

**Ch. Charan Singh University Campus, Meerut**  
**Department of Geography**  
**Course – Post Graduate Diploma in Remote Sensing and GIS**

Course outlines, syllabus, course reading and scheme of examinations of Post Graduate Diploma in Remote Sensing and GIS Course.

The course shall be of one year duration spread over in two semesters. Eligibility for admission to the course shall be graduation in any field. The admission shall be merit based and as per the guidelines set by the University for the purpose.

Duration of examination for theory and practical papers shall be three and four hours respectively. Practical examinations will be conducted by a board of one internal and one external examination out of the panel recommended by Board of Studies in Geography. Project work shall be evaluated as per the existing rules of the university.

The details of the course shall be as under:

**Semester - I**

<b>Course Code</b>	<b>Title of The Paper</b>	<b>Max. Marks</b>	<b>Internal Marks</b>	<b>External Marks</b>
GIS – 1001	Principles of Remote Sensing & Image Interpretation	100	50	50
GIS – 1002	Photogrammetry and Cartography	100	50	50
GIS – 1003	Digital Image Processing	100	50	50
GIS – 1004	Aerial Photographs and Satellite Image (Practical)	100		100
GIS – 1005	Digital Image Analysis (Practical)	100		100

**Semester - II**

GIS – 2001	Geographical Information System and Global Positioning System	100	50	50
GIS – 2002	Thematic Application of Remote Sensing and GIS	100	50	50
GIS – 2003	Geographical Information System (Practical)	100		100
GIS – 2004	Thematic Cartography (Practical)	100		100
GIS – 2005	Project Report	100		100

**Ch. Charan Singh University Campus, Meerut**  
**Department of Geography**  
**P.G. Diploma in Remote Sensing & GIS**  
*Semester – I*  
**(Paper Code: GIS-1001)**  
**Principles of Remote Sensing & Image Interpretation**

Max Marks: 100

Theory Exam: 50

Int. Assess: 50

**Unit – I:** Principles of Remote Sensing

Definition, types and scope of Remote Sensing; development of Remote Sensing, Stages in remote sensing data acquisition; Electromagnetic radiation and electromagnetic spectrum; Black body radiation and radiation laws: Interaction of EMR with Earth's surface features and atmosphere.

**Unit – II:** Platforms, Sensors and Data Products

Platforms - Types and salient characteristics: sensors Types and characteristics, Sensor Resolutions and applications: Remote sensing data products: Indenting of Remote Sensing data in India: Indian Remote Sensing Satellites.

**Unit – III:** Ground Truth and Remote Sensing Images

Ground truth data in remote sensing: Instruments for ground truth data collection Spectral signatures of different objects: Soil, Vegetation. Water, Snow, and Cloud, Interpretation of MSS thermal and microwave images, Hyperspectral Images.

**Unit – IV:** Image Interpretation

Image interpretation: Elements and Factors affecting image interpretation, Image Characteristics and preparation of image interpretation keys: Methods and techniques of image interpretation: Multi concepts in image interpretation.

**Note:** The question paper will have eight questions in all, two from each unit. Candidate will be required to attempt four questions, selecting one question from each unit. All question carry equal marks.

**References:**

1. Arnoff, Stan (1989), Geographical Information System: A Management Prespective, WDL Publication, Ottawa.
2. Bernhardsen, T. (1992), Geographical Information Systems, VIAKIT IT, Norwy.
3. Burrough, Petar and R. Mc Donnell (1998), Principles of Geographical Information Systems, Oxford University Press, Oxford.
4. Garg, P.K. 2019, Theory and Principles of Geoinformatics, Khanna Book Publisher Pvt. Ltd, New Delhi.
5. Nag. P. and M. Kudrat (1998), Digital Remote Sensing, Concept Publishing Company New Delhi.

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*Semester – I*  
**(Paper Code: GIS-1002)**  
**Photogrammetry and Cartography**

Max Marks: 100  
Theory Exam: 50  
Int. Assess: 50

**Unit – I:** Aerial Photography

Aerial photography – Definition, scope, advantages and limitations: Flight planning, Elements of photographic system – Aerial camera and aerial Films: Types and geometry of aerial photographs; Scale of photographs, Relief displacement, Procurement of aerial photographs in India.

**Unit – II:** Stereophotogrammetry

Introduction and principles of Stereophotogrammetry; Stereoscopic vision, Stereoscopic parallax: Use of parallax bar, Measurement of height and slopes; Photogrammetric Stereo Plotters and mapping.

**Unit – III:** Basics of Digital Photogrammetry

Basics of analytical and digital photogrammetry: Photogrammetric mapping and mapping accuracy. Digital orthophotos – Meaning and applications.

**Unit – IV:** Cartography

Cartography Meaning and Aspects of cartography : Scale, Map generalization, Map Design, Map Construction and reproduction: Types and Series of maps; Map Projections Coordinates; Map numbering system.

