

DEPARTMENT OF GEOGRAPHY
M. D. UNIVERSITY, ROHTAK

P. G. Diploma in Remote Sensing and GIS

The P. G. Diploma in Remote Sensing and GIS will be in regular mode from session 2015-16. The programme aims to provide an understanding of the geospatial technology and its application in various fields of spatial studies including an in-depth knowledge of the linkages between geospatial technology, resource planning and management. The course will also provide a comprehensive idea to conduct further research in various aspects of geospatial technology, resource planning and mapping of land surface.

Eligibility Criteria for Admission

Admission to this course is open to candidates who have Masters Degree in Geography from a recognised university with a minimum percentage of marks prescribed by M. D. University for admission to other P. G. Diploma courses.

Selection Criteria for Admission

Selection will be made on the basis of merit in the qualifying examination. Seats will be reserved as per policy laid down by the State Government university.

Duration of the Course

The diploma shall be of one academic year comprising two semesters. The admission to the course shall be held in the month of July every year. A candidate has to complete P G Diploma course within three academic years.

Number of Seats and Award of Diploma

There shall be a total of 15 seats for admission to the course. On successful completion of the course, candidates shall be awarded P. G. Diploma in Remote Sensing and GIS.

Fee Structure

The fee structure of the programme will be as per other regular PG Diploma courses in the University.

Examination Process

At the end of every semester, the students will be subjected to written examination of theory and practical papers. The course content of theory papers shall be spread over four units. The question paper will have five units. Each of the first four units of question paper will contain two questions from each unit of the syllabus. Candidate(s) are required to attempt one question from each unit. Unit-V shall be compulsory and shall contain eight short answer type questions covering entire syllabus. Internal assessment, end semester examination and declaration of results of the programme shall be governed by the rules and regulations of the university from time to time. The practical examination shall be conducted by a board of examiners (one external and internal(s)) out of the panel recommended by PGBOS of the department. The course in-charge will be the internal examiner(s).

Hands-on training/ Field Visits

The department shall conduct visits to related institutes of repute for hands-on. Field visits to collect ground truth data shall be organized when and wherever required. The visit shall be organized under the supervision of a faculty member engaged in the teaching of the course. He/she shall be paid TA/ DA as per university rules.

Project Report

A student is required to write a Project Report in the Second Semester on application of Remote Sensing GIS and GPS under the guidance of a faculty member from among the teachers engaged in the teaching of the course. The topic of the Project Report has to be proposed by the candidate at the beginning of the Second Semester. The findings of the project report will be presented by the candidate in a seminar on a date decided by the HOD. The content of the project report, its presentation in the seminar and viva voce shall be evaluated by a committee comprising of the HOD, concerned supervisor and one faculty member nominated by HOD from among the teachers engaged in the teaching of the course.

SCHEME OF EXAMINATION FOR PG DIPLOMA IN REMOTE SENSING AND GIS:

Session: 2015-16 onwards

Sr No.	Paper No	Name of the Paper	Max. Marks	Internal Assessment	End Sem. Exam	Duration of Exam.
SEMESTER-I						
1.	I	Photogrammetry and Remote Sensing	100	20	80	3 Hours
2.	II	Fundamentals of Digital Image Processing	100	20	80	3 Hours
3.	III	Spatial Statistics, Computer Programming and Report Writing	100	20	80	3 Hours
4.	IV	Practicals: Lab Work on Aerial Photographs and Satellite Images	100	Distribution of marks Lab work test : 60 Record on Lab work : 20 Viva Voce : 20		4 Hours
5.	V	Practicals: Lab Work on Digital Image Processing	100	Distribution of marks Lab work test : 60 Record on Lab work : 20 Viva Voce : 20		4 Hours
SEMESTER-II						
6.	VI	Principles and Applications of Geographical Information System and Navigation System	100	20	80	3 Hours
7.	VII	Optional paper : Any One Application of Remote Sensing/GIS and GPS in: (i) Resource Planning and Management (ii) Urban and Regional Studies (iii) Water Resources (iv) Geomorphological Studies	100	20	80	3 Hours
8	VIII	Practical: Lab Work on GIS and Navigation System	100	Distribution of marks Lab work test : 60 Record on Lab work : 20 Viva Voce : 20		4 Hours
9	IX	Project Report	200	Evaluation of Report : 100 Presentation : 50 Viva-Voce : 50		

