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#### **PRACTICAL-IV GIS and Data Analysis**

##### Surface Analysis

1. Contour
2. Slope
3. Aspect
4. Hill Shade
5. Shortest Path Analysis
6. Mapping Density and Spatial Modeling
7. Site Suitability Model
8. Dam Model
9. Creating TIN surface from Vector Data
10. Creating TIN from Raster Data

\* Distribution of Marks for Practical-III & IV :-

Sr.No.	Practical No.	Practical	Marks
1	III	Remote Sensing Applications (40), Internal Assessment-Practical Record (3) + Viva-Voce (2) + Field Tour & submission of Report (5)	50

2	IV	GIS and Data Analysis(20 + 20) + Internal Assessment - Seminar (5) + Practical Record (3) + Viva-Voce (2)	50
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Burroughs, P.A. 1986. Principles of Geographical Information Systems for Land Resource Assessment. Oxford University Press Inc., New York.

Heywood, Corneliuss and Carver, 2001, 2nd Indian Reprint. An Introduction to Geographical Information Systems Parsian Education (Singapore ) Pte. Ltd., Indian Branch, Delhi 6 110 092, India.

Mitchell, A.,, 1999, The ESRI Guide to GIS Analysis Volume 1: Geographical Patterns and Relationships, Environmental Systems Research Institute, Inc., Red Lands, California. USA 92373 68100

Mitchell, A., Booth Bob and Crosier Scott, 2002, Getting Started with Arc GIS. Environmental Systems Research Institute, Inc., Red Lands, California. USA

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**M.Sc.Part-II**  
**SEMESTER III**

**Paper IX**

**GIS - PROJECT TASKS**

- Unit-I** Arc GIS: Introduction Arc Catalogue: viewing and connecting the data. Arc Map: working with maps óexploring map ó adding a layer ó adding features from data base ó adding labels ó working with map layout ó saving and printing maps.
- Unit-II** Exploring GIS Data: Geographic data models ó formats of feature data. planning a GIS project : GIS analysis ó steps in a GIS Project ó project planning. Assembling the data base: project data base ó adding data to project folder ó previewing data in Arc Catalogue organization ó examining data in Arc Map ó cleaning up catalogue tree.
- Unit-III** Preparing Data for Analysis: data preparation tasks ó defining coordinate system for the elevation data ó coordinate systems ó projecting the river shape file ó exporting the river shape file to the geodatabase = digitizing the historic park ó merging parcel layers.
- Unit-IV** Performing Date Analysis: setting for analysis ó plant site - delineating the area ó within and outside the site ó finding parcels to meet the criteria ó finding vacant parcels ófinding suitable parcels - finding suitable parcels meeting the required total area ó reviewing analysis results.
- Unit-V** Presenting the Results: map design - setting up map page ó creating overview map ó creating maps of suitable and highly suitable parcels ó creating parcel report ó adding list of site criteria to map ó adding map elements ó saving and printing of maps.

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- Burrough, P.A. 1986. Principles of Geographical Information Systems for Land Resource Assessment. Oxford University Press Inc., New York.
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**Paper X**

**SPATIAL MODELING AND ANALYSIS**

- Unit-I** Modeling Spatial Problems: Introduction - need for spatial models ó conceptual model for solving spatial problems - steps involved. Types of spatial models ó descriptive and process models ó types of process models ó creating conceptual models - site suitability model.
- Unit-II** Raster Modeling : Understanding raster data set - composition of raster dataset ó coordinate space and raster data set ó discrete and continuous data ó resolution ó raster encoding ó representing features in raster data set ó assigning attributes.
- Unit-III** Spatial Analysis : Understanding spatial analysis - operators and functions ó local, focal, zonal, global and application functions ó surface analysis: slope, hill shade, contour and hydrologic analysis ó mapping distance: shortest path ó mapping density ó cell statistics ó neighborhood statistics ó reclassification.
- Unit-IV** Creating Surface models: Introduction ó creating raster surface from points ó interpolating a raster surface ó creating TIN surface from vector data ó building TIN ó creating a TIN from a raster ó creating a raster from a TIN.

