ANNEXURE – 1.2

PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE
MARGAO – GOA 403601
Affiliated to Goa University
Accredited by NAAC at A Grade

POST GRADUATE DEPARTMENT OF GEOGRAPHY

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

REVISED SYLLABUS

The objective of this diploma course is to impart instruction and training to candidates in specialized field of techniques and resources and also intended to develop capacity building for employment, teaching and research.

PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE
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POST GRADUATE DEPARTMENT OF GEOGRAPHY

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

2019-2020

Onwards

Proposed Structure of Postgraduate Diploma in Geo-informatics

Course Code	Course Title	Marks	Credits
Semester I		Theory and Practical components 50+50	T & P (2+2=4)
PG.DGIS.C1	Basics of GIS and GPS	**100**	**4**
PG.DGIS.C2	Geostatistics	**100**	**4**
PG.DGIS.C3	Basic of RS and Photogrammetry	**100**	**4**
PG.DGIS.E1	Digital Cartography	**100**	**4**
PG.DGIS.E3	Principles of Computer and Programming	**100**	**4**
Total		**500**	**20**
Semester II			
PG.DGIS.C4	Spatial Analysis and modeling	**100**	**4**
PG.DGIS.C5	Advanced Remote Sensing and GIS	**100**	**4**
PG.DGIS.E4	Digital Image Processing	**100**	**4**
PG.DGIS.E5	GIS for Environmental Management	**100**	**4**
PG.DGIS.E6	Pilot Project, Filed Work and Tour	**100**	**4**
Total		**500**	**20**

Note:
1) Duration – 1 lecture of One hour each and One practical/ Laboratory session is equivalent to one contact hour in class room.
2) Total Marks: 1000 (entire course is divided into 10 papers consisting 100 marks each.
3) 1 credit consists of 25 marks each.

- Semester two -four credit for Project and extra curriculum activity or MOOC through one advanced course
- C- Core subject compulsory

- E- Elective subject optional

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

SEMESTER I
CORE
Course Title: Basics of Geographic Information system and GPS
Course Code: PG.DGIS.C1
Credits: 04
Marks: 100

Course objective
The course focuses on the fundamentals Geographical Information System, and Global Positioning System by introducing the concept, techniques, hardware and software used in collection, processing and analysis of geospatial data.

Course Outcome
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

Details of course contents and allotted credits

No	Topic	L	P
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 data 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		

Reference Books:

1. Bolstad, P. (2005) GIS Fundamentals: A first text on Geographic Information Systems, Second Edition. White Bear Lake, MN: Eider Press, 543 pp.
2. Burrough, P.A. and McDonnell, R.A. (1998) Principles of geographical information systems. Oxford University Press, Oxford, 327 pp.
3. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
4. Chang, K. (2007) Introduction to Geographic Information System, 4th Edition. McGraw Hill.
5. Curran Paul J Principles of Remote Sensing UK: ELBS,
6. Elangovan, K (2006) GIS: Fundamentals, Applications and Implementations. New India Publishing Agency, New Delhi"208 pp.
7. Heywood, I., Cornelius, S., and Carver, S. (2006) An Introduction to Geographical Information Systems. Prentice Hall. 3rd edition.
8. Jensen, J.R. (2000). *Remote sensing of the environment: an Earth resource perspective*. Prentice Hall. ISBN 0-13-489733-1.
9. Joseph, George Fundamentals of Remote Sensing Universities Press India
10. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2003). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
11. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2005) Geographic Information Systems and Science. Chichester: Wiley. 2nd edition.
12. Maguire, D.J., Goodchild M.F., Rhind D.W. (1997) Geographic Information Systems: principles, and applications. Longman Scientific and Technical, Harlow.
13. Muralikrishna V Geographical Information Systems and Remote Sensing Applications Allied Publishers Private Limited
14. Nag P and Kudrat M Digital Remote sensing New Delhi: Concept Publishing
15. Richards, J.A.; and X. Jia (2006). Remote sensing digital image analysis: an introduction, 4th ed., Springer. ISBN 3-540-25128-6.
16. Sabins Floyd F Remote Sensing: Principles and Interpretation New York: WH Freeman and Company
17. 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.
18. Wise, S. (2002) GIS Basics. London: Taylor & Francis.

