PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE

MARGAO – GOA 403601

POST GRADUATE DEPARTMENT OF GEOGRAPHY

POST GRADUATE DIPLOMA

In

GEOINFORMATICS

Course Code	Course Title	Marks	Credits
Semester I		Theory and Practical components 50+50	T&P(2+2=4)
PGD-GIS-C1	Basics of GIS and GPS	**100**	**4**
PGD-GIS-C2	Basic of RS and Photogrammetry	**100**	**4**
PGD-GIS-C3	Geostatistics	**100**	**4**
PGD-GIS-E1		**100**	**4**
PGD-GIS-E2		**100**	**4**
Total		**500**	**20**
Semester II			
PGD-GIS-C4	Spatial Analysis and modeling	**100**	**4**
PGD-GIS-C5	Advanced Remote Sensing and GIS	**100**	**4**
PGD-GIS-E1		**100**	**4**
PGD-GIS-E2		**100**	**4**
PGD-GIS-E3		**100**	**4**
Total		**500**	**20**
Elective subject			
PGD-GIS-E1	Principles of Computer and Programming	**100**	**4**
PGD-GIS-E2	Digital Cartography		
PGD-GIS-E3	Digital Image Processing	**100**	**4**
PGD-GIS-E4	GIS for Environmental Management	**100**	**4**

PGD-GIS-E5	Application of GIS in Agriculture and Soil	**100**	**4**
PGD-GIS –E6	Pilot project,field work and tour	**100**	**4**

Note:

1) Each course will have six instructional contact hours consisting of two hours of theory and four hours of practical.

2) Total Marks: 1000 (entire course is divided into 10 papers consisting 100 marks each.

3) Each semester will consist of 20 credits (1 credit 25 marks) 2 credits for theory and 2credits for practical.

- C 1, C2, C3, C4,C5 - Core Subject Compulsory
- E 1,E2,E3,E4,E5,E6, - Elective Subject Optional

Semester - I
Core
Course Title: BASIC OF GIS AND GPS
Course code: PGD-GIS-C1
Credits: 4
Marks: 100
Duration 90 hours
Prerequisite courses: NIL

Course objective -

1. The course focuses on the fundamentals concept Geographical Information System, and Global Positioning System
2. Introducing the spatial data, non- spatial data, hardware and software used in collection, processing and analysis of geospatial data.

Course Learning Outcome: After successfully completion of this course, students will be able to:

CLO1: Students will demonstrate proficiency and conceptual understanding in using software and automated techniques to carry out thematic maps and analysis through a series of laboratory exercises and creation of reports.

CLO2: Personal effectiveness and workplace competencies are practiced through engagement in discussion boards, following course guidelines, and interactions with the instructor and other students in the class.

CLO3: To be able use these skills to identify and analyzed real world problem and preparing them for a successful career in geospatial industry and research institute.

CLO4: Develop an tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach

No	Topic	Credits	
		L 24	P 48
I	**Introduction to GIS** • History and development. • Components and Applications trends of GIS. • Data models: vector and raster • Data type, structure, Spatial and attribute, point, line, polygon- arc, nodes, vertices, and topology. Attribute data. • Data processing systems, input and output devices, editing and attributing and linking	1	1

II	**Spatial dada inputs** • Digitization • Error identification • Types and sources of error • Correction editing and topology building	**1**	**1**
III	**Introduction to GPS** • History of Positioning System GPS System Description, Error Sources & Receiver • Introduction to DGPS and Total Station, GPS Performance and Policy Applications • Introduction to open source GIS		
		2	**2**

Reference book

Mandatory

1. Burrough, P.A. and McDonnell, R.A. (1998) Principles of geographical information systems. Oxford University Press, Oxford, 327 pp.
2. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
3. Chang, K. (2007) Introduction to Geographic Information System, 4th Edition. McGraw Hill.

Supplementary

1. Curran Paul J Principles of Remote Sensing UK: ELBS,
2. Elangovan, K (2006) GIS: Fundamentals, Applications and Implementations. New India Publishing Agency, New Delhi"208 pp.
3. Heywood, I., Cornelius, S., and Carver, S. (2006) An Introduction to Geographical Information Systems. Prentice Hall. 3rd edition.
4. Jensen, J.R. (2000). Remote sensing of the environment: an Earth resource perspective. Prentice Hall. ISBN 0-13-489733-1.
5. Joseph, GeorgeFundamentals of Remote Sensing Universities Press India
6. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2003). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
7. Thurston, J., Poiker, T.K. and J. Patrick Moore. (2003) Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging. Hoboken, New Jersey: Wiley.
8. Wise, S. (2002) GIS Basics. London: Taylor & Francis.