**Unit-V** Analyzing Surfaces: Understanding the shape of a surface ó calculating slope, mapping contours - deriving contour lines from a surface ó calculating area and volume.

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Burrough, P.A. 1986. Principles of Geographical Information Systems for Land Resource Assessment. Oxford University Press Inc., New York.

Heywood, Cornelliuss and Carver, 2001, 2 nd Indian Reprint. An Introduction to Geographical Information Systems Parsian Education (Singapore ) Pte. Ltd., Indian Branch, Delhi ó 110 092, India.

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### Paper XI Principles of GPS

**Unit-I.** GPS and its utilities: Historical - Various GPS Software products and peripherals - recent trends.

**Unit-II.** System overview: The space segment ó GPS satellite systems ó new programmes - signal structure ó control segment ó tracing of satellites ó control stations. user

segment ó land navigation ó vehicle location ó surveying ó marine navigator.

**Unit-III** Working principle of GPS: Simple navigation ó satellite ranging; calculating the distance to the satellites - error sources; differentially corrected position ó reference receiver - the rover receiver.

**Unit-IV** Geodetic Aspects: GPS coordinate system - local coordinate system ó transformations - map projections and plane coordinates ó the transverse Mercator Projection; the Lambert projection.

**Unit-V.** Surveying with GPS: GPS Measuring techniques ó static surveys ó rapid static surveys - kinematic surveys - RTK surveys; pre-survey

### References:

1. ESRI Arc Pad Manual
2. Introduction to GPS (Global Positioning System) 1. by Leica.

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<http://www.whrc.org/science/globfor>

### Paper XII GPS GIS Integration and Applications

**Unit-I.** Basic for GPS and GIS Integration: Windows CE devices and pocket PCs - transferring data to a window CE device - windows CE resources, maps and layers - layer properties: map projections:

- Unit-II** Displaying data: Creating a new map - adding layers - adding shape files - adding images - specifying a coordinate system ó symbolizing data.
- Unit-III** Connecting and navigating with GPS: Supported GPS protocol; setting communication parameters - activating GPS - selecting a navigation destination - GPS track log - starting and stopping GPS track log - creating point, line and polygon features with GPS.
- Unit-IV** Editing the data and exporting to GIS environ: Editing basics ó creating new layers for editing - selecting layers for editing ó selecting feature for editing - moving and deleting features - extending a line; inserting and deleting vertices - moving a vertices - editing attributes. Preparing the data for Arc Pad - exporting symbology - creating an Arc Pad Map - packing shape files.
- Unit-V** GPS Applications: GPS Applications ó Geo-referencing - sampling; cartographic updating - navigation and mobile tracking.

**References:**

ESRI ArcPad Manual Introduction to GPS (Global Positioning System) 1. by Leica.

**Websites:**

1. [www.geography network.com](http://www.geography network.com)
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3. [www.gpsworld.com](http://www.gpsworld.com)
4. [www.trimble.com](http://www.trimble.com)
5. [www.garmin.com](http://www.garmin.com)
6. [www.gps\\_society.org](http://www.gps_society.org)
7. [www.dbartlett.com](http://www.dbartlett.com)

**Practical V  
GIS Integration**

- a. Working principles of GIS
- b. GIS integration techniques and applications
- c. Software and hardware needs of GIS
- d. Collecting ground control points
- e. Lines
- f. Polygons
- g. Editing points, lines and polygons
- h. Geo referencing using GIS techniques
- i. Exporting to GIS Environs.

**Practical VI  
Field Survey and GPS Integration**

- a. Field survey
- b. Working principles of GPS
- c. Surveying with GPS
- d. Software and hardware needs of GPS
- e. Geo referencing using GPS
- f. GPS integration and applications

**\* Distribution of Marks for Practical-V & VI :-**

Sr.No.	Practical No.	Practical	Marks
1	V	GIS Integration (40)+Internal Assessment - Practical Record (3) + Viva-Voce (2) + Assignment (3) + Unit test (2)	50
2	VI	Field Survey and GPS Integration (20+20)+ Internal Assessment - Seminar (5) + Practical Record (3) + Viva-Voce (2)	50

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ESRI ArcPad Manual Introduction to GPS - Global Positioning System by Leica.

