



North Maharashtra University, Jalgaon

FACULTY OF SCIENCE

Syllabus for

M.Sc. Geoinformatics Part - I (Sem I & II)
(With effect from June 2013)

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M.Sc. Geoinformatics Part - II (Sem III & IV)
(With effect from June 2014)

Name of Course: **M.Sc. Geoinformatics**

Medium of Instruction: **English**

Duration of Course: **2 years**

Instructions:

- Figures to the right hand side indicate number of periods to the respective unit.
- Each theory course consists of total 60 periods of 60 minutes each.
- Each practical course will have 02 practical per week and each practical will be of 03 hours duration.
- Each student has to submit excursion report. The report will carry 20 marks in the respective external practical examination.
- Each course will have examination of 80 marks for university assessment and 20 marks for college assessment.

M.Sc. Geoinformatics

Course Structure

Semester I

Course Code	Course Title
GI 101	Introduction to Geoinformatics and Cartography
GI 102	Fundamentals of Remote Sensing and Aerial Photography
GI 103	Fundamentals of Statistics, Computer and different software used in Geoinformatics
GI 104	Practical in Cartography, Data Preparation and Aerial Photography
GI 105	Practical in Computer Operations, Statistics and Geoinformatics software

Semester II

GI 201	Digital Image Processing
GI 202	Geographic Information System and Global Positioning System
GI 203	Advances in Remote Sensing
GI 204	Practical in Geographic Information System
GI 205	Practical in Digital Image Processing and Global Positioning System

Semester III

GI 301	Advances in Geographic Information System
GI 302	Applications of Remote Sensing and Geographic Information System
GI 303	Introduction to Programming and Database Concepts
GI 304	Practical in Programming and Database Concepts
GI 305	Practical in Remote Sensing and Geographic Information System Applications

Semester IV

GI 401	Project Work
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M.Sc. Geoinformatics Syllabus Part - I (Sem I & II)

SEMESTER I

GI 101: Introduction to Geoinformatics and Cartography

Unit 1: (14)

Definition, Concept and importance of Geoinformatics, Indian Geoinformatics Organisations: NRSC, SOI, NIC, SAC, RRSC, NATMO, GSI, FSI, WII, IIRS, Indian Geoinformatics initiatives – Census (GIS), NSDI, BIS, NCP, NNRMS: Bhoosampada, Disaster Management System, Applications of Geoinformatics in various fields

Unit 2: (12)

Introduction & history of cartography, conventional cartography and digital cartography Maps: Definition, types and importance, Latitude, longitude, meridian, altitude, concept of mean sea level, Map scale: Definition and methods of representing scale, Graphical representation of data

Unit 3 (08)

Introduction and general features of Survey of India Topographic sheets, Series of map, Digital Maps, Licensing of Digital Maps

Unit 4: (10)

Map design, symbolization, colour, and generalization, Methods of Relief feature extraction (Qualitative and Quantitative), Map reproduction process, concept of standard colours and symbols

Unit 5: (16)

Projection: Definition, types of map projections, classification of map projection, choice of projection, coordinate system-geographic and plane coordinate systems, concepts of geoids and datum

References:

1. Geographic information systems, Kang-Tsung Chang (2002), Tata McGraw Hill, New Delhi
2. Concepts and techniques of geographic information system, C. P. Lo. Albert K. W. Yeung (2004), Prentice Hall of India, New delhi
3. Remote Sensing in rescue Geography, R.R. sani., S. C. Kalwar (1991), Pointer Publishers Jaipur
4. Fundamentals of cartography, R. P. Mishra and R. Ramesh, Concept Publishing Company, New Delhi 110059.
5. Map work and practical Geography, Lake Raj Singh and Raghunandan Singh, Central Book Depot, Allahabad
6. Map work and practical geography, Gopal Singh, Vikas publishing house Pvt. Ltd. Delhi
7. Maps and diagrams - F. J. Monk house and Wilkinson Methuen & Company London
8. NRSC and IIRS reports
9. Working with maps, Gupta K. K. and Tyagi V.C., SOI publication (1992)

GI 102: Fundamentals of Remote Sensing and Aerial Photography

Unit 1: (12)

Definition, concept and history of remote sensing, Electro-magnetic radiation, Energy interaction with atmosphere, concept of black body, laws of radiation, interaction with Earth's surface materials, Spectral reflectance curve, spectral signatures, concept of atmospheric window