Web references

1) https://www.nrsc.gov.in/
2) https://www.iirs.gov.in/
3) http://www.undp.org/popin/wdtrends/wdtrends.htm
4) https://www.isprs.org/proceedings/xxxiii/congress/part7/1609_XXXIII-part7.pdf

5) http://www.tric.u-tokai.ac.jp/ISPRScom8/TC8/TC8_CD/headline/JAXA_Special_Session%20-%206/JTS64_20100608144600.pdf
6) https://www.semanticscholar.org/paper/Role-of-Remote-Sensing-in-Disaster-Management-Nirupama-Simonovic/da84562b2057ca5866d933d47ee8815a06f0229c\

Semester - I
Core
Course Title: BASIC OF REMOTE SENSING AND PHOTOGRAMMERY
Course code: PGD-GIS-C2
Credits: 4
Marks: 100
Duration 90 hours
Prerequisite courses: NIL
Course objective

1. Give foundational knowledge about remote sensing and its types and different sensors used for remote sensing which will focus on comprehension of the physical, computational, and perceptual basis for remote sensing.
2. Gain familiarity with a variety of physical, biological, and human geographic applications of remote sensing.
3. Gain basic experience in the hands-on application of remote sensing data through visual interpretation and digital image processing exercises.

Course Learning Outcome

After successful completion of a course in student will be able

CLO1: Students will be able to understand the concept of remote sensing and EMR apart from this basic level of fundamental physical principles of remote sensing.

CLO2: To be able use these skills to identify and analyzed real world problem and preparing them for a successful career in geospatial industry and research institute

CLO3: Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

CLO4: Develop an tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach.

No	**Topic**	**credits**	
		T24	**P48**
I	**Fundamental of Remote Sensing** • Introduction, History, development, • stages of remote sensing, EMR & EMR spectrum, EMR Quantities, Energy sources and radiation principles, • Theories of EMR, Concept of Energy interactions in the atmosphere, energy Black body, atmospheric windows	**1**	**1**

	• types of remote sensing interactions with the earth surface features, Spectral reflectance of vegetation, Soil and water,		
II	**Platform, Orbit and sensor** • Platform: Ground based, air-borne, space-borne, • Orbit: Geostationary satellite and polar orbiting satellite, Sensor: • Types of sensor and cameras, processes of sensor & its characteristics, Whiskbroom and Push broom cameras		
III	**Techniques of interpretation** • Aerial photo interpretation, satellite image interpretation, • Recognition elements: Tone, Color, Texture, Pattern, Shape, Size and associated features	**1**	**1**
IV	**Aerial photography** • Types, Geometry, Scale, Height and Process of Aerial Photograph, • basic requirement of Aerial Photograph, planning & execution of photographic flight, aerial cameras, relief displacement, • stereo vision, stereo model & stereoscope, parallax & parallax measurement		
		2	**2**

References books

Mandatory

1. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
2. Curran Paul, J. (2000) Principles of Remote Sensing UK: ELBS.
3. Joseph, George (2007) Fundamentals of Remote Sensing Universities Press India
4. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2007). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.

Supplementary

1. Moffitt, F. H. (2000). Photogrammetry. 3rd Ed, Harper & Row, NY.
2. Sabins Floyd F Remote Sensing: Principles and Interpretation New York: WH Freeman and Company
3. Wolf, P. R. (2004). Elements of Photgrammetry. McGraw-Hill, NY.
4. Zorn, H. C. (2006). Introductory Course in Photogrammetry. 6th Ed. ITC, Netherlands.

Web references

1) https://www.nrsc.gov.in/
2) https://www.iirs.gov.in/
3) http://www.undp.org/popin/wdtrends/wdtrends.htm
4) https://www.isprs.org/proceedings/xxxiii/congress/part7/1609_XXXIII-part7.pdf

5) http://www.tric.u-tokai.ac.jp/ISPRScom8/TC8/TC8_CD/headline/JAXA_Special_Session%20-%206/JTS64_20100608144600.pdf

Semester - I
Core 3
Course Title: GEOSTATISTICS
Course code: PGD-GIS-C3
Credits: 4
Marks: 100
Duration 90 hours
Prerequisite courses: NIL
Course objective

1. The course is designed to process geospatial data and use of statistics in the field of GIS.
2. The course focuses on the development of the skills using statistical techniques in understanding, organizing, interpolation, analyzing and interpretation of geostatistical data and to develop the firm foundation to apply it in various fields.

