CENTRE FOR GEOINFORMATICS
M.Sc. Geoinformatics
(Revised Syllabus w.e.f the Academic year 2018 – 19 under the CBCS)

Semester	Category	Course Code	Title of the Course	No. of Credits	Theory (hours)	Practical (hours)	Duration of ESE (Hours)	CFA	ESE	Total Marks
I	Core Courses	18GISP0101	Introduction to Geoinformatics	4	4		3	40	60	100
		18GISP0102	Principles of Cartography	3	3		3	40	60	100
		18GISP0103	IT for Geoinformatics	3	3		3	40	60	100
		18GISP0104	Fundamentals of GIS	3	3		3	40	60	100
		18GISP0105	Database Management System	3	3		3	40	60	100
		18GISP0106	Practical - I: Geographical Information System	2		4	3	60	40	100
		18GISP0107	Practical - II: Programming Languages for Geoinformatics	2		4	3	60	40	100
	VAC	18GTPP0001	Gandhi in Everyday Life	2	2	-	-	50	-	50
			Total	22	18	8	-			
II	Core Courses	18GISP0208	Remote Sensing and Photogrammetry	3	3	-	3	40	60	100
		18GISP0209	Digital Image Processing	3	3	-	3	40	60	100
		18GISP0210	Programming Languages for Geoinformatics	3	3	-	3	40	60	100
		18GISP0211	Practical -III: Remote Sensing, Digital Image Processing and Photogrammetry	2		4	3	60	40	100
		18GISP0212	Practical -IV: Customization of GIS Software	2		4	3	60	40	100
	NC	18GISP02F1	Extension / Field Visit	0		0	-	50	-	50
	MC	18GISP00MX	Modular Course	2	2			50	-	50
	NME		Non Major Elective	4	4		3	40	60	100
	VAC	18ENGP00C1	Communication / Soft Skills	2	2			50	-	50
			Total	21	17	8	-			
III	Core Courses	18GISP0313	Global Navigation Satellite System	3	3		3	40	60	100
		18GISP0314	Geoinformatics in Resource Management	3	3		40	60	100	
		18GISP0315	Geoinformatics in Disaster Management	3	3					
		18GISP0316	Practical -V: Geoinformatics in Resources and Disaster Management	2		4	3	60	40	100
		18GISP0317	Practical -VI: Case Study in GIS / RS/ Web GIS	2		4	3	60	40	100
		18APRP0003	Research Methods and Statistics	4	4		3	40	60	100
	ME	18GISP03EX	Major Elective	4	4	-	3	40	60	100
	VPP	18GISP03V1	Village Placement Programme	2		-	-	50	-	50
	MC	18GISP00MY	Modular Course	2	2	-		50	-	50
		18GISP03F2	Extension / Field Visit	0		0	-	50	-	50
			Total	25	19	8	-			
IV	Core	18GISP0418	Dissertation *	6		12		75	125	200
		18GISP0419	Internship**	12		24		200	-	200
			Total	18	-	36		275	125	400
			Grant Total (I + II + III + IV)	86	54	60				

***Dissertation Evaluation** – 75 Marks for evaluation by Internal Examiner, 75 marks for evaluation by the External Examiner and 50 Marks Jointly both Internal and External Examiners.

***Internship Evaluation** - 150 marks for internship report evaluation, 50 marks for viva voce examination conducted by a board of internal examiners

List of Major Elective courses for 18GISP03EX

18GISP03E1	Geography
18GISP03E2	Geology
18GISP03E3	Watershed Management
18GISP03E4	Web Technology for Geoinformatics

18GISP00MX / MY

18GISP00M1	Spatial Decision Support System
18GISP00M2	Introduction to Rural Development
18GISP00M3	Open Source Software
18GISP00M4	LiDAR and its Applications

SEMESTER – 1
First Year

18GISP0101	**Core Course** **Introduction to Geoinformatics**	**4 Credits**

Course Objective: The Course introduces Geoinformatics as an advanced tool consisting of various Geospatial Technologies used for mapping and managing earth resources.