Unit 2: (10)

Sensors: Introduction and types-active and passive sensors, along track and across track scanners, Optical sensor, Microwave sensor, Thermal sensor and Hyperspectral sensor, Sensor resolution- spectral, spatial, radiometric and temporal, Platforms: Introduction and types - Ground based, air borne and space borne platforms

Unit 3: (07)

Satellites types, satellite orbit: geosynchronous and sun synchronous satellites, Indian remote sensing program (past and future), Characteristics of IRS-P6 and Landsat7, High resolution satellites: IKONOS, GeoEye-1, QuickBird and WorldView-2

Unit 4: (08)

Image analysis: visual and digital, Recognition elements: Tone, Texture, Pattern, Shape, Size, Shadow and Association

Unit 5: (12)

Fundamentals of photogrammetry and photo interpretation – types of Photographs - vertical, tilted and oblique, colour, panchromatic, infrared, thermal etc, types of films and filters, types of aerial cameras, Stereoscopy-concept and viewing instruments, vertical exaggeration – factors involved and determination, overlap, sidelap, flight planning, geometric distortions

Unit 6: (11)

Geometric elements of vertical aerial photographs, Aerial mosaics, Orthophotos, Relief Displacement, Stereoscopic Parallax, Making measurements from aerial photographs- Horizontal distances, horizontal angles, heights

References:

1. Textbook of Remote sensing and geographical information systems, M. Anji Reddy (2006), B.S. Publications, Hyderabad
2. Remote sensing Principles and applications, Dr. B. C. Panda (2005), Viva books Private New Delhi
3. Elements of Photogrammetry, Paul R. Wolf, McGraw-Hill, 2000
4. Remote sensing and Image interpretation, Lillesand and Keifer, John Wiley and Sons,1987

GI 103: Fundamentals of Statistics, Computer and different software used in Geoinformatics

Unit 1: (08)

Meaning of Statistics: Definition, Scope and Limitations of statistics, Data: Primary data and Secondary data, Qualitative and Quantitative data, Attributes and Variables, continuous and discrete variables, Frequency distribution, Cumulative frequency distribution

Unit 2: (09)

Population, statistical population, census, sample, sampling, objectives of sampling, Advantages of sampling over census, Methods of sampling; Simple random sampling with and without replacement, Stratified sampling and Systematic sampling

Unit 3: (12)

Measures of central tendency: Mean, Median, Mode; Types of deviation: Range, Mean Deviation, Quartile Deviation, Standard Deviation, Variance and co-variance; Correlation: Introduction and types of correlation, methods of studying correlation, Karl- Pearson coefficient of correlation, Spearman's rank correlation coefficient

Unit 4: (18)

Computer: Definition, History & Generation of Computers, Block Diagram of Computer System, Advantages of Computers, Applications of Computers, Concept of Memory, Input Devices: keyboard, mouse, scanner, Output Devices: monitor, printer, plotter, Storage Devices: compact disk, digital video disk, pen drive

Unit 5: (08)

Computer Network, LAN, MAN, WAN, Client-server Architecture, internet, Web: Concept and applications, word processing, spread sheets, power point, basic concept of database

Unit 6: (05)

Introduction to different software used in Geoinformatics: GIS data preparation and analysis software, Image processing software, GPS software

References:

1. Fundamentals of Mathematical Statistics by S.C.Gupta V.K.Kapoor
2. Fundamental of statistics Vol.1 by A.M.Goon,M.K.Gupta and B.Dasgupta
3. Statistics Volume-I by B.R.Bhat, T.Srivenkatraman,K.S. Madhava Rao.
4. Fundamentals of Computers – V. Rajaraman, PHI publication
5. MS-CIT text material
6. Understanding and Using Internet - Subhash Metha, Global Business Press

GI 104: Practical in Cartography, Data Preparation and Aerial Photography

I. CARTOGRAPHY (12)

1. Map scale
2. Study and interpretation of SOI topographical maps
 - 2.1 Study of marginal information
 - 2.2 Study of physical features on the map
 - 2.3 Study of cultural features on the map
3. Construction of Map Projections

II. DATA PREPARATION (10)

1. Introduction to CAD software
2. Map Scanning and Import the raster data
3. Creation of Layers and Digitization
4. Drawing Cleanup and Topology building
5. Data attachment and Export