HOD, Geography

P G Diploma in Remote Sensing & GIS Semester – I

Session: 2015-16 onwards

PAPER-I

PHOTOGRAMMETRY AND REMOTE SENSING

Max. Marks: 100

End Semester Exam: 80

Internal Assessment: 20

Time: 3 Hours

Unit - I

Introduction: History and Development of Photogrammetry; Aerial photographs- Types, Characteristics, Determination of photo scale and Geometry; Basic information on aerial photographs; Overlapping, Photomoaisics. Flight planning and Execution of aerial photography, Availability and acquisition of aerial photographs in India.

Unit - II

Stereoscopes and Stereoscopic vision; Parallax; Relief displacement. Elements of Image interpretation, Methods and Techniques of interpretation, Multi-concepts in image interpretation. Types of photogrammetry: Analytical and Digital photogrammetry. Digital photogrammetry – Meaning, Concepts and Uses of photogrammetry.

Unit - III

Introduction, history and applications of Remote Sensing; Electromagnetic radiation and remote sensing; energy interactions in atmosphere; energy interactions with earth surface features and spectral signatures. Basic concepts of Thermal, Microwave and Hyper Spectral Remote Sensing.

Unit - IV

Sensors: Characteristics; Platforms: airborne and space borne; Satellite orbits: geostationary and near polar; Image data characteristics: spatial, spectral, radiometric and temporal; Satellite missions of ISRO and LANDSAT programme with their image characteristics; History, development and set up of Remote Sensing Programme of India, USA, Russia, China and ESA.

Note: The question paper will have five units. Each of the first four units of question paper will contain two questions from each unit. Candidate(s) are required to attempt one question from each unit. Unit-V shall be compulsory and shall contain eight short answer type questions covering entire syllabus. All questions carry equal marks.

Recommended Readings:

1. American Society of Photogrammetry, (1983), *Manual of Remote Sensing*, ASP Falls Church, Virginia.
2. Avery, T.E., and G.L. Berlin, (1992), *Fundamentals of Remote Sensing and Airphoto Interpretation*, Macmillan, New York.
3. Campbell, J.B., (1996), *Introduction to Remote Sensing*, Guilford, New York.
4. Curran, Paul J., 1985, *Principles of Remote Sensing*, Longman, London & New York.
5. Drury, S.A., (1998), *Images of the Earth: A Guide to Remote Sensing*, Oxford University Press, Oxford.
6. Jensen, J. R., (2000), *Remote Sensing of the Environmental: An Earth Resource Perspective*, Printce Hall, New Jersey.
7. Joseph, G., (2005), *Fundamentals of Remote Sensing*, Universities Press Hyderabad.
8. Lillisand, T.M. and P. W. Kiefer, (1986), *Remote Sensing and Image Interpretation*, New York. John Wiley & Sons,
9. Wolf, Paul. R. (1983), *Elements of Photogrammetry* , New York,. McGraw-Hill,

P. G. Diploma in Remote Sensing and GIS Semester –I

Session: 2015-16 onwards

PAPER-II

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

Max. Marks: 100

End Semester Exam: 80

Internal Assessment: 20

Time: 3 Hours

Unit-I

Remote Sensing Data: Digital vs Analog data; Visual Interpretation – Introduction and need of image interpretation; Image quality; Elements of digital image interpretation and Convergence of evidence; Multiple images in image interpretation; Equipments of image interpretation. Digital Processing: Introduction and need of digital image processing; Pixel Characteristics; Digital image data format; Colour Composites; Best Band Combination, False Colour Composite (FCC) display.

Unit-II

Image Processing: Image Processing Softwares; Radiometric, Geometric and Atmospheric distortions; Radiometric correction; Geometric correction; Layer Information; Digital Image Histogram.