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[www.dbartlett.com](http://www.dbartlett.com)

**M.Sc.Part-II  
SEMESTER VI  
Paper XIII**

**GIS Applications in Natural Resources and Management**

- Unit-I** *Natural Resource Evaluation: Need – objectives – source of data – limitations –need for evaluation in development planning*
- Unit-II** Land Evaluation: Objectives ó principles ó procedures ó approaches ó land use requirements and land quality parameters ó layer creation ó matching ó classification ó case studies.

- Unit-III** Wastelands: Types of identification of management of eroded lands of types of layer creation of case studies.
- Unit-IV** Water Resources: Surface water: precipitation of space time analysis of overland flow of storage of groundwater: potential of quality of layer creation of overlay analysis of integrated watershed development of case studies.
- Unit-I** Natural Vegetation: Forests of classification (NRSA) of grasslands of layer creation of overlay of management of case studies.

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1. Burrough, P.A. 1986. *Principles of Geographic Information Systems for Land Resources Assessment*. Walton Street, Oxford OX26DP, Oxford University Press.
2. Fischer, M., H.J. Scholten, and D. Unwin, 1996. *Spatial Analytical Perspectives on GIS*, Taylor & Francis, London, UK.
3. Fotheringham, S., and P. Rogerson, Ed. 1995. *Spatial Analysis and GIS*, Taylor & Francis, London, UK.
4. Heit, Michael, H. Dennison Parker, and Art Shortreid (eds.), 1996. *GIS*
5. *Applications in Natural Resources 2*, GIS World, Inc., Fort Collins, Colorado, 540p.
6. Michael F. Goodchild, Louis T. Steyaert, Bradley O. Parks, 1996. *GIS and Environmental Modeling: Progress and Research Issues*. Fort Collins, CO80525: GIS World Inc. Available at the Evans Library reserve desk.
7. Ripple, William J. (ed.). 1994. *The GIS Applications Book: Examples in Natural*
8. *Resources: A Compendium*, American Society for Photogrammetry and Remote Sensing, Bethesda, Maryland.
9. Young, Haines, David Green, and Steven Cousins (eds.), 1994. *Landscape*
11. *Ecology and GIS*, Taylor & Francis, Bristol, P.A.
12. Skidmore Andrew, 2002. *Environmental Modeling With GIS and Remote Sensing*, Taylor & Francis, London.

### On-line journals:

<http://camfer.CNR.Berkeley.EDU/monitoring/>- go to "Workgroup Resources", and "Publications".  
<http://www.gisdevelopment.net>

### Links:

ESPM 275 class Schedule  
 UC Berkeley Academic Calendar

CAMFER  
 Monitoring Landscape Change Workgroup

### Paper XIV

#### GIS for Disaster Management

- Unit-I** Earthquake, Volcano and landslide: Meaning and types of disasters of earthquakes of volcanoes of landslides of selection of variables of creation of layers of space-time analysis of GIS for management plans of case studies.
- Unit-II** Cyclones and Flooding: Cyclone: cyclone related parameters and effects on land and sea of damage assessment. Flooding: topography, land use and flooding of space-time integration of GIS based parameters and layers of flood prone area analysis and management of risk assessment of case studies for cyclones and floods.
- Unit-III** Drought and Desertification: Types of droughts of factors influencing droughts of variable identification of vegetation index of land use /ground water level changes of delimiting drought prone areas of processes of desertification of over utilization of water and land resources layer creation of GIS based management strategies of case studies.
- Unit-IV** Anthropogenic Disasters: Atmospheric Disasters : Ozone layer depletion of green house / global warming of acid rain of snow melt of sea level rise of related problems layer creation of case studies. Marine Disasters: oil spill and chemical pollution of coastal erosion and deposition of variable identification of over lays of analysis / management strategies of case studies.
- Unit-V** GIS in Biodiversity Disasters: Ecological degradation of nuclear disaster and biodiversity loss of parameters (mapping of forest types, protected areas and natural forests) of population extinction of conserving bio-diversity (species and subspecies) of soil erosion of coral / mangrove depletion of forest fire-mining of overlay analysis of GIS in environmental modeling of case studies.

