

Name of Programme: Post Graduate Diploma in Remote Sensing and GIS
Session: 2022 – 23 onwards

Semester wise Structure and Scheme of Examination

Semester – I

Sr. No.	Course Code	Course Title	Type	Credits	Max. Marks	Internal Assessment	End. Sem Exam
1	PGDRS - 01	Remote Sensing and Digital Image Processing	PC	4	100	30	70
2	PGDRS - 02	Fundamental of Computers, Software & Programming Languages	PC	4	100	30	70
3	PGDRS - 03	Geographical Information System & GNSS	PC	4	100	30	70
4	PGDRS - 04	Lab - I UAV Images and Digital Image Processing	PC	3	100	30	70
5	PGDRS - 05	Lab - II Geographical Information System & GNSS	PC	3	100	30	70
		Total		18	500	150	350

Semester – II

Sr. No.	Course Code	Course Title	Type	Credits	Max. Marks	Internal Assessment	End. Sem Exam
6	PGDRS - 06	Application of Geospatial tools in Resources Planning and Management	PC	4	100	30	70
7	PGDRS - 07	Project Work on any one theme of: a. Geography b. Urban & Regional Planning c. Agriculture d. Forestry e. Geology f. Environment / Ecology g. Any other theme may be chosen as per student's background	PC	8	200	60	140
		Total		12	300	90	210

PC :


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Semester - I

Course Code: PGDRS - 01

Remote Sensing and Digital Image Processing

Credits: 04

Maximum Marks: 100

Internal Marks: 30

External Marks: 70

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of seven short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students are required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-1

1. Definition, types scope and principles of remote sensing; Stages in remote sensing data acquisition; Electromagnetic radiation and electromagnetic spectrum, Interaction of EMR with atmosphere and Earth's surface features, spectral signatures and reflectance earth cover types (water, soil and vegetation).
2. Remote sensing platforms and orbits: Types & characteristics of Remote sensors, Sensor's resolution; Spatial, Spectral, Radiometric and Temporal.

Unit-2

3. Principles of microwave remote sensing; Microwave data sets SLAR, SAR and LIDAR, Application of Microwave data.
4. Elements of visual Image interpretation, Introduction to techniques of image interpretation & Interpretation keys. Interpretation of physical and cultural features from IRS imagery, Image metadata and their use in image interpretation.

Unit-3

5. Digital Image: Introduction, Types and characteristics, Digital data formats. Image distortions & corrections.
6. Image Enhancement (Radiometric & Spectral): Contrast Stretching; Linear contrast stretching, Non-linear contrast stretching, histogram equalization, Gaussian stretch, Image Enhancement (Spatial): spatial domain, High pass and low pass; Linear edge enhancement & edge detection: directional & nondirectional; Laplacian filter.

Unit-4

7. Image Transformation: arithmetic & image fusion; Band ratio; Normalized Differential Vegetation Index, and Normalized Differential Water Index, Soil Moisture index.
8. Image Classification: concept, principles, and types of classification, Spatial pattern recognition. Supervised classification, Unsupervised classification, Concept of accuracy assessment


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Suggested 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

Course Code: PGDRS - 02

Fundamental of Computers, Software & Programming Languages

Credits: 04

Maximum Marks: 100

Internal Marks: 30

External Marks: 70

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of seven short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students are required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit I

1. Introduction to computers, types of computers, basic components of computer systems- CPU-memory, Input Devices & Output devices.
2. Computer Networks and Internet: Overview of computer Networks and Internet: computer networks - LAN, WAN, WiFi and their applications, intranet, naming computers connected to internet.

Unit II

3. Introduction to Computer Programming; Development of algorithms and flow chart.
4. Types of Programming Language, Introduction of C Programming, Data Types, Variable, Keywords, Operators, Introduction Loops, Functions,

Unit - III

5. Introduction to Python Programming: Data-types, Variables in Python – Declaration and Use, Operators in Python – Assignment, Logical, Arithmetic etc., Conditional Statements – If else and Nested If else and elif, Loops in Python – For Loop, While Loop & Nested Loops,
6. String Manipulation – Basic Operations, Slicing & Functions and Methods and User Defined Functions – Defining, Calling, Types of Functions, Arguments. Open-source GIS


Unit IV

7. Geo-database Concept: Feature Dataset, Feature Class, Domain; RDBMS Concept, Introduction to RDBMS, Relational Database Integrity - The Keys - Referential Integrity - Entity Integrity - Redundancy and Associated Problems – Single Valued Dependencies – Normalisation - Rules of Data Normalisation.
8. STRUCTURES QUERY LANGUAGE (SQL): Meaning – SQL commands - Data Definition Language - Data Manipulation Language - Data Control Language - Transaction Control Language - Queries using Order by – Where - Group by - Nested Queries. Joins – Views – Sequences - Indexes and Synonyms - Table Handling.