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

CORE
Course Title: Geostatistics
Course Code: PG.DGIS.C2
Credits: 04
Marks: 100

Course objective
The course is designed to process geospatial data and use of statistics in the field of GIS. 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.

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

Details of course contents and allotted credits

No	Topic	L	P
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, • Spectral analysis: linear sequences, Gilgai transect, power spectra and Caragabal transact(bandwidth and confidence interval)	**1**	**1**
III	Geostatistical uncertainty, probability and reliability • Data management for Geostatistics • Applications of Geostatistics		

Reference Books:

1 Simon W. Houlding, (2000) Practical Geostatistics: Modeling and Spatial Analysis, Springer, Berlin
2 Ricardo A. Olea (1999) Geostatistics for Engineers and Earth Scientist, Kluwer Academic Publishers, Boston
3 Richard Webstar and Margaret A. Oliver : Geostatistics for Environmental Scientists, Statistics in Practice (2^{nd} ed) J. Wiley
4 Ott, T. and Swiaczny, F. (2001). Time-integrative GIS. Management and analysis of spatio-temporal data. Berlin / Heidelberg / New York: Springer.
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 Roy, P.S. (2006). Geoinformatics for Tropical Ecosystems Bishen Singh Mahendra Pal Singh, Dehradun

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

CORE
Course Title: Basic of Remote Sensing and Photogrammetry
Course Code: PG.DGIS.C3
Credits: 04
Marks: 100

Course objective
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. Gain familiarity with a variety of physical, biological, and human geographic applications of remote sensing. Gain basic experience in the hands-on application of remote sensing data through visual interpretation and digital image processing exercises.

Course outcome
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, including the electromagnetic spectrum; the emission, scattering, reflection, and absorption of electromagnetic (EM) radiation; how EM radiation interactions vary across a limited number of substances, geometries, and temperatures; and geometric properties of photographs and imagery.

Details of course contents and allotted credits

No	Topic	L	P
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 • types of remote sensing interactions with the earth surface features, Spectral reflectance of vegetation, Soil and water,	1	1
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		

References books

1. Campbell, J.B. (2002). *Introduction to remote sensing*, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
2. Curran Paul, J. (1984) 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.
5. Moffitt, F. H. (1980). Photogrammetry. 3rd Ed, Harper & Row, NY.
6. Sabins Floyd F Remote Sensing: Principles and Interpretation New York: WH Freeman and Company
7. Wolf, P. R. (1983). Elements of Photogrammetry. McGraw-Hill, NY.
8. Zorn, H. C. (1980). Introductory Course in Photogrammetry. 6th Ed. ITC, Netherlands.

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

ELECTIVE
Course Title: Digital of Cartography
Course Code: PG.DGIS.E1
Credits: 04
Marks: 100

Course objective
The course gives emphasis on the art, science, and technologies of cartography and Photogrammetry. 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 outcome
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. Remote sensing, image processing and analysis through a series of laboratory exercises and reports

Details of course contents and allotted credits

No	Topic	L	P
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

Reference Books:

