS

UNIT-1

Outlines of DBMS and Application of DBMS in Geoinformatics. (4 Hours)

UNIT-II

Introduction to SQL and its application in Geoinformatics. SQL Queries (Alter, Insert, Update, Delete). (20 Hours)

UNIT-III

Introduction to Microsoft Excel. Use of Microsoft Excel in Storing and Analysis of Data. (12 Hours)

Introduction to Microsoft PowerPoint. Techniques in the application of Microsoft Power Point to themes in Geoinformatics. (12 Hours)

UNIT-1V

Outlines of Visual Basics 6 and application with data storage in Geoinformatics.

(16 Hours)

PAPER GI 456 GEOGRAPHIC INFORMATION SYSTEMS & REMOTE SENSING –LAB

A- GEOGRAPHIC INFORMATION SYSTEMS

UNIT-I

Interpretation of Toposheets, Images, and Hydrographic Charts. Identification of the Central Theme of Toposheets and Images. Scanning, Mosaicing of topomaps. Building of Contour Maps using suitable software. (12 Hours)

UNIT-II

Extraction of thematic layers-onscreen from toposheets, images, Hydrographic charts using MapInfo, ERDAS etc. Connecting spatial and Aspatial data. (12 Hours)

UNIT-III

Registering the maps and Imageries. Onscreen digitization using ArcView MapInfo Professional and ERDAS Imagine software. (12 Hours)

Extraction of Thematic Layers using spatial data from involving Oceanographic, Urban, Environmental and other data. Modelling studies for Marine Pollution using GIS Query Techniques. (20 Hours)

UNIT-IV

Introduction VB.NET. (8 Hours)

B- REMOTE SENSING

UNIT-I

Image Manipulation: Using ERDAS for Georeferencing, Use of Sobel Technique for lineament extraction. (20 Hours)

Edge Enhancement: Directional and Non Directional. (6 Hours)

UNIT-II

Texture Analysis Using IRS image (4 Hours)

Outlines and description of Slope, Aspect, Shaded Relief maps. (6 Hours)

UNIT-III

Classification: Un/Supervised Classification techniques using ERDAS. (8 Hours)

Change Detection studies using IRS1C/1D images. (6 Hours)

UNIT-IV

Interpretation of Hyperspectral Images. (14 Hours)

SEMINAR AND FIELD WORK 2 CREDITS/WEEK

III SEMESTER

PAPER GI-501 GEOINFORMATICS OF COASTAL ENVIRONMENTS

UNIT-I (13 Hours)

Introduction: Concepts of Geoinformatics. Outlines of Remote Sensing, Air Photo Interpretation, and Geographic Information System.

Outlines of Indian Satellites:
Chandrayaan – 1: Mission, Scientific Payloads from Indian and abroad, Images from Chandrayaan-1. Bhuvan: Description of 3D Satellite Mapping. Chandrayaan-2, Mission, Design, and use.
IRS-P4, Ocean Sat-II: Description and Payloads.
IRS-IC/D. A brief note on Hyperspectral Remote Sensing.
Resourcesat, Cartosat-I & II etc.

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 Echosounders and Multibeam unit.

UNIT-II (17 Hours)

Coastal Environments: Geomorphology of Coasts. Classification of Coastal Environments. Relevance Geology and Geotectonics to the genesis of coasts.

Spatial Analysis of Coastal Environments: Collection of Spatial Data from Coastal Environments. Data Interpretation and use of GIS in modeling studies.

Air Photos and Remote Sensing of Coastal Environments: Interpretation of Air-photos and Remotely Sensed digital images of coastal landforms Types of Satellites used in Urban and Rural mapping.

UNIT-III (16 HOURS)

Coastal Regulations and Zones: Outlines of CRZ-I, CRZ-II, CRZ-III and CRZ-IV. Amendments to the CRZ norms.

Environment Impact Analysis of Marine & Coastal areas: Description of Urban and SEZ areas. Description of Urban Sprawls. Rural Coastal areas and undisturbed zones.

UNIT-IV 18 hours

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.

Environment Management Plan: Description of EMP and its application to Urban and Rural Coastal Environments with reference to Ports, Harbours, SEZ areas.

Coastal Information System: Concepts of a Coastal Information System. Use of GIS in developing a Coastal Information System.

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Aradhana, A. 2006, "Special Economic Zones: Revisiting the Policy Debate",. Economic and Political Weekly, Vol. XLI Nos. 43 and 44, 4-10

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.