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PGDRS - 02
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Suggested Readings:

1. P. K. Sinha & Priti Sinha , "Computer Fundamentals", BPB Publications, 2007.
2. Yashwant Kanetker, Let us C, BPB
3. Elmasri & Navathe, "Fundamentals of Database Systems", 5th edition, Pearson Education.
4. Ivan Bayross, "SQL, PL/SQL-The Programming Language of ORACLE", BPB Publications 3rd edition.
5. Sheetal Taneja and Naveen Kumar, "Python Programming A modular Approach", Pearson


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Semester - I

Course Code: PGDRS - 03

Geographical Information Systems and GNSS

Credits: 04

Maximum Marks: 100

Internal Marks: 30

External Marks: 70

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of seven short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students are required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-I

1. Introduction to GIS History and development of GIS; Component of GIS, Recent trends and applications of GIS; Cartography –GIS interface.
2. Cartography; map, scale and resolution; Coordinate system; Projection system; WGS-84 datum and UTM Projection.

Unit-II

3. GIS Database Geographic data: Spatial and non-spatial data and their sources; Data models: Raster and vector; Data input: scanning and digitization of analog maps/images; Topology building: editing and cleaning;
4. Database Management System (DBMS); Data Structures: Relational, hierarchical and network; linking spatial and non-spatial data; error in GIS; data quality.

Unit III

5. Spatial Analysis: Spatial overlay operations, buffer and proximity analysis; Interpolation techniques; 3D models: DEM, DTM.
6. Query in GIS; GIS output and Geovisualisation.

Unit IV

7. GNSS: Introduction to GNSS, Segments: Control Segment, Space Segments, User Segment; GNSS Positioning Types- Absolute Positioning, Differential positioning.
8. Basic Concepts. NAVSTAR, GLONASS, Indian Regional Navigational Satellite System (IRNSS), GAGAN; Application of GPS; Advantage and limitations of GPS.


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Suggested Readings:

1. Burrough, P.A., 1986, Geographical Information System for land Resources System, Oxford Univ. Press, UK.
2. Fotheringham, S.; Rogerson, P. (ed.), 1994. Spatial Analysis and GIS. Taylor and Francis, London, UK.
3. Laurini, Robert and Dierk Thompson, 1992, Fundamentals of Spatial Information Systems, Academics Press, ISBN 0-12-438380-7.
4. Maguire, D.J.; Goodchild, M.F.; Rhind, D.W. 1991. Geographical information System, Longman, London, UK.
5. Siddiqui, M.A.; 2006, Introduction to Geographical Information System, Sharda Pustak Bhayan, Allahabad.
6. Siddiqui, M.A.; 2011, Concepts and Techniques of Geoinformatics, Sharda Pustak Bhavan, Allahabad.
7. Devillers, R. and Jeansoulin (2006). Fundamentals of Spatial Data Quality. ISTE Ltd, United States.
8. Draper, N. and Smith, H. (1981). Applied Regression Analysis. Wiley, New York.
9. Hengl, H. (2007). A Practical Guide to Geostatistical Mapping of Environmental Variables. European Commission, Italy.
10. Sen, Z. (2009). Spatial Modeling Principles in Earth Sciences. Springer.


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Semester - I

Course Code: PGDRS – 04 (Lab – I)

UAV Images and Digital Image Processing

Credits: 03

Maximum Marks: 100

Internal Marks: 30

External Marks: 70

Time: 3 Hours

Note: Distribution of Marks is as under;

Exercise - 40

Record File - 20

Viva – voce - 10

1. For giving marks under Lab. Record college will maintain practical assessment record by using the following procedure: - Each student has to perform a minimum number of exercises/experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab Record.
2. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practicals will be entered. This record will be signed by the concerned teacher.
3. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

Exercises:

1. UAV Image Interpretation
2. Identification of objects and features from stereo-pairs UAV Images
3. Data products and reference system (IRS)
4. Data downloading (BHUVAN Portal, google earth engine, etc.)
5. Introduction to Image Processing Software
6. Image loading / Import of different satellite images format
7. Image georeferencing
8. Layer stacking
9. Creating subset
10. Mosaicking
11. Image Enhancement (Radiometric & Spectral)
12. Image Enhancement (Spatial)
13. Image classification & Preparation of LULC: supervised and unsupervised
14. Accuracy Assessment


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Suggested Readings:

1. Lillesand, T.M. and R.W. Kiefer, (1999), *Remote Sensing and Image Interpretation*, New York: Wiley.
2. Lillesand, T.M., Kiefer, R.W., and Chipman, J.W., (2004), *Remote Sensing and Image Interpretation*, Wiley.
3. Mathur, P.M., (1999), *Computer Processing of Remotely Sensed Images: An introduction*, Wiley, Chichester.
4. Mullar J.P. (1986), *Digital Image Processing in Remote Sensing*, Taylor & Francis.
5. Pratt, W.K., (1991), *Digital Image Processing 2nd ed.*, New York Wiley.
6. Schowengerdt, R.A., (1983), *Techniques for image processing and classification in Remote Sensing*, New York: Academic Press.
7. American Society of Photogrammetry, (1983), *Manual of Remote Sensing*, ASP Falls Church, Virginia.
8. Avery, T.E., and G.L. Berlin, (1992), *Fundamentals of Remote Sensing and Airphoto Interpretation*, Macmillan, New York.
9. Campbell, J.B., (1996), *Introduction to Remote Sensing*, Guilford, New York.
10. Joseph, G., (2005), *Fundamentals of Remote Sensing*, Universities Press Hyderabad.
11. Wolf, Paul. R. (1983), *Elements of Photogrammetry*, New York, McGraw-Hill


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Semester - I

Course Code: PGDRS – 05 (Lab – II)

Geographical Information Systems and GNSS

Credits: 03

Maximum Marks: 100

Internal Marks: 30

External Marks: 70

Time: 3 Hours

Note: Distribution of Marks is as under;

Exercise - 40

Record File - 20

Viva – voce - 10

1. For giving marks under Lab. Record college will maintain practical assessment record by using the following procedure: - Each student has to perform a minimum number of exercises/experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab Record.
2. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practicals will be entered. This record will be signed by the concerned teacher.
3. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.


Exercises:

1. Introduction to GIS software's
2. Scanning spatial data
3. Georeferencing: Key board entry, Image to image & using GPS
4. Reprojection of georeferenced image
5. Mosaicking
6. Creating subset
7. Creation of Geodatabase
8. Data input: digitization
9. Spatial data editing and cleaning
10. Attribute data entry and management
11. Data exploration and analysis
12. GIS Model and Modelling
13. Preparation of layout and printing of thematic map.
14. Working and surveying with GPS


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Department of Geographical Information Systems and GNSS
2024

Suggested Readings:

1. Burrough, P.A., 1986, Geographical Information System for land Resources System, Oxford Univ. Press, UK.
2. Fotheringham, S.; Rogerson, P. (ed.), 1994. Spatial Analysis and GIS. Taylor and Francis, London, UK.
3. Laurini, Robert and Dierk Thompson, 1992, Fundamentals of Spatial Information Systems, Academics Press, ISBN 0-12-438380-7.
4. Maguire, D.J.; Goodchild, M.F.; Rhind, D.W. 1991. Geographical information System, Longman, London, UK.
5. Siddiqui, M.A.; 2006, Introduction to Geographical Information System, Sharda Pustak Bhavan, Allahabad.
6. Siddiqui, M.A.; 2011, Concepts and Techniques of Geoinformatics, Sharda Pustak Bhavan, Allahabad.
7. Devillers, R. and Jeansoulin (2006). Fundamentals of Spatial Data Quality. ISTE Ltd, United States.
8. Draper, N. and Smith, H. (1981). Applied Regression Analysis. Wiley, New York.
9. Hengl, H. (2007). A Practical Guide to Geostatistical Mapping of Environmental Variables. European Commission, Italy.
10. Sen, Z. (2009). Spatial Modeling Principles in Earth Sciences. Springer.


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Semester - II

Course Code: PGDRS – 06

Application of Geospatial Tools in Resources Planning & Management

Credits: 04

Maximum Marks: 100

Internal Marks: 30

External Marks: 70

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of seven short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students are required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-1

1. Landuse/Land Cover: classification system (NRSC & Andersons), Landuse and Land cover mapping, Land use change
2. Urban Environment: Urban land use planning, urban sprawl, Cadastral mapping, solid waste management, urban information system.

Unit - 2

3. Agriculture: Crop type mapping, Crop monitoring, crop damage assessment, agriculture production forecasting.
4. Soil Resources Analysis: Soil survey and landuse planning, National soil Information system,

UNIT- 3

5. Forest resource analysis: Forest type, inventory and mapping, deforestation, agroforestry mapping.
6. Water resource analysis: Watershed, delineation of watershed and its management,

UNIT - 4

7. Geology and Geomorphology: Structural mapping and terrain analysis, Lineament extraction, shifting sand dunes,
8. Disaster Management: flood and drought mapping, weather forecasting and cyclone monitoring, Disaster damage assessment, Global warming.