Course Learning Outcome

After successful completion of a course in student will be able

CLO1: After completion of the course students will understand various types of datasets and applying different statistical techniques to different data sets.

CLO2: This will systematically access, analyze and evaluate information and ideas from multiple sources in order to identify underlying assumptions, and formulate conclusions. The course will enhance skills like solving quantitative problems and statistical queries.

CLO3: Develop an tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach.

CLO4: Workplace competencies are strengthened as students apply the analytical and evaluative tools to GIS mapping and apps

No	Topic	Credits	
		T 24	P48
I	**Introduction to Statistics** • Statistical and Graphical foundation, data classification • Integrated approach, advantages and disadvantages. • Data type and structure. • 3D grid data geometry and association	1	1
II	**Basic statistics** • Measurement and summary, distribution, covariance and correlation, transformations, data analysis, display and sampling. • Prediction and interpolation : spatial interpolation,	1	1

	• Spectral analysis: linear sequences, Gilgai transect, power spectra and Caragabaltransact(bandwidth and confidence interval)		
III	Geostatistical uncertainty, probability and reliability • Data management for Geostatistics • Applications of Geostatistics		
		2	**2**

Reference Books:

Mandatory

1. Simon W. Houlding, (2000) Practical Geostatistics: Modeling and Spatial Analysis, Springer, Berlin

supplementary

1. Ricardo A. Olea (2001) Geostatistics for Engineers and Earth Scientist, Kluwer Academic Publishers, Boston
2. Richard Webstar and Margaret A. Oliver: Geostatistics for Environmental Scientists, Statistics in Practice (2nd ed) J. Wiley
3. Ott, T. and Swiaczny, F. (2001). Time-integrative GIS. Management and analysis of spatio-temporal data. Berlin / Heidelberg / New York: Springer.
4. Thurston, J., Poiker, T.K. and J. Patrick Moore. (2003). Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging. Hoboken, New Jersey: Wiley.
5. Roy, P.S. (2006). Geoinformatics for Tropical Ecosystems Bishen Singh Mahendra Pal Singh, Dehradun

Web references

1. **https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/**
2. **https://www.esri.com/en-us/home**
3. **https://www.intergraph.com/**
4. **https://www.sac.gov.in/Vyom/index.jsp**
5. **https://bhuvan.nrsc.gov.in/bhuvan_links.php**
6. **https://glovis.usgs.gov/**
7. **https://www.nrsc.gov.in/EO_Agr_Objective**
8. **https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en**
9. **https://www.iirs.gov.in/**

Semester - I

Elective

Course Title: PRINCIPLES OF COMPUTER AND PROGRAMMING

Course code: PGD-GIS-E1

Credits: 4

Marks: 100

Prerequisite courses: NIL

Course objective

1. The course will explore the Application of computer in the field of GIS, DBMS and programming for GIS customization.
2. The main focus is on introduction to computers-DBMS, basics of programming languages.

Course Learning Outcome.

After successful completion of a course in student will be able

CLO1: Students will demonstrate proficiency and conceptual understanding in data creation and storage, languages or manuscripts techniques to carry out geographical data for developing and designing application and use of Programming in GIS.

CLO2: To be able use these skills to identify and analyzed real world problem and preparing them for a successful career in gis industry and research institute.

CLO3: Develop an tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach.

CLO4: Workplace competencies are strengthened as students apply the analytical and evaluative tools to geospatial mapping and apps

Details of course contents and allotted time

No	**Topic**	**Credits**	
		T24	**P48**
I	**Introduction to Computers** • Hardware and Software, System requirement, configuration and operating systems and Computer Applications • Algorithms and Programming in Computers • MS ACCESS and applications	**1**	**1**
II	**Introduction to simple programming in C** • Developing programming techniques and solutions for spatial algorithms and problem-solving using VB • Getting started with HTML, flash	**1**	**1**

III	**Introduction to Python**		
		2	**2**

Reference Books:

Mandatory

1. Benjamin C. Pierce (2002). Types and Programming Languages, The MIT Press.
2. Bruce J. MacLennan (1999). Principles of Programming Languages: Design, Evaluation, and Implementation, Oxford University Press.