Course Outcome

CO1. Understand the Basic information about to earth, atmosphere and principles of acquiring earth related information	Understand
CO2. Understand the meaning, scope and science & technologies involved in Geoinformatics.	Understand
CO3. Understand the basics principles of surveying using conventional and modern tools and technologies	Understand
CO4. Understand the various types of geodata.	Understand
CO5. Understand the applications of Geoinformatics in various fields.	Understand

UNIT I Introduction about Earth	Earth – Origin, Interior, Age, size, shape and Physiography. Atmosphere: Origin and nature, Composition and layers of the atmosphere. Fundamental principles of acquiring earth related information: geodetic information - lat - long - time – altimetry.
UNIT II Geoinformatics	Meaning and Scope of Geoinformatics – Science and Technologies involved: Remote Sensing- Geographical Information System- Digital Image Processing - Photogrammetry - Geodesy- Global Positioning SystemInformation & Communication Technologies
UNIT III Basics Principles of Surveying	Basic principles of surveying – Classification and applications- Scales - Conventional signs - Survey Methods : traversing, trilateration and triangulation - Survey instruments : conventional & electronic (total station) - Aerial and Satellite based survey techniques (Photogrammetry, RADAR, LiDAR) - Survey by GPS.
UNIT IV Geodata Visualalization	Geodata visualization and analysis - two – three – fourth dimension viewing - viewing by animation - Visualization by hyper map - virtual images – web GIS.
UNIT V Applications	Application of Geoinformatics: Rural Development, Geosciences, Agriculture, Forestry, Soil Studies, Meteorology, Military, Transport, Environmental studies, Banking and Health Civil Engineering etc.,

Text Books
1. LO. C.P., and Albert K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall of India, New Delhi, 2009.
2. Lillesand M. Thomas and Ralph W.Kiefer, Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons, New York, 2017.

Reference Books
1. Radhakrishnan. V, General Geology, V.V.V.P Publishers, Tuticorin, 1996
2. Arthur H.Robinson, Joel L.Morrison, Phillip C.Muehreke, A.Jon Kimerling and Stephen C.Guptill, Elements of Cartog
3. Peter A. Burrough and Rachael A. Mc. Donnell, Principles of Geographical Information System, 3rd Edition, Oxford University Press Inc., New York, 2015.
4. Ian Heywood, Sarah Cornelivs and Steve Carver, An Introduction to Geographical Information System, 3rd Edition, Pearson Education Pvt .Ltd., New Delhi, 2010.
5. Lillesand M. Thomas and Ralph W.Kiefer, Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons, New York, 2017

E-Learning Resources

1. Applications http://elearning.irrs.gov.in, www.geospatialworld.net/edu.
2. Basics Principles of Surveying http://onlinecourses.nptel.ac.in

18GISP0102	Core Course Principles of Cartography	3 Credits

Course Objective:

The course helps the students to know about the basic principles and importance of cartography, map projection, data visualisation, map design and layout and various techniques of map production and reproduction.

Course Outcome:

CO1.	Understand the basics of cartography and projection	Understand
CO2.	Get knowledge on data collection and visualization	Understand
CO3.	Design and prepare layout of maps	Apply
CO4.	Apply the computers in map making and Web Cartography	Apply

UNIT I Concept of Cartography	Introduction to cartography: Definition – nature, scope and History of Cartography; Principles of Cartography; map, Characteristics of maps and its components, Types of maps: based on scale and purpose, Numbering of topographical maps, Interpretation of topographic/ thematic maps.
UNIT II Map Projection	Projection: Definition – major types of projection – rectangular, polar coordinate systems – advantages and disadvantages of projections – UTM-WGS - projection – Choice of Projection for a country / Project.
UNIT III Data and Visualisation	Data Collection and Nature of Data, Creation of Database, Representation of data: Isopleth, Choropleth, Choroschematic and Chorochromatic mapping techniques. Cartographic communication process - Visualization of geospatial data - map compilation and generalization- symbolization - 3D visualization - various issues in map visualization.
UNIT IV Map Design & Layout	Map designing and layout: Definition - Overall map designing – Internal map components designing. Data output: Cartographic data products – dissemination of geospatial data, use and users of products. Map reproduction: methods of printing maps
UNIT V Digital Cartography	Digital Cartography: Adaptation of Computer in Cartography – History – Computer's influence – Components of digital Cartography - Benefits – disadvantages of digital cartography - Analog to digital conversion of data, Conventional mapping Vs Digital Mapping; Web cartography.

Text Book

1. Arthur H. Robinson et al. Elements of Cartography, John Wiley & Sons, New York, 2002.

Reference Books

1. LO, C.P. and Albert K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall of India, New Delhi, 2009.
2. Misra, R.P. and Ramesh, A., Fundamentals of Cartography, Concept Publishing Company, New Delhi, 2002.
3. Cartwright .W, Gartner G. ALehn (Eds.), Cartography and Art, Springer – Verlag Berlin Heidelberg, 2009.
4. Anji Reddy, M, Geoinformatics for Environmental Management, BS Publications, Hyderabad, 2004.
5. Menno-Jan Kraak, Ferjan Ormeling, Cartography Visualization of Geospatial Data, Pearson Education Pvt ltd, New Delhi, 2005.