1. ESRI. 2004. ESRI Cartography: Capabilities and Trends. Redlands, CA. White Paper
2. Imus, D. and Dunlavey, P. 2002. Back to the Drawing Board: Cartography vs the Digital Workflow. MT. Hood, Oregon.
3. Kraak, Menno-Jan and Allan Brown (2001): Web Cartography – Developments and prospects, Taylor & Francis, New York, ISBN 0-7484-0869-X.
4. MacEachren, A.M. (1994). Some Truth with Maps: A Primer on Symbolization & Design. University Park: The Pennsylvania State University. ISBN.
5. Monmonier, Mark (1991). How to Lie with Maps. Chicago: University of Chicago Press. ISBN 0-226-53421-9.
6. Monmonier, Mark (1993). Mapping It Out. Chicago: University of Chicago Press. ISBN.
7. Pickles, John (2003). A History of Spaces: Cartographic Reason, Mapping, and the Geo-Coded World. Taylor & Francis. ISBN 0-415-14497-3
8. Sircar, D.C.C. (January 1990). Studies in the Geography of Ancient and Medieval India. Motilal Banarsidass Publishers. ISBN 8120806905.
9. 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**.**
10. Terry A. Slocum (1999): Thematic Cartography and Visualization, Prentice Hall, New Jersey
9. MJ Kraak, F Ormeling - 2003 - Cartography**:** visualization of geospatial data Addison-Wesley Longman Ltd
10. Burnside, C. D. (1985). Mapping from Aerial Photography. 2nd Ed, Collins.
11. Campbell, J.B. (2002). *Introduction to remote sensing*, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
12. Curran Paul, J. (1984) Principles of Remote Sensing UK: ELBS.
13. Joseph, George (2007) Fundamentals of Remote Sensing Universities Press India
14. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2007). *Remote sensing and image interpretation*, 5th ed., Wiley. ISBN 0-471-15227-7.
15. Moffitt, F. H. (1980). Photogrammetry. 3rd Ed, Harper & Row, NY.
16. Sabins Floyd F Remote Sensing: Principles and Interpretation New York: WH Freeman and Company
17. Wolf, P. R. (1983). Elements of Photgrammetry. McGraw-Hill, NY.
18. Zorn, H. C. (1980). Introductory Course in Photogrammetry. 6th Ed. ITC, Netherlands.

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

ELECTIVE
Course Title: Principles of computers and computer programming
Course Code: PG.DGIS.E3
Credits: 04
Marks:100

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

Course outcome.
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.

Details of course contents and allotted credits

No	Topic	L	P
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**		

Reference Books:

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.
3. Daniel P. Friedman and Mitchell Wand (2001). Christopher Thomas Haynes: Essentials of Programming Languages, the MIT Press.
4. David Gelernter and Suresh Jagannathan (1990). Programming Linguistics, The MIT Press.
5. Goldschlager, L. (1998). A Lister Computer Science - a modern Introduction Prentice Hall, 1988.
6. John C. Mitchell (2002). Concepts in Programming Languages, Cambridge University Press.
7. Michael L. Scott (2005). Programming Language Pragmatics, Morgan Kaufmann Publishers.
8. Ravi Sethi (1996). Programming Languages: Concepts and Constructs, 2nd ed., Addison-Wesley.

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

CORE
Course Title: Spatial Analysis & Modeling
Course Code: PG.DGIS.C4
Credits: 04
Marks:100

Course objective
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. It also looks into integration of non-spatial data and its application.

Course outcome
Student will able to apply spatial tool and techniques in spatial datasets for carry out Surface and 3d analysis. Students will demonstrate proficiency and conceptual understanding spatial model making process.

Details of course contents and allotted credits

No	Topic	L	P
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** • 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	**1**	**1**
III	**Spatial modeling** • Role of spatial model, explanative, predictive and normative models, Handling complex spatial query, case studies.		

Reference Books:

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.
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. M Goodrich (2000). Data Structures and Algorithms in Java, 2nd Edition Wiley.
6. Malczewski, J. (1999). GIS and Multicriteria Decision Analysis. New York: John Wiley and Sons
7. GIS and Multi-criteria Analysis by Makrewski Jacek, USA, 1999.
8. Principals of GIS by Burrough P.A. MacDonneli R.A. published by Oxford University Press, 2000.
9. Geographical Information Science, vol. I by Roy P.S. Published by IIRS, 2000.
10. Fundamentals of Geographic Information Systems, 2nd Edition by Demers M.N. published by John Wiley & Sons 2000

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

CORE
Course Title: Advanced Remote Sensing and GIS
Course Code: PG.DGIS.C5
Credits: 04
Marks: 100

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

Course outcome
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. They will create Remote sensing application

Details of course contents and allotted credits

No	Topic	L	P
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 softwares and Distributed GIS systems	**1**	**1**
III	**Multi-criteria decision making analysis –** • Ranking • Rating • Pair wise comparison **Fuzzy logic**		