III. AERIAL PHOTOGRAPHY (08)

1. Marginal information and Calculation of scale of aerial photographs
2. Feature extraction and tracing of details from stereo pairs.
3. Calculation of Air base and determination of flight line
4. Interpretation of Aerial Photographs

References:

1. Autodesk Manual
2. Aerial photographic interpretation, Lueder, D.R., McGraw Hill Book Co., 1959
3. Elements of Photogrammetry, Paul R. Wolf, McGraw-Hill, 2000
4. Remote sensing and Image interpretation, Lillesand and Keifer, John Wiley and Sons, 1987
5. An Introduction to Map Projection, by Suren Talukdar. Publisher : Eastern Book House

GI 105: Practical in Computer Operations, Statistics and Geoinformatics Software

I. COMPUTER OPERATIONS (12)

1. Introduction to various parts of Computer system
2. Preparing a text document by applying various formatting tools
3. Creation of data table in spreadsheet and various formulas on data table
4. Draw different type of chart using data sheet (pie chart, bar chart, etc)
5. Design a PowerPoint presentation
6. Creation of table in to database and write SQL queries for finding max, min, average, count
7. Write nested SQL queries to retrieve complex data from group of table
8. Report writing using database

II. STATISTICAL SOFTWARE (10)

1. Construction of frequency and cumulative frequency distribution from raw data
2. Drawing of random sample by using simple random sampling, stratified random sampling and systematic random sampling.
3. Computation of A.M , G.M & H.M for ungrouped data.
4. Computation of median, mode, range, quartile deviation, mean deviation and standard deviation and their coefficients for ungrouped data.
5. Computation of Karl Pearson's correlation coefficient, Spearman's rank correlation coefficient

III. DIFFERENT SOFTWARE USED IN GEOINFORMATICS (08)

1. Introduction of various GIS, Remote Sensing and GPS packages
2. Tools exploration in GIS software (Zoom in, Zoom out, etc)
3. Geographic data management (copy, paste, rename, delete, etc)
4. Tools exploration in Remote Sensing software
5. Tools exploration in GPS software

References:

1. MS-CIT text material
2. SPSS Manual
3. Getting Started with ArcGIS, Bob Booth and Andy Mitchell, ESRI Press
4. ERDAS Manual

Semester II

GI 201: Digital Image Processing

Unit 1: (10)

Concept of Digital Image, fundamental steps in DIP, false and true color composites, remote sensing image data formats - BIP, BIL, BSQ

Unit 2: (12)

Geometric correction, radiometric correction, Atmospheric correction, Noise removal

Unit 3: (12)

Contrast Enhancement: Linear and non-linear, Density slicing, Spatial Filtering: low frequency and high frequency, Edge Enhancement, Band Rationing

Unit 4: (16)

Supervised classification, classification algorithms-minimum distance to means classifier, parallelepiped classifier, Gaussian maximum likelihood classifier, Unsupervised classification-classification algorithms-K means clustering and ISODATA method, accuracy assessment, post classification smoothing

Unit 5: (10)

Data merging and GIS integration, NDVI, Change detection, Principle Component Analysis (PCA)

References:

1. Digital Image Processing, Richards.J.A., Xiuping Jia, Springer (1999)
2. Digital Image Processing, Third Edition, by Rafael C. Gonzalez and Richard E. Woods. Publisher : Pearson Education
3. Digital Image Processing, by Jayaraman S and Veerakumar T and Esakkirajan S. Publisher : Tata Mcgraw Hill
4. Digital Image Processing and Analysis, by B. Chanda. Publisher : Prentice Hall India
5. Digital Image Processing, Prithvish Nag, Kudrat, Concept publishing
6. Digital Image Processing, by Kenneth R. Castleman
7. Remote sensing and Image interpretation, Lillesand and Keifer, John Wiley and Sons,1987

GI 202: Geographic Information System and Global Positioning System

Unit 1: (10)

GIS: Definition, history and introduction, components of GIS, Concept of data, information, knowledge Data: spatial and non-spatial data, raster and vector data, GIS file formats: Coverage, Shapefile, Geodatabase, and GRID File, spatial and non-spatial data acquisition

Unit 2: (14)

Scanning, Digitization, Geometric transformation, Error Correction; Accuracy and Precision; Topology: introduction, relationships and topological errors, Attribute data models in GIS - Hierarchical, Network, Relational, Object oriented; attribute data query, spatial data query and report generation

