P. G. Diploma in Remote Sensing and GIS – DRG1 One Year (Two Semesters)

Session: 2015-16 onwards

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**.**

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.

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).

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.

PROGRAM SPECIFIC OUTCOMES

Students will be able to:

PSO1: Understand not only the place where they live in but also about the lives of people living in other areas of the interconnected world. It also enhances understanding of the relationship between the global and the local level and the outcomes of these relationships (relationship between global processes and their local manifestations).

PSO2: Understand places, regions and spatial relationship as result of series of inter-related factors of nature, culture and individual human actions.

PSO3: Understand the social and cultural differences (race, ethnicity, gender, age, class) and their geographical embeddedness.

PSO4: Understand the need to conserve environment, resources in order to have a more sustainable earth;

PSO5: Relative the theoretical knowledge with local realities by making field visits to different areas.

PSO6: Use and map the digital spatial data in more rational way.

PSO7: Understand the paradigm shifts all along with the process of historical development of geography as a subject of learning.

SCHEME OF EXAMINATION

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		

P G Diploma in Remote Sensing & GIS – DRG1

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

Course Outcomes
Students would be able to:

CO1: Know the basic aspects of photogrammetry and remote sensing.
CO2: Have knowledge about operational principles of the geospatial technology with specific reference to acquisition of aerial photographs and satellite images.
CO3: To interprate aerial photographs and satellite images.
CO4: Create information about earth surface features from variety of aerial photographs and satellite images.
CO5: Know about the application of aerial photographs and satellite images.

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,

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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

Course Outcomes
Students would be able to:

CO1: Analyze general terminology of digital image processing.

CO2: Have sufficient expertise in its wide range of applications of digital image processing for solving real world problems.

CO3: Function on multidisciplinary teams.

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.

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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

Course Outcomes
Students would be able to:

CO1: Solve various problems in the field employing statistical methods.
CO2: Understand and write software programs for analyzing spatial datasets.
CO3: Know how to read, analyse and display data using programming languages, as well as the basics of computer programming syntax.
CO4: Demonstrate writing skills.

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

P. G. Diploma in Remote Sensing and GIS – DRG1

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

Course Outcomes
Students would be able to:

CO1: Understand various aspects of interpretation, mapping and use of aerial photographs and satellite images.

CO2: Have a practical exposure on use of instruments i.e. stereoscopes etc for interpretation purposes.

CO3: Extract information from of aerial photographs and satellite images.

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.

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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

Course Outcomes
Students would be able to:

CO1: Have software skills and analytical background for building digital image and its application.
CO2: Identify image processing techniques for advancement of knowledge
CO3: Design and create practical solutions to a range of common image processing problems and to critically assess the results of their solutions.

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.

P G Diploma in Remote Sensing & GIS – DRG1

Semester – II Session: 2015-16 onwards

PAPER-VI: PRINCIPLES AND APPLICATIONS OF GEOGRAPHICAL INFORMATION SYSTEM AND NAVIGATION SYSTEM

Max. Marks: 100
End Semester Exam: 80
Internal Assessment: 20
Time: 3 Hours

Course Outcomes
Students would be able to:

CO1: Have basic conceptual knowledge about Geographical Information System and Navigation System.

CO2: Understand various aspects of data acquisition and management through GIS technology.

CO3: Know how to integrate different kinds of spatial and non-spatial data with the help of GIS technology

CO4: Understand the GPS but also to integrate the GPS data and its integration.

Unit - I

Basic Concepts and Functions:

Geographic Information System (GIS): definition and applications; GIS and remote sensing interface; components and elements of GIS; development of GIS technology; geographic objects: point, line, area and their computer representation. Coordinate systems and transformation.

Unit - II

Functions, Data Structure and Management: Basic functions in GIS: data input/capturing, storage and manipulation, query, data analysis and presentation, topology creation, data quality and errors in GIS.

Nature of geographic data: spatial and non spatial; sources of data; concept of vector and raster based models; data base management system (DBMS); data Structures: relational, hierarchical and network;

Unit - III

Spatial Analysis:

Spatial Analysis**:** neighbourhood , network and overlays analysis. 3D models, TIN, DEM, DTM. Applications of GIS in geographical studies.

Unit - IV

Navigation System

Introduction to Global Positioning System; GPS satellites constellations; GPS segments: Space, Control, User; GPS antennas, signals and codes; GPS receivers; Modes of measurements and post processing of data; Accuracy of GPS measurements; Application of GPS.GAGAN and NAVSTAR.