### References:

1. Korte, G. B., (2001) the GIS book: 5th edition, Onward Press, Australia.
2. Anji Reddy, M., (2001) Remote Sensing and Geographical Information Systems., 2nd edition, Bs.Publications, Hyderabad.
3. Demers, Michael N., (2000) Fundamentals of Geographic Information Systems, John Willey and sons. Inc. New York.

4. John A. Matthews (2002) Natural hazards and environmental change, Bill McGuire, Ian Mason.
5. Andrew Skeil (2002) Environmental Modeling with GIS and Remote sensing, John Willey and Sons, Inc New York.
6. John G. Lyon (2003) GIS for Water Resource and Water Shed Management, Taylor and Francis.

### Paper XV

#### Internet GIS

- Unit-I.** Introduction: Internet, web and Internet GIS. Fundamentals of computer networking ó network environment ó network communication models ó Protocols ó TCP/IP.
- Unit-II** Client/server computing ó client ó server ó glue ó client/server system partition ó layered architecture ó advantages and disadvantages of client server architecture. Distributed component framework ó web mapping ó static and interactive web mapping ó open GIS web map server.
- Unit-III** Distributed geographic information services ó principle ó components ó logic and data components.
- Unit-IV.** Geographic markup language - principle ó characteristics - commercial web mapping programs - mobile GIS. Distributed GIS in data warehousing and data sharing.
- Unit-V** Internet GIS Applications in intelligent transportation systems, planning and resource management.

### Paper XVI

#### Thermal and Radar Remote Sensing

- Unit-I** Thermal Remote Sensing: Radiant flux ó heat transfer ó thermal infrared radiation ó thermal properties of materials ó emissivity of materials ó thermal inertia of Earth surface features.
- Unit-II** Thermal IR detection and imaging - characteristics of TIR images. Factors controlling IR Survey ó applications - comparison of IR images with other TM band and air photographs.
- Unit-III** Radar Remote Sensing : Meaning ó aircraft radar system ó SLAR - components, imaging system, wavelengths ó range and azimuth resolution - real aperture and synthetic aperture systems.
- Unit-IV** Satellite Radar system : Seasat SIR ó radar return and image signatures ó geometry of radar Images ó geometry of radar images ó mosaics.

- Unit-V** Image Characteristics: Polarization, look direction and image irregularity -image interpretation ó terrain, structures, vegetation, sand, land use and land cover.

### Practical VII

#### Remote sensing interpretations in water resources

01. Spectro Radiometric Survey of Water Bodies.
02. Analysis of Aerial Photographs and Satellite Images for Drainage Morphometry and Water Shed Demarcation.
03. Analysis of Satellite and Aerial Photographs for Surface Water Resources Mapping.
04. Water Quality and Snow Cover Mapping Using Satellite Data.
05. Analysis of Satellite and Aerial Photographs for Mapping Lithologically And Structurally Controlled Aquifer Systems.
06. Mapping of Geomorphic Aquifers
07. Identification Of Recharge Areas Using Remotely Sensed Data.
08. Analysis of Thermal and Microwave Data for Ground Water Targeting.
09. Land use / Land cover Mapping Upto Level II Using Aerial Photos and Satellite Images.

### Practical VIII

#### Project work

- Each student should undertake Project work allotted by the Head of the Department in a given area pertaining to Remote Sensing and GIS by the end of Semester V and should submit project report by the end of Semester VI.

#### \* Distribution of Marks for Practical-VII & VIII :-

Sr.No.	Practical No.	Practical	Marks
1	VII	Remote Sensing, interpretation in water resources (40) + Internal Assessment - Practical Record (3) + Viva-Voce (2) + Field Tour & submission of Report (5)	50
2	VIII	Project Work (20)+Submission of Report (10) + Presentation (10) + Internal Assessment - Seminar (5) + Viva-Voce (5)	50

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

3. Kraak, M., and A. Brown (2001) Web Cartography: Development and Prospects, London: Taylor and Francies.
4. Kraak, M. and F. Ormeling (2003) Cartography: Visualization of Geospatial Data, Delhi: Pearson Education.

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