Unit 3: (14)

Logic operations, general arithmetic operations, general statistical operations, geometric operations, buffer zones analysis, dissolving the feature, vector overlay analysis, raster overlay analysis

Unit 4: (10)

Global Positioning system (GPS) – Introduction and historical background, functional segments: space, control and user segments, working principle, GPS errors, GPS positioning services

Unit 5: (12)

Signal structure-carrier wave, ranging codes, navigation data, satellite geometry and accuracy measures, GPS receivers, components of receivers, types of receivers, DGPS, Applications of GPS in various fields

References:

1. Introduction to Geographical Information System, Kang- Tsung – Chang, 2002, McGraw Hill.
2. Geographic Information System- an introduction, 3rd edition, Tor Bernhardsen, Wiley Pub.
3. Geographic Information Systems and Science (2nd ed.), 2005, Paul A. Longley, Michael F. Goodchild, David J. Maguire, and David W. Rhind, John Wiley & Sons, Ltd.
4. Concepts and techniques of Geographic Information System, C.P.Lo & Albert K.W.Yeung, 2002, Prentice Hall, India.
5. Introduction of Geographic Information Systems and Science, Paul A. Longley, Michel F. Goodchild, D.J.Maguire & D.W. Rhind, 2002, John Wiley & Sons Ltd.
6. Principles of Geographical Information System, P.A. Burrough & R.A. McDonnell, 2000 Oxford University Press.
7. Fun With GPS, Donald Cooke, ESRI Press

GI 203: Advances in Remote Sensing

Unit 1: (10)

Introduction to microwave remote sensing, advantages of microwave remote sensing, active and passive microwave sensors, Airborne and Space borne radar systems, interaction of radar signal with earth surface materials

Unit 2: (14)

Side Looking Airborne Radar (SLAR), working of SLAR, geometric characteristics of SLAR image, System parameters - Wavelength, Polarization, Resolutions, Synthetic Aperture Radar (SAR), Application of microwave remote sensing, LIDAR-introduction, working principle and applications

Unit 3: (12)

Introduction - Thermal properties of materials, Emissivity, absorptive, radiant temperature, Thermal conductivity: Thermal capacity, thermal inertia, apparent thermal inertia, Thermal diffusivity.

Unit 4: (12)

Infrared - radiometers, Airborne and Satellite TIR scanner system, Characteristics of TIR images, Scanner distortion, image irregularities, effects of weather on images: i) Clouds, ii) Surface winds, iii) Penetration of smoke plumes. Interpretation and Application of Thermal imagery

Unit 5: (12)

Hyperspectral concepts, data collection systems, calibration techniques, data processing techniques, Classification techniques, airborne and space-borne hyper-spectral sensors and applications, comparison between hyperspectral and multispectral remote sensing

References:

1. Microwave Remote Sensing active and passive, Fawaz T Ulaby, Richard K Moore and Adrian K Fung, Vol. 1, 2 and 3 Addison – Wesley Publication company 1981, 1982, and 1986
2. Techniques and Applications of Hyperspectral Image Analysis by Hans Grahn, Paul Geladi. Wiley Publications
3. Imaging Radar for Resource Survey: Remote Sensing Applications, W Travelt, Chapman & Hall.
4. Remote Sensing, optics and optical systems, Philip N Slater, 1980

GI 204: Practical in Geographic Information System

Data Analysis Software:

1. Symbolizing, labeling and classifying the vector and raster (01)
2. Creation of choropleth and dot maps (01)
3. Georeferencing of toposheet (02)
4. Projection, reprojection and digitization (03)
5. Preparation of geodatabase (01)
6. Attribute table operations (03)
7. Editing features and attributes (01)
8. Table join and relate (01)
9. Creating shapefile from GPS point data (01)
10. Attribute and spatial query (04)
11. GIS operations-split, clip, dissolve, identify, buffer, spatial join (04)
12. Overlay analysis (03)
13. Geo-modelling (03)
14. Creating a map layout and map export (02)

Excursion: One week field excursion for identification of features in the field using satellite image, aerial photographs and GPS.