Supplementary

1. Daniel P. Friedman and Mitchell Wand (2001). Christopher Thomas Haynes: Essentials of Programming Languages, The MIT Press.
2. David Gelernter and Suresh Jagannathan (2008). Programming Linguistics, The MIT Press.
3. Goldschlager, L. (2006). A Lister Computer Science - a modern Introduction Prentice Hall, 1988.
4. John C. Mitchell (2002). Concepts in Programming Languages, Cambridge University Press.
5. Michael L. Scott (2005). Programming Language Pragmatics, Morgan Kaufmann Publishers.
6. Ravi Sethi (1996). Programming Languages: Concepts and Constructs, 2nd ed., Addison-Wesley.
7. James S. McKeown (2010), Programming in Visual Basic 2010: The Very Beginner's Guide
8. Richard Mansfield (2003), Visual Basic .NET All in One Desk Reference for Dummies

Web references

1. **https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/**
2. **https://www.esri.com/en-us/home**
3. **https://www.intergraph.com/**
4. **https://www.sac.gov.in/Vyom/index.jsp**
5. **https://bhuvan.nrsc.gov.in/bhuvan_links.php**
6. **https://glovis.usgs.gov/**
7. **https://www.nrsc.gov.in/EO_Agr_Objective**
8. **https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en**
9. **https://www.iirs.gov.in/**

Semester - I
Elective
Course Title: DIGITAL CARTOGRAPHY
Course code: PGD-GIS-E2
Credits: 4
Marks: 100
Duration 90 hours
Prerequisite courses: NIL
Course objective

1. The course gives emphasis on the art, science, and technologies of cartography and Photogrammetry.
2. It develops the user's ability to understand how maps are created traditionally and digitally. Representation and communicate spatial phenomena and their relationships through photogrammetric perspective which emphasis on skills like making of map, map reading signs and symbols etc..

Course Learning Outcome

After successful completion of a course in student will be able

CLO1: Students will understand different types of projections and datum used in various locations. Proficiency and conceptual understanding in using Manual and computer techniques to carry out thematic maps and special purpose maps.

CLO2: Remote sensing, image processing and analysis through a series of laboratory exercises and report

CLO3: Be able to demonstrate proficiency in quantitative reasoning and analytical skills

CLO4: Acquire of fundamental and advanced knowledge of the different aspect in cartography with the means ability to specialize in a specific field.

Details of course contents and allotted credits

No	**Topic**	**Credits**	
		T 24	**P 48**
I	**Introduction to Cartography** • Basics of Map • Fundamentals of direction, scale, types, sources • Elementary geodesy- Datum and Projection • Projection coordinates • WGS 84	**1**	**1**
II	**Thematic Cartography Characteristics of geographical phenomena** • Principles of colour perception • Colour scheme for Univariate choropleth and Isorithmic maps,		

	proportional symbol mapping • Interpolation methods for smooth continuous phenomena symbolizing smooth continuous phenomena. Dot and asymmetric mapping		
III	**Geographic representation** • Map and mapping, map design, symbolization, conventional signs • map layout, map referencing and indexing, scale of maps and map contents • Field work techniques, socio – economic survey and attribute data.	**1**	**1**
		2	**2**

Reference Books:

Mandatory

1. ESRI. 2004. ESRI Cartography: Capabilities and Trends. Redlands, CA. White Paper

supplementary

1. Kraak, Menno-Jan and Allan Brown (2001): Web Cartography – Developments and prospects, Taylor & Francis, New York, ISBN 0-7484-0869-X.
2. MacEachren, A.M. (2001). Some Truth with Maps: A Primer on Symbolization & Design. University Park: The Pennsylvania State University. ISBN.
3. Monmonier, Mark (2005). How to Lie with Maps. Chicago: University of Chicago Press. ISBN 0-226-53421-9.
4. Monmonier, Mark (2005). Mapping It Out. Chicago: University of Chicago Press. ISBN.
5. Pickles, John (2003). A History of Spaces: Cartographic Reason, Mapping, and the Geo-Coded World. Taylor & Francis. ISBN 0-415-14497-3
6. Sircar, D.C.C. (January 2005). Studies in the Geography of Ancient and Medieval India. Motilal Banarsidass Publishers. ISBN 8120806905.
7. Slocum, T. (2003). Thematic Cartography and Geographic Visualization. Upper Saddle River, New Jersey: Prentice Hall. ISBN 0-130-35123-7. Wilford, John Noble (2000). The Mapmakers. Vintage Books. ISBN 0-375-70850-2.

Web references

1. **https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/**
2. **https://www.esri.com/en-us/home**
3. **https://www.intergraph.com/**
4. **https://www.sac.gov.in/Vyom/index.jsp**
5. **https://bhuvan.nrsc.gov.in/bhuvan_links.php**
6. **https://glovis.usgs.gov/**
7. **https://www.nrsc.gov.in/EO_Agr_Objective**

8. **https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en**

Semester - II
Core
Course Title: SPATIAL ANALYSIS AND MODELING
Course code: PGD-GIS-C4
Credits: 4
Marks: 100
Duration 90 hours
Prerequisite courses: NIL
Course objective

1. The course focuses on fundamental aspects of spatial data modeling specifically on the aspect of two dimensional and three-dimensional (3D) modeling, structuring of raster and vector analysis and its types.
2. It also looks into integration of non-spatial data and its application.