**Note:** The question paper will have eight questions in all, two from each unit. Candidate will be required to attempt four questions, selecting one question from each unit. All question carry equal marks.

**References:**

1. Arnoff, Stan (1989), Geographical Information System: A Management Perspective, WDL Publication, Ottawa.
2. Bernhardsen, T. (1992), Geographical Information Systems, VIAKIT IT, Norwy.
3. Burrough, Petar and R. Mc Donnell (1998), Principles of Geographical Information Systems, Oxford University Press, Oxford.
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*Semester – I*  
**(Paper Code: GIS-1003)**  
**Digital Image Processing**

Max Marks: 100  
Theory Exam: 50  
Int. Assess: 50

**Unit – I:** Digital Image Processing

Digital Images : Terms and definitions; Digital image data Formats: Hardware and Software Requirements for Image Processing : Hardware specification and software modules; Analog-to-digital conversion of digital images, History of images, True colour and False colour images

**Unit – II:** Statistics and Corrections applied in Image Processing

Basic statistics used in image processing: Image restoration, Radiometric and Geometric corrections; Image rectification.

**Unit – III:** Image Enhancements

Contrast stretching: Linear and non – Linear contrast. Histogram equalization, Density Slicing; Band ratioing; Image convolution; Filtering techniques in Image Processing; Principal Component Analysis (PCA).

**Unit – IV:** Image Classification

Supervised classification: Parallelepiped classifier, minimum distance to Mean classifier, Gaussian maximum likelihood classifier; Unsupervised classification, Artificial Intelligence, Machine learning.

**Note:** The question paper will have eight questions in all, two from each unit. Candidate will be required to attempt four questions, selecting one question from each unit. All question carry equal marks.

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1. Arnoff, Stan (1989), Geographical Information System: A Management Perspective, WDL Publication, Ottawa.
2. Bernhardsen, T. (1992), Geographical Information Systems, VIAKIT IT, Norwy.
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***Semester – I***  
**(Paper Code: GIS-1004)**  
**Aerial Photographs and Satellite Image (Practical)**

Max. Marks:100

1. Scale of a Photograph.
2. Stereovision from aerial photos.
3. Manual Interpretation.
4. Geometric Correction of Digital Satellite Image.
5. Enhancement of Satellite images.
6. Supervised Classification of image for LULC mapping.
7. Unsupervised Classification of image for LULC mapping.
8. Download free satellite images and creation of mosaic.

**Reading List:**

1. Burrough P.A. and McDonnell R.A., 2000: Principles of Geographical Information System-Spatial Information System and Geostatic, Oxford University Press.
2. Chang K.- T., 2009: Introduction to Geographic Information Systems, McGraw-Hill.
3. Clarke K.C., 2001: Getting Started with Geographic Information Systems, John Wiley & Sons.
4. DeMers M.N., 2000: fundamentals of Geographic Information Systems, John Wiley & Sons.
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6. Heywood I., Cornelius S. and Carver S., 2006: An Introduction to Geographical information Systems, Prentice Hall.

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***Semester – I***  
**(Paper Code: GIS-1005)**  
**Digital Image Analysis (Practical Erdas Imagine)**

1. Open Digital image in viewer window.
2. Subset of Image.
3. Mosaicking of image.
4. Supervised Classification.
5. Unsupervised Classification.
6. Map Composition.
7. Geo-reference of image.
8. Geo-reference of image with toposheet.
9. Principle component analysis.
10. Histogram Analysis.

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1. Burrough P.A. and McDonnell R.A., 2000: Principles of Geographical Information System-Spatial Information System and Geostatic, Oxford University Press.
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***Semester - II***  
**(Paper Code: GIS-2001)**  
**Geographical Information System and Global Positioning System**

Max Marks: 100

Theory Exam: 50

Int. Assess: 50

**Unit – I:** Introduction to GIS

Definition and scope of GIS: Introduction to computers: Basic operating systems DOS and Windows: Functional requirements of GIS: Hardware configuration and software modules; Graphic user interface of Arc Info. Arc View and Geomedia: Open source GIS Cartographic interface; Recent trends in GIS - DSS.

**Unit – II:** Data base, Data structures and Analysis

Geographic data: Spatial and non-spatial; Data Models: Raster and Vector, Database management System (DBMS) and Data Structures: Relational : Hierarchical and network; Data input : Digitization of maps and imageries : Topology building Editing and cleaning; Coordinate transformation; Attribute data generation.

**Unit – III:** Spatial Analysis

Overlay operations, network analysis and buffer analysis; Query in GIS : Data output and report writing; Internet GIS.

**Unit – IV:** Global Positioning System

Introduction and definition of Global Positioning Systems: GPS satellite and constellations; GPS segments – Space Segments, Control Segments, User Segments: GPS signals and codes; GPS receivers: DGPS Different mode of measurements and post processing of data; Accuracy of GPS measurements.

**Note:** The question paper will have eight questions in all, two from each unit. Candidate will be required to attempt four questions, selecting one question from each unit. All question carry equal marks.