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. Burrough, P.A. and McDonnell, R.A. *Principles of Geographic Information System*. Oxford: Oxford University Press. 1998. Print.
2. Chang, Kang-tsung. *Introduction to Geographic Information Systems*. New Delhi: Tata McGraw-Hill.2006.Print.
3. De Mers and Michael N. *Fundamentals of Geographic Information System*. New York: John Wiley & Sons.1999.Print.
4. Doberstein, Dan. *Fundamentals of GPS Receivers: A Hardware Approach.* New York: Springer.2012.Print.
5. El-Rabbany, Ahmed. *Introduction to GPS: The Global Positioning System.* Boston: Artech House.2002.Print.
6. Heywood, I. et al. *An Introduction to Geographic Information Systems*. New Delhi: Pearson Education.2004.Print.
7. Longley, P.A. et. al. *Geographic Information Systems and Science*. Chichester: Willey.2001.Print.
8. Paul Wolf, Bon DeWitt, and Benjamin Wilkinson. *Elements* of *Photogrammetry with Application in GIS.* USA: Mc-Graw Hill Education.2014.Print.

P G Diploma in Remote Sensing & GIS – DRG1

Semester – II Session: 2015-16 onwards

PAPER-VII (i): APPLICATION OF REMOTE SENSING/GIS AND GPS IN RESOURCE PLANNING AND MANAGEMENT

Max. Marks: 100
End Semester Exam: 80
Internal Assessment: 20
Time: 3 Hours

Course Outcomes
Students would be able to:

CO1: Understand the fundamental concept of soils, various models to address soil problems.

CO2: Know about the application of Remote Sensing techniques in water resource development and management.

CO3: Explore the use of Remote Sensing and GIS for various applications in Forestry.

Unit - I

Fundamental concepts of soil; Spectral characteristics of soils; Remote sensing application in soil survey and mapping; Concept and approaches of land evaluation; Remote sensing in characterization of land degradation types and their processes; Soil erosion modeling using geoinformatics.

Unit - II

Principles of remote sensing in water resource assessment; Spectral characteristics of water and water quality; Ground and surface water inventory; Watershed characterization, Delineation and Codification; Sediment Yield Modeling and Watershed Prioritization.

Unit - III

Role of geoinformatics in forest studies; Spectral and Temporal characteristics of vegetation; Forest cover mapping through geoinformatics; Forest density mapping; Biomass estimation using geoinformatics

Unit - IV

Remote Sensing in Agriculture - an introduction and background; Spectral characteristics of crops; Principles of crop identification and crop acreage estimation using geoinformatics; Crop Yield Modeling using geoinformatics; Role of Satellite Remote sensing in drought monitoring.

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. Anji Reddy, M. 2004. Geoinformatics for environmental management.B.S. Publications.
2. Avery, T, E. 1977. Interpretation of Aerial Photographs. Burgess Publishing Co., Minnesota (3rd Ed.).
3. Chow, V.T ed. (1964). Handbook of Applied Hydrology. Mc-Graw Hill book Company. New York.
4. Engman, E.T. and Gurney, R.J. 1991. Remote Sensing in Hydrology. Chapman and Hall, London.
5. Franklin S.E. 2001. Remote Sensing for sustainable forest management. Lewis Publication.
6. Jensen,J.R. 2000. Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall.
7. Lecture Note (Module II), Agriculture and Soil Division. IIRS Dehradun.
8. Lecture Note (Module II), Forest Division. IIRS Dehradun.
9. Lecture Note (Module II), Water Resource Division. IIRS Dehradun.
10. Lillesand, T.M., and Kieffer, R.M., 1987. Remote Sensing and Image Interpretation, John Wiley.
11. Lillesand, T. M. and Kiefer, R. W. 1994. Remote Sensing and Image Interpretation. John Wiley & Sons, New York, Third edition.
12. Meijerink, A.J., Hans A.M. de Blouwer, Chris M. Mannaerts, Colrol R. Valenzuela, 1994. Introduction to the use of Geographic Information System for Practical Hydrology. ITC Publication No. 23.
13. Nefedov, K.E. and Popova, T.A., 1972 – Deciphering of Ground water from aerial photographs. Amerind Publishing Co., New Delhi.
14. O' Callaghan, J .F. and D.M. Mark, 1984. The extraction of drainage netwoks from digital elevation data. Comp Vis, Graphics and Image Proc. 28, pp 323-344.
15. Sharma, P.D. Ecology and Environment, Rastogi Publications
16. Skidmore A.2002: Environmental modeling with GIS and Remote Sensing. Taylor and Francis.