Course Learning Outcome

After successful completion of a course in student will be able

CLO1: Student will able to apply spatial tool and techniques in spatial datasets for carry out Surface and 3d analysis.

CLO2: Students will demonstrate proficiency and conceptual understanding spatial model making process.

CLO3: Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

CLO4: Acquire of fundamental and advanced knowledge of the different aspect in Geoinformatics with the means ability to specialize in a specific field.

No	Topic	Credits	
		T24	P 48
I	**Introduction to analysis.** • Significance of spatial analysis, overview of tools for analysis **Spatial analysis of Vector Base** • Overlay operations: point in polygon, line polygon, polygon in polygon, Single layer operations, features identification, extraction, classification and manipulation, Multilayer operations: union, Intersection, difference **Spatial analysis of raster base** • Map algebra, grid-based operations, local, focal, zonal and global functions, cost surface analysis, optimal path and proximity search.	1	1
II	**Analysis**	1	1

	• Network Analysis- Concept of network analysis, Types of network analysis, Evaluation of network complexity using Alpha, Gama indices, Network data model • Point pattern- Method for evaluating point patterns, Clustered and random distribution • Surface analysis- Interpolation method, DEM, TIN, variance filter, slope and aspect, relief and hill shading		
III	**Spatial modeling** • Role of spatial model, explanative, predictive and normative models, handling complex spatial query, case studies.		
		2	**2**

Reference Books:

Mandatory

1. Alias A. Rahman and Morakot Pilouk (2008) Spatial Data Modeling for 3D GIS, Springer New York
2. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2005). Geographic Information Systems and Science. Chichester: Wiley. 2nd edition.

Supplementary

1. Ott, T. and Swiaczny, F. (2001). Time-integrative GIS. Management and analysis of spatio-temporal data. Berlin / Heidelberg / New York: Springer.
2. Thurston, J., Poiker, T.K. and J. Patrick Moore. (2003). Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging. Hoboken, New Jersey: Wiley.
3. M Goodrich (2000). Data Structures and Algorithms in Java, 2nd Edition Wiley.
4. Malczewski, J. (1999). GIS and Multi-criteria Decision Analysis. New York: John Wiley and Sons
5. GIS and Multi-criteria Analysis by Makrewski Jacek, USA, 2001.
6. Principals of GIS by Burrough P.A. MacDonneli R.A. published by Oxford University Press, 2000.
7. Geographical Information Science, vol. I by Roy P.S. Published by IIRS, 2000.
8. Fundamentals of Geographic Information Systems, 2nd Edition by Demers M.N. published by John Wiley & Sons 2000

Web references

1. **https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/**
2. **https://www.esri.com/en-us/home**
3. **https://www.intergraph.com/**
4. **https://www.sac.gov.in/Vyom/index.jsp**
5. **https://bhuvan.nrsc.gov.in/bhuvan_links.php**
6. **https://glovis.usgs.gov/**
7. **https://www.nrsc.gov.in/EO_Agr_Objective**
8. **https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en**
9. **https://www.iirs.gov.in/**

Semester - II
Core
Course Title: ADVANCED REMOTE SENSING AND GIS
Course code: PGD-GIS-C5
Credits: 4
Marks: 100
Duration 90 hours
Prerequisite courses: NIL

Course objective

1. The course will provide latest state of art in remote sensing and GIS technology.
2. It will provide an opportunity to understand and work with latest developments remote sensing data base and GIS technology.

Course Learning Outcome

After successful completion of a course in student will be able

CLO1: Students will be able to apply mathematical relationships (at a pre-calculus level) describing fundamental physical, geometric, and computational principles relevant to remote sensing and GIS.

CLO2: They will create Remote sensing application

CLO3: Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

CLO4: Acquire of fundamental and advanced knowledge of the different aspect in Geoinformatics with the means ability to specialize in a specific field.