References:

1. Getting Started with ArcGIS, Bob Booth and Andy Mitchell, ESRI Press
2. Geographical Information Science, Reference Material, Volume I by Roy P. S., Published by IIRS, 2000

GI 205: Practical in Digital Image Processing and Global Positioning System

Digital Image Processing: (24)

1. Raster image exploration
2. Data import and export
3. Layer Stacking using model
4. Image Enhancement
5. Georectification of toposheet and satellite data
6. Subset, Mask and Mosaic operations
7. Unsupervised Classification
8. Supervised Classification
9. Accuracy Assessment

Global Positioning System (GPS): (06)

1. Introduction to GPS receiver
2. Resource Mapping
3. Import and export GPS data to computer system
4. Area calculation using GPS
5. Demonstration of DGPS on field

References:

1. ERDAS Manual
2. GPS satellite surveying : Alfred leick
3. The Global Positioning System and GIS: An Introduction, by Michael Kennedy. Bk & CD ROM edition (May 1996)
4. The GPS Manual: Principles & Applications, by Gregory T. French.

M.Sc. Geoinformatics Syllabus Part - II

(Sem III & IV)

Semester III

GI 301: Advances in Geographic Information System

Unit 1: (10)

DEM, DSM and DTM, need of DEM, types of DEM, data sources and sampling methods for DEM, Products derived from a DEM

Unit 2: (12)

Vector data analysis - pattern analysis, distance measurement, raster data analysis- local, neighbourhood, zonal and global operations, path analysis with applications and network analysis with applications

Unit 3: (10)

GIS Modelling: Concept, importance, classification of GIS models, types of GIS model - binary, index, regression and process

Unit 4: (13)

Surface analysis - Contouring, vertical profiling, hillshading, hypsometric tinting, perspective view, viewshed, surface curvature, spatial interpolation - concept & types - Trend, IDW, Krigging

Unit 5: (15)

Spatial Decision Support System: Introduction, Spatial Decision Making, importance of Spatial Decision Support System, Current Spatial Decision Support Systems, Recent trends: virtual globes, Open source GIS, OOGIS (object-oriented GIS), GIS-AM/FM, Spatial Multimedia, Geo-Data warehouse, WebGIS, GIS Cloud Computing

References:

1. Spatial Analysis: Modelling in a GIS Environment, Paul A. Longley, Michael Batty, John Wiley & Sons
2. Advanced Spatial Analysis: The CASA Book of GIS, Paul A. Longley, Michael Batty, ESRI
3. ESRI Guide to GIS Analysis, Volume 1: Geographic Patterns and Relationships, Andy Mitchell, ESRI Press
4. Spatial Statistical Data Analysis for GIS Users, Konstantin Krivoruchko, ESRI Press
5. Advances in Remote Sensing and GIS Analysis, Peter M. Atkinson, John Wiley & Sons
6. Spatial analysis and GIS, Stewart Fotheringham, Peter Rogerson. Publisher: Taylor & Francis
7. Geographic Information Systems and Science, Paul A. Longley, John Wiley & Sons

GI 302: Applications of Remote Sensing and Geographic Information System

Unit 1: (14)

Applications of RS and GIS in Agriculture: Introduction – Agriculture Ecosystems, Yield parameters, identification of crops and acreage estimation, disease identification

Applications of RS and GIS in Urban Planning: Land use and land cover mapping, Land Information System (LIS), Solid waste management, Urban change detection

Applications of RS and GIS in Soil Sciences: Introduction – Soil survey methods, soil classification, Spectral response curve of soils, soil mapping, mapping and monitoring of degraded land

Unit 2: (14)

Applications of RS and GIS in Geology: Remote Sensing application to lithology - Igneous Sedimentary and Metamorphic rocks, their physical properties, mode of origin and mode of occurrence - Lithological mapping using aerial photos and satellite imagery, Criteria for structural mapping, Criteria for geomorphological mapping, Groundwater potential zones,

Applications of RS and GIS in Mineral Exploration: Spectral response curve of minerals, Mineral exploration, recent advances in remote sensing techniques of mineral exploration, Methods for oil field detection through remote sensing

Unit 3: (14)

Applications of RS and GIS in Watershed and Water Resource Management: Basic concept of water resources, hydrological cycle, Sustainable watershed management, Spectral response of pure water, Water pollution detection, Salinity and waterlogged area mapping

Applications of RS and GIS in Geo-Disaster Management: Natural and non-natural disasters, Causes, effects and management methods for flood, cyclone, drought, earthquake, volcanism, landslide

Unit 4: (12)