Reference Books:

1. Asrar Ghassem (2004) Theory and applications of optical remote sensing New York: John Wiley and Sons
2. Berry, J.K. (1993) Beyond Mapping: Concepts, Algorithms and Issues in GIS. Fort Collins, CO: GIS World Books.
3. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2003). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
4. Malczewski, J. (*1999)*. GIS and Multicriteria Decision Analysis. New York: John Wiley and Sons
5. 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.
6. Ott, T. and Swiaczny, F. (2001) Time-integrative GIS. Management and analysis of spatio-temporal data, Berlin / Heidelberg / New York: Springer.
7. Peterson, Michael P. (ed.) (2003): Maps and the Internet, Elsevier, ISBN 0-08-044201-3.
8. Skolnik, Merrill I. (2001). Introduction to Radar Systems, McGraw-Hill (1st ed., 1962; 2nd ed., 1980; 3rd ed.), ISBN 0-07-066572-9.
9. 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.
10. Worboys, M. & Matt Duckham. (2004) GIS: a computing perspective. Boca Raton: CRC Press.

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

ELECTIVE
Course Title: Digital Image Processing
Course Code: PG.DGIS.E4
Credits: 04
Marks:100

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

Course outcome
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

Details of course contents and allotted credits

No	Topic	L	P
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		

Reference Books:

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.
3. Damen MCJ, Sicco Smith G and Kerstappen(Ed) (). Remote Sensing for Resources Development and Environmental Management 3rd.volume Set Netherlands: Balkema
4. Gonzalez, Rafael C.; Richard E. Woods (1992). Digital Image Processing. ISBN 0-201-50803-6.
5. Jensen John R (2007). Introductory Digital Image processing: Remote Sensing Perspective New Jersey: Prentice Hall
6. Joseph, George (2007). Fundamentals of Remote Sensing Universities Press India
7. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2007). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
8. Pratt, William K. (1978). Digital Image Processing. ISBN 0-471-01888-0.
9. Romeny, Bart M. (2003). Front-End Vision and Multi-Scale Image Analysis. ISBN1-4020-1507-0.
10. Umbaugh, Scott E (2005). Computer Imaging: Digital Image Analysis and Processing. ISBN 0-84-932919-1.

POST GRADUATE DIPLOMA
In
GEOINFORMATICS

ELECTIVE
Course Title: GIS for Environmental Management
Course Code: PG.DGIS.E5
Credits: 04
Marks:100

Course objective:
The main focus of the course is on use of GIS in Environment Managemnt wich focuses on Analyze and synthesize understanding by identifying and developing a research and application proposal using remote sensing and GIS.

Course outcome
Students will describe a remote sensing application and assemble and summarize relevant literature in a written assignment, case study and development of models in various environmental activities.

Details of course contents and allotted credits

No	Topic	L	P
I	**Introduction to the Field of Natural Resources.** • Earth's natural resources and ecological systems, conservation protection and management of natural resources and environments. • Data collection and analysis,	**1**	**1**
II	Site suitability Analysis Network Analysis	**1**	**1**
III	Watershed Analysis Disaster Management		

Reference Books:

1. Cracknell A P(ed) (1998) Remote Sensing in Meteorology, Oceanography and Hydrology. Chichester: Ellis Horwood Limited
2. Damen MCJ, Sicco Smith G and Kerstappen(Ed) (1997) 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 (1998) Environmental Modeling with GIS and Remote Sensing Taylor and Francis
7. Steven MD and Clark JA (1998). Applications of Remote Sensing in Agriculture London Butterworths.
8. Vincent RK (1998) Fundamentals of Geological and Environmental Remote Sensing New Jersey: Prentice Hall
9. P.K. Das, The Mansoons, National Book trust
10. P. Castro and M.E. Huber, Marine Biology, McGraw-Hill
11. Richard A Geyer ,Marine Environmental Pollution, , Elsevier Oceanography Series
12. V. Subramaniam, Water: Quantity-Quality Perspective, Kingston Intl.