No	Topic	Credits	
		T24	P48
I	**Advanced Remote Sensing** • Microwave Remote Sensing • Thermal Remote Sensing • Hyper spectral Remote Sensing • LiDAR & Drone	1	1
II	**Advancement in GIS** • Participatory GIS and Mobile GIS • WebGIS (ArcIMS, MapServer, Geomedia, MapGuide • GIS servers, Intermediate software and Distributed GIS systems	1	1
III	**Multi-criteria decision-making analysis –** • Ranking • Rating		

	• Pair wise comparison **Fuzzy logic**		
		2	**2**

Reference Books:

Mandatory

1. Asrar Ghassem (2004) Theory and applications of optical remote sensing New York: John Wiley and Sons.
2. *Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2003). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.*
3. Malczewski, J. (*2001).* GIS and Multicriteria Decision Analysis. New York: John Wiley and Sons

Supplementary

1. Mitchel, Tyler (2005): WebMapping Illustrated, O'Reilly, Sebastopol, 350 pages, ISBN 0-569-00865-1. This book discusses various Open Source WebMapping projects and provides hints and tricks as well as examples.
2. Ott, T. and Swiaczny, F. (2001) Time-integrative GIS. Management and analysis of spatio-temporal data, Berlin / Heidelberg / New York: Springer.
3. Peterson, Michael P. (ed.) (2003): Maps and the Internet, Elsevier, ISBN 0-08-044201-3.
4. Skolnik, Merrill I. (2001). Introduction to Radar Systems, McGraw-Hill (ISBN 0-07-066572-9.
5. Thurston, J., Poiker, T.K. and J. Patrick Moore. (2003) Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging. Hoboken, New Jersey: Wiley.
6. Worboys, Michael, and Matt Duckham. (2004) GIS: a computing perspective. Boca Raton: CRC Press.

Web references

1. **https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/**
2. **https://www.esri.com/en-us/home**
3. **https://www.intergraph.com/**
4. **https://www.sac.gov.in/Vyom/index.jsp**
5. **https://bhuvan.nrsc.gov.in/bhuvan_links.php**
6. **https://glovis.usgs.gov/**
7. **https://www.nrsc.gov.in/EO_Agr_Objective**
8. **https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en**
9. **https://www.iirs.gov.in/**

Semester - II
Elective
Course Title: DIGITAL IMAGE PROCESSING
Course code: PGD-GIS-E3
Credits: 4
Marks: 100
Duration 90 hours
Prerequisite courses: NIL

Course objective

1. This course will introduce fundamental technologies of digital image processing i.e. compression, information extraction and analysis.
2. Students will also gain understanding of algorithm, analytical tools, and practical implementations of various digital image applications.

Course Learning Outcome

After successful completion of a course in student will be able

CLO1: Students will demonstrate proficiency and conceptual understanding in using software or manual techniques which will prove how digital technology has come over traditional technology to carry out remote sensing image processing and analysis through a series of laboratory exercises and reports

CLO2: Acquire of fundamental and advanced knowledge of the different aspect in DIP with the means ability to specialize in a specific field.

CLO3: Workplace competencies are strengthened as students apply the analytical and evaluative tools to GIS mapping and apps

CLO4: Be able to demonstrate proficiency in quantitative reasoning and analytical skills

No	Topic	Credits	
		T24	P48
I	**Introduction to Digital Image Processing** • Visual perception, Image sensing and acquisition, • Digital Data Formats Image sampling and Quantization • Basic relationship between pixels. • Development, scope and fundamental steps involved in Digital Image Processing, components of Image Processing	1	1
II	**Image Rectification** • Radiometric and Atmospheric Correction • Geometric Correction, Ortho-rectification, calibration and rectification of photo and images, • Image enhancement in spatial domain and frequency domain, Filtering, Fourier Transform, Noise removal	1	1

III	**Multispectral Image Processing** • Colour Image processing, slicing, Image compression, dilation, Segmentation, Spectral rationing, density slicing and image fusion • Object recognition, classification, object recognition, feature extraction, accuracy, assessment, change detection Accuracy Assessment and integration with GIS		
		2	**2**

Reference Books:

Mandatory

1. Burger, Wilhelm; Mark J. Burge (2007). Digital Image Processing: An Algorithmic Approach Using Java. Springer. ISBN 1846283795.
2. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.

Supplementary

1. Damen MCJ, Sicco Smith G and Kerstappen (Ed) (2001). Remote Sensing for Resources Development and Environmental Management 3rd.volume Set Netherlands: Balkema
2. Gonzalez, Rafael C.; Richard E. Woods (2003). Digital Image Processing. ISBN 0-201-50803-6.
3. Jensen John R (2007). Introductory Digital Image processing: Remote Sensing Perspective New Jersey: Prentice Hall
4. Joseph, George (2007). Fundamentals of Remote Sensing Universities Press India
5. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2007). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
6. Pratt, William K. (2004). Digital Image Processing. ISBN 0-471-01888-0.
7. Romeny, Bart M. (2003). Front-End Vision and Multi-Scale Image Analysis. ISBN1-4020-1507-0.
8. Umbaugh, Scott E (2005). Computer Imaging: Digital Image Analysis and Processing. ISBN 0-84-932919-1