E-Learning Resources

1. Fundamentals of General Cartography,

   http://164.100.133.129:81/econtent/Uploads/Fundamentals_of_General_Cartography.pdf

2. Cartography – a tool for spatial analysis, https://www.pdfdrive.net/cartography-a-tool-for-spatial-analysis-d39693639.html

18GISP0103	Core Course IT for Geoinformatics	3 Credits

Course Objective :	
This course offers basic knowledge about hardware and software used in Geoinformatics, GPS and Remote sensing and creates awareness about the user security.	

Course Outcome:

CO 1. Understand about computer hardware and software	Understand
CO 2. Know about usefulness of computers in Geoinformatics	Analyze
CO 3. Understand about the Internet and net works	Understand
CO 4. Gather the information from the internet /Google Earth & maps	Apply
CO 5. Understand Mobile computing	Understand

UNIT I Hardware	The Computer System - types of computers - foundations of modern technology - types of memory – buses - Communication with peripherals – Inputs output devices : Modern output - display screens – printers - secondary storage - Modern Storage : storage media - floppy disk, hard disk drive and optical disk – pen drive – memory card- blue ray - backing up of data.
UNIT II Software	Software: User interface - application programs - Operating systems - file management and utilities – Cloud computing – Data base management system – Data mining – Big data Analytics - major software issues - Global Positioning System - Applications of IT in GPS - Remote Sensing – GIS - Cartography - Real Time GIS.
UNIT III Internet	Introduction to World Wide Web and Web - Client server technology - Foundations of modern networks – LAN and WAN - Introduction, architecture and system - Some Internet Applications: Email, Information browsing and data retrieval from the web (audio /video/ pictures, animation) use of Google maps and Google earth.
UNIT IV Mobile Computing	Mobile Computing – Wireless application Protocol – blue tooth- IR transmission - Video Conferencing- Virtual reality - GIS Mobile apps – VoIP – 3G , 4G and 6G technologies – VoLTE.
UNIT V Security	Personal, Social and Ethical Issues: Computers and health - viruses – Anti- viruses - cyber crime – cryptography. Concept of fire wall - network security - wireless technology and security- Virtual Private Network.

Text Book

1. Dennis P. Curtin, Kim Foley, Kunal Sen && Cathleen Morin, Information Technology - The Breaking Wave, Tata McGraw Hill Ed., 1999.

Reference Books

1. Rajaraman V., Fundamentals of Computers, 4/e, Prentice Hall of India, New Delhi, 2008.
2. Alex Leon, Fundamentals of Information Technology, Leon Techno Pubications, Chennai 2008
3. Cryptography and Network Security, William Stallings, 1999, 5th Edition, Pearson Education, Inc., publishing as Prentice Hall.
4. Borko Furht Armando Escalante, Handbook of Cloud Computing, Springer Pulications, 2010.
5. Tomasz Imielinski, Henry F. Korth, Mobile Computing, Kluwer Academic Publishers, 1996.

E-Learning Resources

1. Operating System: http://nptel.ac.in/courses/106106144/

2. Cloud Computing : http://nptel.ac.in/courses/106106129/28

3. Mobile Computing: http://nptel.ac.in/courses/106105167/1

18GISP0104	Core Course Fundamentals of GIS	3 Credits

Course Objective: The course provides an introduction about Geographical Information System, data structures, methods to input and editing data into GIS, basic analytical tools of GIS, various methods of GIS outputs and the recent trends in GIS. Thus providing a strong foundation in GIS.

Course Outcome:

CO1. Understand GIS and methods of data input and editing.   Understand
CO2. Apply various tools of GIS   Apply
CO3. Get knowledge on different forms of GIS outputs   Understand
CO4. Know the recent developments in GIS.   Understand

UNIT I Basics of GIS	GIS – scope – components – Data used in GIS - characteristics of Spatial Data – sources of spatial and attribute data - data structure - raster and vector - GIS approach: Layer – tile – object oriented; Modeling third and fourth dimension - integration of spatial and attribute data
UNIT II Data input and editing	Data Input methods: Keyboard – scanning - digitization – electronic data transfer - Data editing: Checking and correcting errors in spatial and attribute data - transformation – edge matching - rubber sheeting – building integrated database **–** cloud computing - big data analysis – spatial data mining
UNIT III Data analysis	Measurement of length, perimeter and area - queries – reclass – buffer - overlay - spatial interpolation – surface analysis - network analysis.
UNIT IV GIS outputs	Maps as output – Thematic Maps - non-cartographic outputs – spatial multimedia – delivery mechanism - map as a decision tool -GIS and Spatial Decision Support System.
UNIT V Trends in GIS	Trends in GIS: Easy access to digital data – Location based services - hardware revolution – software trends – Future Issues: Privacy - Data ownership - Scientific visualization – New focus

Text Book

1. Ian Heywood, Sarah Cornelivs and Steve Carver, An Introduction to Geographical Information System, 3rd Edition, Pearson Education Pvt .Ltd., New Delhi, 2010.