P G Diploma in Remote Sensing & GIS – DRG1

Semester – II Session: 2015-16 onwards

PAPER-VII (ii): APPLICATION OF REMOTE SENSING/GIS AND GPS IN URBAN AND REGONAL STUDIES

Max. Marks: 100
End Semester Exam: 80
Internal Assessment: 20
Time: 3 Hours

Course Outcomes
Students would be able to:

CO1: Understand various processes of urbanisation and the linkages between urban areas and its rural surroundings.

CO2: Understand the applications of Remote Sensing/GIS and GPS in urban and regional studies.

CO3: Know about the use of Geospatial Technology in Urban studies

Unit - I

Introduction to basic urban processes. Concept of urban and regional planning. Problems of urban and regional planning in India. Application of remote sensing/GIS/GPS in urban and regional studies. Study of morphology and internal structure of Indian cities using Remote Sensing/GIS/GPS.

Unit - II

Urban Information System(UIS) and its use in urban studies . Requirement and availability of remote sensing data for urban and regional studies. Urban physical infrastructure planning. Planning urban utilities and services. Site suitability analysis for urban settlements. Urban land use planning: problems and methods.

Unit - III

Land use/ land cover mapping. Classification system for urban land use classification with specific reference to Anderson's and NRSA/NUIS. Creation and updating of urban land use maps (Case studies from Indian Cities). Urban sprawl - introduction, issues associated with urban sprawl in India and world. Mapping of urban sprawl with aerial photos and satellite imageries. A Case study of sprawl of Rohtak and Panipat cities in Haryana.

Unit - IV

Rural-urban fringe: characteristics, demarcation, mapping and analysis with fine resolution satellite data and GIS tools (A case study). Urban hazards: meaning, types, planning and mapping. (Application of Remote Sensing/GIS/GPS)-A case study from Indian cities. Urban slums: introduction, identification, problems and policies for slum development in India.

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. Avery, T.E., and G.L. Berlin, 1985, *Interpretation of Aerial Photographs,* Burgess Minneapolis.
2. Branch, M.C., 1971, City Planning and Aerial Information, Harvard University Press, Cambridge.
3. Lindgren, D.T. 1985 Land use Planing and Remote Sensing, Niijhoff, Dordrecht.
4. Sokhi, B. S. and Rashid S.M., 1999, Remote Sensing of Urban Environment, Manak Publishers, New Delhi
5. Buruside, C.D., 1979, Mapping from Aerial Photographs,Grands, London
6. Gautam, N. C. 1970, Urban Landuse Study through Aerial Photo Interpretation Techniques, Pink Publishing House,Mathura.
7. Nag, Prithvish, 1992, Thematic Cartography and remote Sensing, Concept,New Delhi.
8. Sunderam, K. V., 1977, Urban and Regional Planning in India, Concept, New Delhi.
9. Taylor, John, L. Williams, David C., 1981, Urban Planning Practice in Developing Couries, Pergamon Press.

P G Diploma in Remote Sensing & GIS – DRG1

Semester –II Session: 2015-16 onwards

PAPER-VII (iii): APPLICATION OF REMOTE SENSING/GIS AND GPS IN WATER RESOURCES

Max. Marks: 100
End Semester Exam: 80
Internal Assessment: 20
Time: 3 Hours

Course Outcomes
Students would be able to:

CO1: Understand the fundamental concept of water resources.

CO2: Gain skills in the use of Remote Sensing techniques in water resource development and management.

CO3: Explore the use of Remote Sensing and GIS for various applications in water resources.

Unit - I

Applications of GIS and Remote Sensing in Water Resources. Use of Landsat, LISS,SRTM, ASTER images in water resources studies. Calculation of NDVI, NDWI and Water Ratio Index.

Unit - II

Surface water Hydrology-Terrain Analysis; Digital Elevation Model, Slope and Aspect.

Unit - III

Watershed, Stream order and basin delineation, (use of Arc Hydro) computation of NDVI and NDWI through ArcGIS.

Unit - IV

Spatial Interpolation; Types of Interpolation, Interpolation for precipitation and groundwater table, water quality in GIS (IDW and Kriging).