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Michael Zeiler, Modeling Our World: The ESRI Guide to Geodatabase Design. ESRI press.3-7.

Prabha Shastri Ranade, 2009, *Special Economic Zones: Global And Indian Experiences*, ISBN: 8131411559, Publ: ICFAI, 324pp.

Sabine Latteman, 2010, Development of an Environmental Impact Assessment and Decision Support System.12-23.

Wood, C., 1995, Environmental Impact Assessment –Acomparative Review. 1-337.

PAPER GI 502 APPLIED GEOINFORMATICS: EXPLORATION OF PETROLIFEROUS, PLACER AND KIMBERLITE TERRAINS

UNIT-I

Concept of a Depositional Sedimentary Basin. (5 Hours)

Sediment transport and Deposition. (5 Hours)

Origin and Genesis of Oil and Natural Gas. Oil bearing strata. Outlines of Petroliferous Basins. Depositional Basins bearing oil and gas-Case studies. Use of modern techniques in exploration of Oil, gas and diamonds. (10 Hours)

Wild-cat and GIS explorations in Oil and Gas. Geophysical (Gravity, Magnetic & Seismic) and GIS Quantification Techniques in Oil Exploration. Use of Geophysical & Sedimentary data in spatial modelling for Offshore Oil Exploration. (16 Hours)

UNIT-II

Application of Remote Sensing and GIS in Exploration of Oil bearing strata and basins. Salt domes and the use of RS and GIS in mapping oil fields. (7 Hours)

Application of GIS to offshore and onshore petroliferous basins in mapping and quantification. (4 Hours)

Application of TIN in mapping oil bearing terrains. (2 Hours)

UNIT-III

Geomorphic signatures and quantification of 3-D terrains bearing diamonds. (5 Hours)

Application of GIS and RS in mapping Kimberlite Terrains. (5 Hours)

UNIT-IV

Use of GIS and Geophysical data in spatial modelling for onshore diamond bearing terrains. (5 Hours)

BIBLIOGRAPHY

Beaumont, Edward A.; Foster, Norman H, 2000 *Exploring for Oil and Gas Traps*, U.S.A. *American Association of Petroleum Geologists*. 45-62.

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Boyd, F. R.; Meyer, Henry O. A., 1979. *Kimberlites, Diatremes and Diamonds: Their Geology*, Petrology and Geochemistry *Amer Geophysical Union.* 21-56.

CHALAPATHI RAO N. V., S. A. GIBSON , D. M. PYLE and A. P. DICKIN, 2004, *Petrogenesis of Proterozoic Lamproites and Kimberlites from the Cuddapah Basin and Dharwar Craton, Southern India. Journal of Petrology* 45(5) Oxford University Press. 907-948.

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PAPER GI 503 MARINE GEOINFORMATICS

UNIT-I

Introduction (8 Hours)

Introduction to Coastal and Marine Environments, Classification of Coastal and Marine Environments. Introduction to Remote Sensing and GIS to Oceanography and Environmental studies. Data products and their acquisition.

UNIT-II

Coastal Marine and Environments: (20 Hours)

Concepts of Zonation ,Rocky Shores, Sandy Shores, Cuspate Beaches, Spits and Beach Ridges, Back Shore Dune, Environments, Mangrove Environments, Island Environments, Tidal Flat Environments, Intertidal Environments. Major Currents of the Oceans. Currents in Indian Ocean

UNIT-III

Satellite Oceanography: (20 Hours)

History of Oceanographic Satellites. Technical Characteristics of IRS-P4 including OCM/MSMR. Outlines of Retrieval of Chl-a and Total Suspended Matter. *In situ* recovery of Chlorophyll, SST, Wind Speed, Sea Surface Currents, Salinity, and TSM. Concepts of Biophysical Coupling. Prediction models of Sea Surface Temperature.

UNIT-IV

Applied Oceanography: (16 Hours)

Use of Satellite Oceanography and GIS to identify Potential Fishing Zones. Use of GIS and Cartography to Map Morpho-ecosystems of the Coast. Use of Cartography, GIS and Satellite Oceanography in site selection of Major and Minor Ports and Beach Recreational Environments.

BIBLIOGRAPHY

Andy Mitchell, *The ESRI Guide to GIS Analysis,* Vol 1. ESRI Press. 11-21.