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GGS Indraprastha Univ. Delhi

Suggested Reading

1. Remote sensing applications (2009), Published by NRSC, ISRO, Hyderabad, Chapters – 1 & 13.
2. Manfred Owe; Guido D'Urso (2005). Remote Sensing for Agriculture, Ecosystems, and Hydrology VII: Proceedings of SPIE Volume: 5976.
3. Applications of remote sensing in agriculture (1990) edited by M.D. Steven, J.A. Clark, Publisher – Butterworth, London.
4. Ustin, S. (2001). Manual of Remote Sensing, Volume 4, Remote Sensing for Natural Resource Management and Environmental Monitoring, 3rd Edition, Willey Publishing.
5. Encyclopedia of Soil Science - Second edition (2010) Edited by Rattan Lal, Publisher – Taylor & Francis.
6. Bala Krishnan P. "Issues in Water Resources Development and Management & the role of Remote Sensing", Technical Report ISRO-NNRMS-TR-67-86, NNRMS, ISRS, India.
7. Beven, K.J. (2001). "Rainfall-runoff modelling: the primer". John Wiley and Sons, UK.
8. Chow V.T., Maidment D.R. and Mays L.W. (1988). "Applied Hydrology", McGraw-Hill, New York.
9. Engman E.T. and Gurney R.J (1991). "Remote sensing in Hydrology", Chapman & Hall, London.
10. Gregory K.J., Walling D.E. (1973). "Drainage Basin Form and Process: A Geomorphological approach", Edward Arnold Ltd., U.K.
11. Isobel W. H. (2009). "Integrated watershed management: principles and practice" John Wiley and Sons, U.K.
12. Levizzani V., Bauer P. and Joseph Turk F. (eds.) (2007). "Measuring Precipitation from space EURAINSAT and the Future", Published by Springer, P.O. Box 17,3300, AA Dordrecht, The Netherlands.
13. Maidment D.R., (2002). "Arc Hydro: GIS for Water Resources", ESRI Press, Redlands CA, USA.
14. Michaelides S. (ed.) (2008). "Precipitation: Advances in Measurement, Estimation and Prediction". Published by Springer-Verlag, Berlin, Heidelberg.
15. Ellen M. van Bueren, Hein van Bohemen, Laure Itard, Henk Visscher. Sustainable Urban Environments: An Ecosystem Approach.
16. George Z. Xian. Remote Sensing Applications for the Urban Environment.
17. Xiaojun Yang. Urban Remote Sensing: Monitoring, Synthesis and Modeling in the Urban Environment.
18. P.S. Roy (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing (IIRS), 2000.
19. Spatial Technologies for Natural Hazard Management. Proceedings of ISRS National Symposium, Nov.21-22, 2000, IIT, Kharagpur.


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Semester - II

Course Code: PGDRS – 07 (Project Work)

Credits: 08

Maximum Marks: 200

Internal Marks: 60

External Marks: 140

Time: 3 Hours

Note: Distribution of Marks is as under;

Evaluation of Report: 70

Presentation: 40

Viva – Voce: 30

In this paper, individual students or groups of two to three students will be expected to produce a project report using different remote sensing and GIS techniques learnt through the course in GIS software under the supervision of a faculty member from among the teachers engaged in the teaching of this course as per the student's choice. The topic of the project has to be proposed by the candidate at the beginning of the second semester. They will choose a study area and theme and will collect data for it. Project Report will be submitted in typed form (with text typed in double line spacing in font size 12 on A4 size paper with one inch margin on all sides) around 75 pages having following components;

- I. Introduction
- II. Data and Methodology
- III. Data representation and analysis
- IV. Discussion
- V. Summary and conclusion

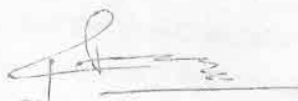
The major findings of the project will be presented by the candidate before evaluator / examiner on a date decided by the University.



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Suggested Readings:

1. Anderson, Janathan; Durston, Berry H; and Poole, Millicent. 1970 (or latest). *Thesis and Assignment Writing*. New Delhi: Wiley Eastern Limited.
2. Day, Robert A. 1995. *How to Write and Publish a Scientific Paper (4th Ed.)* (Cambridge Low Price Edit ion), Cambridge University Press.
3. Gibaldi, Joseph. 2000. *MLA Handbook for Writers of Research Papers (5th Ed.)*. New Delhi: Affiliated East-West Press Pvt. Ltd.
4. Panneerselvam, R. 2006. *Research Methodology*. (Eastern Economy Edit ion). New Delhi: Prent ice-Hall of India, Private Limited.
5. University of Chicago Press. 1996. *The Chicago Manual of Style (14th Ed.)*. New Delhi: Prent ice-Hall of India, Private Limit ed.



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