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1. Arnoff, Stan (1989), Geographical Information System: A Management Perspective, WDL Publication, Ottawa.
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***Semester - II***  
**(Paper Code: GIS-2002)**  
**Thematic Applications of Remote Sensing & GIS**

Max Marks: 100

Theory Exam: 50

Int. Assess: 50

**Unit – I:** Remote Sensing Application of Human Settlement Analysis

Introduction to the use of remote sensing and GIS in urban and regional planning; Application of remote sensing and GIS in facilities mapping; Land transformation and urban sprawl; Solid waste management using remote sensing and GIS; Urban Information System.

**Unit – II:** Remote Sensing Application in Geosciences

Elements of interpretation; Convergence of evidence; Principle of geomorphologic analysis; Different genetic landforms and their identification and mapping of various rocks types and structural elements; Applied aspects of geological mapping.

**Unit – III:** Remote Sensing Application in Agriculture and Soil

Remote Sensing in agriculture; agriculture and approaches of crop inventory and crop production forecasting; Thermal and Microwave application in agricultural water management; Soil mapping units; Physiographic and soil relationship: Approaches and methods of mapping; Watershed characterization; Prioritization of watershed based on SYI model; Principles, qualitative and quantitative methods of land evaluation: Application of land evaluation.

**Unit – IV:** Remote Sensing Application in Hydrology & Water Resources Management

Hydrological cycle – Types of precipitation and analysis of precipitation data: Thiessen polygon method of estimating average rainfall using GIS: Evapotranspiration; Runoff estimation using modified SCS method: Methods of estimating evapotranspiration and soil moisture; Water balance computation using Thornthwait and Marher model; Watershed management : Concept of watershed management; Watershed work plans; Watershed management programs in India; Role of remote sensing and GIS in watershed management.

**Note:** The question paper will have eight questions in all, two from each unit. Candidate will be required to attempt four questions, selecting one question from each unit. All question carry equal marks.

**References:**

1. Burrough P A and Mc Donnell R: Principles of Geographical Information System, Oxford University Press, London.
2. Campbell Jhon, B: 1996 : Introduction to Remote Sensing, Taylor & Francis.
3. Census: 2001 : Bangalore Urban and Rural Districts.
4. ERDAS IMAGINE field guide • ERDAS IMAGINE tour guide.
5. FAO: (1976) : A framework for land evaluation. Soil Bulletin 32, Food and Agricultural Organization of United Nations.
6. Garg, P.K. 2019, Theory and Principles of Geoinformatics, Khanna Book Publisher Pvt. Ltd, New Delhi.



6. Indore Development Plan 2011 (Draft) : 2003 : published by Directorate of Town and Country Planning and ISRO, Ahmedabad.
7. Jacek Malczewski : 1999 : GIS and Multi-Criteria Decision Analysis, Jhon Wiley & Sons.
8. James Heitzman: 2004: Network City Planning the Information Society in Bangalore : Published by Oxford University Press, New Delhi.
9. Jenson Jhon ,R: 1996: Introcution to Digital Image Processing: A Remote Sensing Perspective, II Edition, Prentice Hall.

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*Semester - II*  
**(Paper Code: GIS-2003)**  
**Geographical Information System (Practical)**

Max. Marks:100

1. Creation of Spatial data through Digitization (Point, Line and Area Features)
2. Creation of attribute tables of Spatial data
3. Creation of Vector and raster data
4. Overlay analysis in GIS.
5. Buffering in GIS.
6. Making simple query from GIS database.
7. Study of BHUVAN Website.
8. Change analysis in GIS.

**Reading List:**

1. Burrough P.A. and McDonnell R.A., 2000: Principles of Geographical Information System-Spatial Information System and Geostatic, Oxford University Press.
2. Chang K.- T., 2009: Introduction to Geographic Information Systems, McGraw-Hill.
3. Clarke K.C., 2001: Getting Started with Geographic Information Systems, John Wiley & Sons.
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7. Schuurman N.,2004:GIS- A Short Introduction, Blackwell.

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*Semester - II*  
**(Paper Code: GIS-2004)**  
**Thematic Cartography (Practical)**

Max. Marks: 100

1. Study of various types of maps.
2. Study of various symbols & colours used in cartographic mapping.
3. Study of real – world coordinates and map sheet numbering of survey of India.
4. Preparation of Linear and Diagonal scales.
5. Data representation methods (maps, diagrams, choropleth, isopleths).
6. Area computation from a map.
7. Interpretation of thematic maps.

**Reading List:**

1. Burrough P.A. and McDonnell R.A., 2000: Principles of Geographical Information System-Spatial Information System and Geostatic, Oxford University Press.
2. Chang K.- T., 2009: Introduction to Geographic Information Systems, McGraw-Hill.
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*Semester - II*  
**(Paper Code: GIS-2005)**

**Project Report**

Max. Marks: 100

Every candidate will be required to write a project report on a topic approved by the competent authority. Candidate will be required to submit project report by the end of second semester.