Web reference

1. **https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/**
2. **https://www.esri.com/en-us/home**
3. **https://www.intergraph.com/**
4. **https://www.sac.gov.in/Vyom/index.jsp**
5. **https://bhuvan.nrsc.gov.in/bhuvan_links.php**
6. **https://glovis.usgs.gov/**
7. **https://www.nrsc.gov.in/EO_Agr_Objective**
8. **https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en**
9. **https://www.iirs.gov.in/**

Elective
Course Title: GIS for Environment MANAGEMENT
Course Code:PGD-GIS-E4
Credits: 04
Marks: 100
Duration 90 hours

Prerequisite course: NIL
Course objective

1. The course is aimed to introduce the concept of land, water and coastal management. Taxation and to learn how GIS can be applied in resource management sector.

Course Learning Outcome: After successfully completion of the course, students will be able to

CLO1: Understanding importance of nature resources and its categorizes
CLO2: To be able use these skills to identify and analyzed real world problem and preparing them for a successful career in geospatial industry and research institute
CLO3: Acquire of fundamental and advanced knowledge of the different aspect in Geoinformatics with the means ability to specialize in a specific field.
CLO4: Develop a tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach.

Details of course contents and allotted time

No.	Topic	**Credits**	
		T24	**P48**
1	• Spatial approach in forest resource Management • Cadastral Mapping, Land Registration Workflow, Parcel management, Land Parcel Data Model, data capture, data management and processing	1	1
2	• Land Capability Mapping and Limitations, Public Access, Land classifications, Land use planning, Taxation		
3	• Water Resources- Watershed Management, Flood management and Damage Assessment, Zone Mapping, Groundwater recharge mapping, Water Quality, Watershed Erosion Modeling	1	1

4	• Coastal Zone management, Fisheries, Coral Reefs, Navigation, data storage and access, analysis		
	Total	2	2

Reference Books:

Mandatory

1. Michael G. Wing, Pete Bettinger (2008),Geographic Information Systems: Applications in Natural Resource Management, Oxford University Press, USA

Supplementary

1. Ali S.A. Resources for Future Economic Growth, Vikas Publications House, New Delhi, 2004
2. Ress J. Natural Resources, Allocation, Economics & Policy, Rout Ledge, London, 2007.
3. Turner R.K. Sustainable Environmental Management, Belhaven Press, London, 2000.
4. Nancy von Meyer (2004), GIS and Land Records, ESRI press
5. Laura Lang (2004), Managing Natural Resources with GIS, ESRI Press, ISBN 1-879102-53-6
6. Roger Tomlinson (2007), Thinking about GIS, ESRI Press
7. John G. Lyon (2002). GIS for Water Resource and Watershed Management, Taylor & Francis

Web reference

1. ISO TC 211 (2003) ISO TC 211 homepage. http://www.isotc211.org
2. OGC (2003) The Open Geospatial Consortium Homepage, http://www. opengeospatial.org
3. Open Geospatial Consortium Inc. http://www.opengeospatial.org/docs/02-058.pdf
4. ISO/IEC DIS 14772, 1997, The Virtual Reality Modeling Language: (VRML 97), http://www.vrml.org/technicalinfo/specifications/vrml97/index.htm
5. VRML-Streaming Working group, http://www.web3d.org/WorkingGroups/vrml-streams/

Elective
Course Title: APPLICATION OF GIS IN AGRICULTURE &SOIL
Course Code:PGD-GIS-E5
Credits: 04
Marks: 100
Duration 90 hours

Prerequisite NIL

Course objective

1. The course is aimed to introduce the concept of Agriculture, Soil and land management.
2. To Develop model and decision support system for different Agriculture system.

Course Learning Outcome: After successfully completion of the course, students will be able to

CLO1: Understanding importance of Agriculture resources and its categories.
CLO2: To be able use these skills to identify land use and land cover problem.
CLO3: Develop and built application in agriculture sector.
CLO4: Critically think geospatial technology aspect.