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Thomas G. Lane., *Arc View -3D Analyst*. ESRI, Press.13-22.

PAPER GI 504 WATER RESOURCES & EXPLORATION FOR GROUND WATER

UNIT-I

Introduction to Water Resources. (10 Hours)
Concepts of Surface Water and Groundwater, Theory of the Hydrologic Cycle. Groundwater Resources of India, Groundwater Resources of Karnataka.

Remote sensing and GIS in Water Resources. (15 Hours)
Application of Remote sensing and GIS in the study of Water Resources.
Visual and Digital techniques in Water Resources Investigations.
Selection of appropriate software and Data products useful in Water Resource.

UNIT-II

Hydrogeomorphic studies in Water Resources (14 Hours)
Theory of Geomorphic Controls of Water Resources, Concept of Basin Network Analysis. Surface Runoff, Slope Analysis, Application of DEM in Water Resources, Flood mapping, Quantitative studies of drainage basins.

UNIT-III

Groundwater Analysis in Water Resources (11 Hours)
Vertical Distribution of Groundwater, Types of Aquifers, Rock Properties Affecting Groundwater Resources, Lineament studies in Water Resources

UNIT-IV

Water Resources and Watershed Management (14 Hours)
Concept of River Basin Management, Concept of Natural Recharge, Concepts in Artificial Recharge, Use of DEM in Recharge.

BIBLIOGRAPHY

David K. Todd, 1980, *Groundwater Hydrology*, John Wiley & Sons, 5-85.

Keith, P. B, 1973. Thompson *et al* (ed) *Remote Sensing Water Resources Association*, Urban Illineis, 27-86.

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PAPER GI 505 GEINFORMATICS AND URBAN DEVELOPMENT, WATER RESOURCES-LAB

UNIT-I

Identification of objects related to settlements in Topomaps. (12 Hours)

Identification of objects related to settlements in Arial Photographs. (12 Hours)

UNIT-II

Data generation & Extraction of Thematic layers using GIS software. (10 Hours)
Construction of Road network, polygon-Parks, Urban facilities
using GIS software. (20 Hours)

Use of MapInfo/ArcView in quantification of Lakes, Water Bodies, Reserved Forest & Urban Sprawl. (10 Hours)

UNIT-III

Identification of Drainage pattern, Computation of Stream Density, Stream Frequency,

Ruggedness Number, Thyessen polygons, Precipitation contours, Flow net etc. (10 Hours)

UNIT-IV

Quantification of Ground Water Potential of the River Basins. (10 Hours)

PAPER GI 506 MARINE GEOINFORMATICS-LABS

UNIT-I

Construction of Chlorophyll-a, SST, Depth, Salinity, Biomass, Total Suspended Matter, Biomass, Distribution Maps. (14 Hours)

UNIT-II

Instrumentation in *In-situ* collection of Oceanographic Data: Secchi Disc, Water Samplers, Grab Samplers, Anemometers, D. O., Salinity, pH meters etc. (10 Hours)

UNIT-III

Field Mapping of Coastal Geomorphic Attributes. (10 Hours)

CRZ mapping using topographic sheets, Hydrographic charts, Air photographs, Digital data products. (10 Hours)

Mapping of Riverine, Beach, Tidal Flat, Rocky and Sandy shore environments from aerial photographs. (10 Hours)

UNIT-IV

Identification & Description of Oceansat, Modis, and other Oceanographic Satellite Images. (10 Hours)

SEMINAR AND FIELD WORK 2 CREDITS/WEEK

IV SEMESTER

PAPER GI-551

Project Work: It shall consist of 36 hours of Project work per week and include the entire fourth semester and the students shall carryout their Project Work either in a Software Company, GIS Applications Company, Remote Sensing Company or any Research Institute such as NIO, INCOIS, CESS, C-GIST, NCAOR, etc. In-house Project Work with an affiliation of an external company or Research Institute with and external guide will also be considered for the 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 pre the regulations for Geoinformatics. A Viva-voce shall be mandatory as provided in the regulations for Geoinformatics M. Sc., Course. An internal Assessment shall be conducted by the External Guide and the marks are as per the Regulations for Geoinformatics. The total of the fourth semester shall be of twenty two credits only.

GRAND TOTAL CREDITS SHALL BE 100 FOR ALL SEMISTERS

FOR THE M. Sc GEOINFORMATICS COURSE