Applications of RS and GIS in Forestry and Ecology: Introduction - forest density, Forest type mapping, inventory of forests, delineation of degraded forests, damage assessment, Landscape characterization, Biomass assessment, Forest ecosystem management

Unit 5: (06)

Applications of RS and GIS in Health Sciences: Introduction, disease distribution mapping, health hazard zonation, spatio-temporal maps health hazards

References:

1. Remote Sensing Applications, P.S. Roy, R.S. Dwivedi, NRSC/ISRO
2. Principles & Applications of Photogeology, Shiv N. Pandey, New Age International (P) Ltd.
3. GIS for Decision Support and Public Policy Making, Christopher Thomas Jou, Nancy Humenik-Sappington, ESRI Press

4. Spatial modelling of soil alkalinity in GIS environment using IRS data (ACRS 1997), Nitin Kumar Tripathi, Brijesh Kumar Rai and Praveen Dwivediore, Geoinformatics Division Department of Civil Engineering Indian Institute of Technology, Kanpur
5. Corp discriminational in salt affected soils by satellite Remote Sensing (ACRS 1994) R.K. Sharma, K S Sundara Sarma and D K Das, Division of Agricultural Physics, Indian Agricultural Research Institute, New Delhi
6. GIS techniques for carrying capacity study of Damodar River Basin, S. Sampath Kumar, K. T. Sridhar (Peagus Software Consultabnts Pvt Ltd, Bangalore) M. K. Chakraborty, B. K. Tewary (Central Mining Research Institute, Dhanbad)
7. Remote Sensing and GIS application studies at national institute of hydrology, S.M. Seth, S.K. Jain & M.K. Jain. National Institute of Hydrology
8. Water Resource Assessment and Management in Himalayan Catchments through Remote Sensing and GIS Technology, Dr. M. S. Rawat, Department of Geography & Resource Management, School of Sciences, Nagaland University, Mokokchung
9. Objective approach for land use allocation using GIS techniques Case study of Kharghar, Navi Mumbai, Ravi Kumar, Senior Planner, K Priya, City & Industrial Development Corporation (CIDCO), Navi Mumbai, India
10. **Important Web links:**
<http://www.gisdevelopment.net/application/index.htm>
<http://www.isro.org/scripts/remotesensingapplications.aspx>
<http://www.itc.nl/ilwis/applications/application14.asp>

GI 303: Introduction to Programming and Database Concepts

Unit 1: (06)
Concept of Object oriented programming, Object, Class, data encapsulation, data abstraction, polymorphism, inheritance

Unit 2: (10)
VB project, VB windows form and control, VB programming concept, variable, if-else, loops, function. VB modules, VB control's properties, events and methods, Programming with events (click, change, double click, select etc) and properties (Enable, disable, visible etc) of VB controls

Unit 3: (07)
ActiveX controls in VB, programming for ActiveX control like FlexGrid, Dialog box, and Windows common controls

Unit 4: (08)
Database programming in VB, Database connection in VB, Database controls in VB, simple programs using MS-Access (data save, load, view using VB)

Unit 5: (04)
Basic concepts – Data, Information, Database, Database Management System (DBMS), Characteristics of DBMS, Advantages and Disadvantages of DBMS, Database Users, Database Administrator, Instances & Schemas, Data Independence

Unit 6: (05)
Data models: Object based logical model, Record based logical model, Physical data model, Mapping cardinality, Data constraints, Referential integrity

Unit 7: (10)
Introduction to SQL, DDL Commands, DML Commands, Simple Queries, Aggregate Functions, Clauses, Nested Queries

Unit 8: (10)
Introduction to RDBMS, Introduction to Normalization- 1NF, 2NF, 3NF, BCNF, Introduction to RDBMS packages – Oracle, SQL Server, MySQL, Spatial Database Extensions, Introduction to - PostGIS, Oracle Spatial, MS-SQL spatial, MySQL spatial

References:-

1. Visual Basic 6: The Complete Reference By Jerke, Tata McGraw-Hill Education
2. An Introduction to Programming Using Visual Basic 6.0, David I. Schneider, Prentice Hall
3. Microsoft Visual Basic 6.0: Programmer's Guide, Microsoft Press, 1998
4. Database System Concepts :- Abraham Silberschatz, Henry F. Korth & S. Sudarshan, McGraw-Hill
5. Fundamentals of Database Systems, Ramez Elmasri, Shamkant Navathe, Addison-Wesley
6. Database Systems: Concepts, Design & Applications, S. K. Singh, Pearson Education India