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. J. R.Jensen and R.R. Jensen (2013) Introductory Geographic Information System, Pearson, Delhi.
2. Lo, C. P. and Yeung, A.K.W (2005) Concept and Techniques of Geographic Information System, API, New Delhi.
3. Schuurman, N. (2003) GIS: A short Introduction, Oxford, Blackwell. University Press, Oxford.

P G Diploma in Remote Sensing & GIS – DRG1

Semester –II Session: 2015-16 onwards

PAPER-VII (iv): APPLICATION OF REMOTE SENSING/GIS AND GPS IN GEOMORPHOLOGICAL STUDIES

Max. Marks: 100
End Semester Exam: 80
Internal Assessment: 20
Time: 3 Hours

Course Outcomes
Students would be able to:

CO1: Understand the concepts of general geomorphology.
CO2: Have knowledge about dynamic and applied aspects of geomorphology.
CO3: Know the uses of remote sensing and GIS techniques in geomorphological studies.

Unit - I

General Geomorphology
Geomorphic processes and landforms-weathering, fluvial, aeolian, glacial, and groundwater etc. Igneous, sedimentary, and metamorphic rocks-forms, structure. Faults, Folds and their field location.

Unit - II

Geomorphic Applications
Principles and recognition elements for terrain evaluation, mapping of terrain, classification of land forms; Interpretation of erosional and depositional land forms; Interpretation of drainage system; Study of land slide and floods - case studies.

Unit – III

Lithologic and Stratigraphic Applications
Spectral characteristics of lithologic/ stratigraphic features;factors affecting tonal appearance of rocks;Identification and mapping of rock types;Study of faults, folds, lineaments and lithologic bounderies-case studies.

Unit – IV

Hydro-geomorphological Applications
Hydrologic features and its elements; Surface water and ground water studies, Interpretation techniques for targeting ground water potential zones; Delineation of watershed, watershed prioritization and management- case studies.

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. Agarwal, C. S. and P.K. Garg, 2000, A Text Book on remote Sensing in Natural Resources Monitoring and Management, Wheeler, Publishing Co., New Delhi.
2. American Society of Photogrammetry, 1993, Manual of Remote Sensing, Falls Church, Virginia.
3. Arthur L. Bloom, Geomorphology, Prentice Hall, New Delhi.
4. Burrough. P.A., 1986, Geographical Information Systems for Land Resources Systems, Oxford University Press, New York.
5. Druary, S.A., 1987, An Image Interpretation in Geology, Allen and Unwin Ltd. London.
6. Greedry, Alan, F., 1974, Application of Remote Sensing with Special References ton Geosciences, Gregory Geo-Science.
7. P. Dayal, Text Book of Geomorphology Shukla book depot, Patna.
8. Siegal, B. S. & Gillespie, A. R., 1986, remote Sensing in geology, John Wiley Publications.
9. Smith, William, L., 1977, Remote Sensing Applications for Mineral Exploration Dawden Hutchingers and Ross Inc.
10. Townsend, J.T.G., 1981, Terrain Analysis and Remote Sensing, George Allen and Unwin.

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Semester –II Session: 2015-16 onwards

PAPER-VIII: LAB WORK ON GEOGRAPHICAL INFORMATION SYSTEM AND NAVIGATION

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

Course Outcomes
Students would be able to:

CO1: Have knowledge about fundamental concepts and practices of Geographic Information Systems
CO2: Create thematic maps.
CO3: Use GIS and Navigation System to address spatial problems.

1. Familiarization with GIS Software.
2. Projection and Reprojection
3. Georefrencing and Image Registration
4. Spatial data creation – creating shape files and digitization
5. Data Exploration
6. Working with Tables
7. Data Query (Spatial Querying and Attribute Querying)
8. Terrain Analysis
9. Multi- Criteria Analysis
10. Interpolation Techniques
11. Map Layout
12. Working with Google Earth
13. Familiarization with GPS instrument and software
14. Area and Length measurement (Track and Route)
15. GPS survey of natural and Cultural features.

Note:
(a) The Lab Work examination shall consist of **six** questions. Candidates are required to attempt any **three** questions. 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.

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Semester –II Session: 2015-16 onwards

PAPER-IX: PROJECT REPORT

Evaluation of Report: 100
Presentation: 50
Viva- Voce: 50
Maximum Marks: 200

Course Outcomes

Students would be able to:

CO1: Learn research skills to discover and employ information.

CO2: Design and execute the report on the results of the project in written form and present the results in front of a critical audience.

CO3: Critically assess the quality of the project result.