Unit-III

Image Enhancement: Contrast, Causes of low contrast in an image; Contrast enhancement techniques: linear and non-linear; Histogram Equalization; Density Slicing; Spatial Filtering – low pass and high pass, edge detection and edge enhancement; Image transformation- Band Rationing and Principal Component Analysis.

Unit-IV

Image Classification: Unsupervised classification; Supervised classification-various classification algorithms i.e. Parallelepiped ; Minimum Distance to Means; Gaussian Maximum likelihood; Accuracy assessment; Image fusion; Texture transformations; Image segmentation.

Note: The question paper will have five units. Each of the first four units of question paper will contain two questions from each unit. Candidate(s) are required to attempt one question from each unit. Unit-V shall be compulsory and shall contain eight short answer type questions covering entire syllabus. All questions carry equal marks.

Recommended Readings:

1. Jahne, B., (1991), *Digital Image Processing*, New York: Springer-Verlag.
2. Jain, A.K., (1989), *Fundamentals of Digital Image Processing*, Englewood Cliffs, NJ, Prentice Hall.
3. Jonson, J.R. (1996), *Introductory Digital Image Processing*, Printice-Hall, Inc.
4. Lillsand, T.M. and R.W. Kiefer, (1999), *Remote Sensing and Image Interpretation*, New York: Wiley.
5. Lillesand, T.M., Kiefer, R.W., and Chipman, J.W., (2004), *Remote Sensing and Image Interpretation*, Wiley.
6. Mathur, P.M., (1999), *Computer Processing of Remotely Sensed Images: An introduction*, Wiley, Chichester.
7. Mullar J.P. (1986), *Digital Image Processing in Remote Sensing*, Taylor & Francis.
8. Pratt, W.K., (1991), *Digital Image Processing* 2nd ed., New York Wiley.
9. Richards, J.A., (1986), *Remote Sensing Digital Image Analysis*, New York: Springer- Verlag.
10. Russ, J.C. (1992), *Image Processing Handbook*. Boca Raton, FL: CRC Press 445p
11. Schowengerdt, R.A., (1983), *Techniques for image processing and classification in Remote Sensing*, New York: Academic Press.

P. G. Diploma in Remote Sensing and GIS Semester –I

Session: 2015-16 onwards

PAPER- III

SPATIAL STATISTICS, COMPUTER PROGRAMMING AND REPORT WRITING

Max. Marks: 100

End Semester Exam: 80

Internal Assessment: 20

Time: 3 Hours

Unit I: Spatial Statistics

Introduction to Statistics; Frequency polygon and frequency curve; Histograms; Measures of central tendency (Mean, Median and Mode); Standard Deviation; Coefficient of variation; Correlation; Regression; Principal Component Analysis

Unit II: Matrices

Definition; Square matrix; Zero matrix ; Identity matrix, Diagonal matrix; Scalar multiple of a matrix; Addition of matrices; Subtraction matrices; Multiplication of matrices; Transpose of matrix; Determinants; Cofactor of an element; Cofactor matrix; Adjoint of matrix; Inverse of matrix; solution of simultaneous equations by matrix method.

Unit III: Computer Programming

Introduction to Computer Programming; Development of algorithms and flow chart;

C++ language - Introduction, Objects, Decisions, Loops, Functions, Structs, References, Classes, Pointers.

Unit IV: Report writing

Research, Identification of a research problem; review of literature; Techniques of Report writing; Ethics in Research.

Note: The question paper will have five units. Each of the first four units of question paper will contain two questions from each unit. Candidate(s) are required to attempt one question from each unit. Unit-V shall be compulsory and shall contain eight short answer type questions covering entire syllabus. All questions carry equal marks.