GI 304: Practical in Programming and Database Concepts

1. Demonstrate the data types like integer, float, text, string and demonstrate the data structure array in visual basic (01)
2. Write a program in VB which demonstrate basic controls of VB like button, text box, list box, combo box, picture box, menu etc. (02)
3. Simulate a windows notepad application which has facility to write text file, save and open text file (02)
4. Using MapWinGIS control, write a program which loads vector maps on the forms. (01)
5. Write a program which calculates area, perimeter of the each shape from the given shapefile and display summery average area and perimeter, sum of area, max and min from area and perimeter (02)
6. Write a program which uses SQL queries to retrieve data from database and show on the datagrid (02)
7. Write a program which open attribute table of shapefile on the form (01)
8. Write a program which add, delete and modify records from the attribute table of the given shapefile (02)
9. Practical based on Data Definition Language commands (01)
 - Create a new table with **Create** command
 - Modify the table with **Alter** command
 - Delete the table with **Drop** command
10. Practical based on Data Manipulation Language commands (02)
 - Add the data in database with **Insert** command
 - Select data from database with **Select** command
 - Modify data of database with **Update** command
 - Deleting records from database with **Delete** command
11. Practical based on Integrity Constraints (03)
 - NOT NULL
 - Unique Constraint
 - Primary Key Constraint
 - Foreign Key Constraint
 - Check Constraint
12. Practical based on Aggregate Functions (02)
 - MAX
 - MIN
 - SUM
 - COUNT
 - AVG
 - DATE, MATH and STRING functions

13. Practical based on various Clauses (04)
- Where
 - AND & OR
 - Like
 - Ordered by
 - Group by
 - Distinct
 - Having
14. Practical based on SET operations (UNION, INTERSECTION, DIFFERENCE) (01)
15. Practical based on Nested queries (02)
16. Practical based on PostGIS spatial and Oracle spatial extension (02)

References:-

1. Visual Basic 6: The Complete Reference By Jerke, Tata McGraw-Hill Education
2. An Introduction to Programming Using Visual Basic 6.0, David I. Schneider, Prentice Hall
3. Microsoft Visual Basic 6.0: Programmer's Guide, Microsoft Press, 1998
4. Database System Concepts :- Abraham Silberschatz, Henry F. Korth & S. Sudarshan, McGraw-Hill
5. Fundamentals of Database Systems (6th Edition), Ramez Elmasri, Shamkant Navathe, Addison-Wesley; 6th edition
6. Database Systems: Concepts, Design & Applications, S. K. Singh, Pearson Education India

GI 305: Practical in Remote Sensing and Geographic Information System Applications

1. DEM: TIN, Contour, Slope and Aspect (02)
2. Derive the basic Morphological parameters of river basin (03)
3. Analysis of drainage system from topographical maps and satellite imageries (02)
4. Land use/land cover mapping (05)
5. Interpolation methods (03)
6. Identification of geomorphologic and cultural forms from satellite image (02)
7. Calculation of NDVI, NDWI, NDSI (02)
8. Change detection using time series data of LULC and NDVI (02)
9. Site suitability analysis (02)
10. Road network analysis (02)
11. Spectral modeling for biomass estimation (03)
12. Groundwater potential mapping (02)

References:

1. Remote principle and application, B. C. Panda
2. Remote-sensing techniques for regional development, R. K. Banarjee, Bireswar Banarjee
3. ERDAS Manual
4. GIS for Decision Support and Public Policy Making, Christopher Thomas Jou, Nancy Humenik-Sappington, ESRI Press
5. ESRI Guide to GIS Analysis, Volume 1: Geographic Patterns and Relationships, Andy Mitchell, ESRI Press

Semester IV

GI 401 - Project Work

All admitted participants will have to complete a project allotted /assigned to them. Selection of the topic may be based on any entitled theory paper or related subjects.

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| • Problem identification and literature review | 25 Marks |
| • Data acquisition / collection | 25 Marks |
| • Field work | 25 Marks |
| • Data Processing | 75 Marks |
| • Results and interpretation | 75 Marks |
| • Report Writing | 25 Marks |
| • Presentation | 50 Marks |

Total - 300 Marks