Details of course contents and allotted time

No.	Topic	**Credits**	
		T 24	**P48**
1	**Agriculture** -Spectral characteristic of crop, crop inventory, crop yield modeling, crop water management, agro ecological zoning	1	1
2	**Soil** – crop acreage and production estimation model, ground water potential zone, recharge and identification		
3	**Land** -Land evaluation, physiographic soilmapping, soil type identification, soil moisture mapping	1	1

4	**Case study-** Review case studies in Geosciences, Water Recourse, Agriculture, Soil		
	Total	2	2

Reference Books:

Mandatory

1. Vincent RK (2000) Fundamentals of Geological and Environmental Remote Sensing New Jersey: Prentice Hall

Supplementary

1. Cracknell A P(ed) (2000) Remote Sensing in Meteorology, Oceanography and Hydrology. Chichester: Ellis Horwood Limited
2. Damen MCJ, Sicco Smith G and Kerstappen(Ed) (2004) Remote Sensing for Resources Development and Environmental Management 3rd.volume Set Netherlands: Balkema
3. Jensen, J.R. (2000). Remote sensing of the environment: an Earth resource perspective. Prentice Hall. ISBN 0-13-489733-1.
4. Kondratyev K Ya, Buznitov AA and Pokrovoky OM (2000). Global Change and Remote Sensing: John Wiley and Sons.
5. Roy, P.S. Geoinformatics for Tropical Ecosystems Bishen Singh Mahendra Pal Singh, Dehradun
6. Skidmore Andrew (2000) Environmental Modeling with GIS and Remote Sensing Taylor and Francis
7. Steven MD and Clark JA (2001). Applications of Remote Sensing in Agriculture London Butterworths.

Web reference

1. **https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/**
2. **https://www.esri.com/en-us/home**
3. **https://www.intergraph.com/**
4. **https://www.sac.gov.in/Vyom/index.jsp**
5. **https://bhuvan.nrsc.gov.in/bhuvan_links.php**
6. **https://glovis.usgs.gov/**
7. **https://www.nrsc.gov.in/EO_Agr_Objective**
8. **https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en**
9. **https://www.iirs.gov.in/**

Semester - II

Elective

Course Title: pilot project, fieldwork and tour

Course code: PG-DGIS-E6

Credits: 4

Marks: 100

Duration 90 hours

Prerequisite courses: NIL

Course objective

1. The course is designed to develop field and Survey techniques using different survey instruments and Interpretation of topo sheets and maps.
2. This includes field techniques and importance of field survey in GIS.

Course Learning Outcome

After successful completion of a course in student will be able

CLO1: Students will describe a survey method and different instruments and it's assembled and summarize relevant survey for relevant work which will skill development in using different instruments.

CLO2: Report writing and Interpretation of Maps will focus on writing skills.

CLO3: Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

CLO4: Acquire of fundamental and advanced knowledge of the different aspect in Geoinformatics with the means ability to specialize in a specific field.

Details of course contents and allotted time

No.	Topic	Credits	
		L 24	P 48
I	**Introduction to Field Survey** • Importance of field instrument survey - scope and purpose, principles and application of selected survey instruments.	1	1

II	**Chain and Plane Table Survey** • Chain survey: use of tapes-open traverse, triangulation survey; Plane table; plan preparation, • resection -one point and two point problem; three • point problem; tracing paper method.		
III	**Dumpy level, Auto level and Theodolite Survey** • Dumpy level: traverse survey, contour plan preparation. Theodolite - horizontal, land vertical (height) measures, accessible and inaccessible method.	1	1
IV	**Village Survey and Report writing** • Fundamentals of Village survey, prerequisites of village survey, preparation of questionnaires, data entry, basic analysis in Microsoft excel • Interpretation of surveyed maps and Report writing.		

Reference book

Mandatory

1. Clendening, J. Principles and use of Surveying Instruments. 2nd edition, Blockie. A 2000.

Supplementary

1. Hotine, Major M. The re-triangulation of Great Britain. Empire survey review 2005.
2. Mitra,R.P. and Ramesh A : Fundamentals of Cartography Revised Edition, Concept Publication, New Delhi.
3. Monkhouse - Maps and diagrams Methuen 2004.
4. Negi, Balbir Singh. Practical Geography Third revised Ed. Kedar Nath and Ram Nath, Meerut &Delhi, 2006.
5. Sandover,J.A. Plane Surveying. Arnold 2007.
6. Singh &Karanjta - Map work and Practical Geography Central Book Dept Allahabad 2009.
7. Singh, R.L.andDutt, P.K. Elements of Practical Geography, Students Friends, Allahabad.2003.

Web reference

1. **https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/**
2. **https://www.esri.com/en-us/home**
3. **https://www.intergraph.com/**
4. **https://www.sac.gov.in/Vyom/index.jsp**
5. **https://bhuvan.nrsc.gov.in/bhuvan_links.php**
6. **https://glovis.usgs.gov/**
7. **https://www.nrsc.gov.in/EO_Agr_Objective**
8. **https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en**
9. **https://www.iirs.gov.in/**