Recommended Readings:

1. Alvi, Z, (1995), *Statistical Geography-Methods and Applications*, New Delhi: Rawat Publications.
2. Harvey, David (1969), *Explanation in Geography*, London: Edward Arnold.
3. Hoggart, Keith et.al. (2002), *Researching Human Geography*, London: Arnold.
4. Hubbard, Phil et.al. (2002), *Thinking Geographically*, London: Continuum.
5. Johnston, R.J. and J.D. Sidaway (2004), *Geography and Geographers*, London: Arnold.
6. King, L. J., (1969), *Statistical Analysis in Geography*, Prentice –Hall.
7. Kitchin, Rob and Nicholas J. Tate (2000), *Conducting Research in Human Geography*, London: Prentice Hall.
8. Lafore, Robert (2002), *Object-Oriented Programming in C++*, New Delhi: Dorling Kindersley (India) Pvt. Ltd.
9. Mahmood, A. (1977), *Statistical Methods in Geographical Studies*, Rajesh Publications.
10. Robinson, Guy M. (1998), *Methods and Techniques in Human Geography*, New York: John Wiley.

P. G. Diploma in Remote Sensing and GIS Semester –I

Session: 2015-16 onwards

PAPER - IV

LAB WORK ON AERIAL PHOTOGRAPHS AND SATELLITE IMAGE

Max Marks: 100
Distribution of marks
Lab Work Test: 60
Record on Lab Work: 20
Viva Voce: 20
Time: 4 hrs

Unit - I

1. Orientation of Mirror Stereoscope.
2. Stereo test and depth perception.
3. Determination of Photo scale (various methods).
4. Determination of heights from single vertical aerial photograph.
5. Use of parallax bar and height measurement.
6. Preparation of Photo Index maps.
7. Preparation of Stereogram and Stereotriplet.
8. Identification, Mapping and Interpretation of Physical and Cultural features on aerial photographs.
9. Preparation of landuse / landcover map on aerial photographs.
10. Demonstrations on LPS software and orthophoto generation.

Unit - II

11. Study of a satellite image - annotation (IRS - IB, IRS- IC etc.)
12. Collection of radiant temperatures and plotting of diurnal values.
13. Visual interpretation of a satellite image and separating physical and cultural features.
14. Identification of objects on panchromatic, multiband and FCC images and their comparison.
15. Identification and mapping of landuse/land cover on satellite images.
16. Study of thermal image and interpretation of various features.
17. Study of Radar image and interpretation of various features
18. Study of hyperspectral image and interpretation of various features.
19. Acquisition of open source satellite data from USGS / GLOVIS.
20. Acquisition of open source satellite data from BHUVAN (ISRO).

Note:

(a) The Lab Work examination shall consist of six questions, three from each unit. Candidates are required to attempt three questions selecting at least one from each unit. All questions carry equal marks.

(b) Candidates shall produce their lab work record before the Board of Examiners for evaluation at the time of their viva-voce examination.

P. G. Diploma in Remote Sensing and GIS Semester-I

Session: 2015-16 onwards

PAPER- V

LAB WORK ON DIGITAL IMAGE PROCESSING

Max Marks: 100
Distribution of marks
Lab Work Test: 60
Record on Lab Work: 20
Viva Voce: 20
Time: 4 hrs

Unit - I

1. Familiarization with ERDAS Imagine/Geomatica/ Open Source Software.
2. Visualization; Import and Export of Satellite Data into various formats.
3. Geocoding of Toposheet
4. Georeferencing of Satellite Data.
5. Creating subset of Satellite Image/Topo Sheet.
6. Resolution merge
7. Mosaic of Toposheets
8. Mosaic of Satellite Images

Unit - II

9. Displaying Individual Pixel Value and Image Information.
10. Image Enhancement Techniques-Image Contrast, Histogram Equalization & Density Slicing.
11. Band Rationing.
12. Filtering Techniques.
13. Principal Component Analysis.
14. Classification – Supervised
15. Classification – Unsupervised.
16. Change Detection.

Note:

(a) The Lab Work examination shall consist of six questions, three from each unit. Candidates are required to attempt three questions selecting at least one from each unit. All questions carry equal marks.

(b) Candidates shall produce their lab work record before the Board of Examiners for evaluation at the time of their viva-voce examination.