Reference Books

1. Peter A. Burrough and Rachael A. Mc. Donnell, Principles of Geographical Information System, 3rd Edition, Oxford University Press Inc., New York, 2015.
2. David Martin, Geographic Information Systems, Routledge, London, 2002.
3. Kang-tsung chang, Introduction to Geographic Information Systems,Tata McGraw – Hill Publishing Company Limited, New Delhi, 2006.
4. LO C.P.and Albert K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall of India, New Delhi – 2009.

E-Learning Resources

1. Shahab Fazal, GIS Basics, New Age International Publishers, New Delhi, 2008, https://www.pdfdrive.net/gis-basics-e19526515.html
2. Francis Harvey, A Primer of GIS, The Guilford Press. London, 2008 https://www.pdfdrive.net/primer-of-gis-e38168527.html
3. Otto Huisman, Rolf A.de. By, Principles of Geographic Information System, ITC, Netherlands, 2009.

18GISP0105	Core Course Database Management System	3 Credits

Course Objective:
This course provides the concept of DBMS, data models, design and SQL language, applications of DBMS in GIS.

Course Outcome:

CO 1. Understand the importance of Data Base	Understand
CO 2. Know about Data, Data models & structure of Database	Understand
CO 3. Understand database design concepts of Data Base.	Understand
CO 4. Write SQL queries for accessing the database	Analyze
CO 5. Understand spatial database management system.	Understand

UNIT I Introduction	Purpose of database systems - view of data - data models - database languages – transaction management - storage manager - database administrator and database users - overall system structure. E-R model: E-R diagram - constraints – keys - weak entity sets - Extended E-R features - design of an E-R database scheme-Reduction of an E-R Schema to tables.
UNIT II Database Design	First normal form - pitfalls in relational database design - functional dependencies - Decomposition - Boyce–codd normal form - third normal form, fourth normal form – denormalization - Object-oriented databases: Object-Oriented Data Model - Object-Oriented Languages.
UNIT III SQL	SQL- Basic structure - set operations, aggregate functions, null values Modifications of data base – Join operations – DDL - query-by-example - domain constraints, referential integrity - assertions – triggers – security and authorization - authorization in SQL - encryption and authentication.
UNIT IV Application of DBMS	Transaction concept – Transaction state – Database Recovery Techniques – Database Security - Emerging Database Technologies and Applications: Mobile Databases, Multimedia Databases, and Geographic Information Systems (GIS).
UNIT V Spatial Database	Spatial Database: Overview - Application domains - Compare a SDBMS with a GIS - Categories of Users - An example of SDBMS application-Spatial database management system- Abstract data types- Spatial Data warehousing- Spatial Data mining - Commercial Systems- ArcInfo – ArcView- Oracle spatial Data – PostreSQL.

Text Book
1. N.F.Korth and A.Silberschatz, S.Sudarshan, Database Management System Concepts, 4/e, McGraw Hill Inc., New Delhi, 2002.

Reference Books
1. Philippe Rigaux, Michel Scholl and Agnes Voisars, Spatial Databases with application to GIS , Morgan Kaufmann Publishers, ISBN 1-55860-588-6
2. B. C. Desai, An Introduction to Database Systems, Galgotia Publications New Delhi, 1995.
3. R.Elmasri and S.B. Navathe Benjamin Cummings, Fundamentals of Database Systems, Redwood City, 1994.
4. Albert K.W. Yeung , G. Brent Hall, Spatial Database Systems , Design, Implementation and Project Management, Springer Publications, ISBN-13 978-1-4020-5392-4 (e-book)
5. Yannis Manolopoulos, Apostolos N. Papadopoulos, Michael Gr. Vassilakopoulos, Spatial Databases: Technologies, Techniques and Trends, Idea Group Publishing Hershey, 2005.

E-Learning Resources
1. DBMS - http://nptel.ac.in/courses/106106093/
2. SDBMS – http://nptel.ac.in/courses/105102015/

18GISP0106	**Core Course** **Practical I – Geographical Information System**	**2 Credits**

Course Objective:

The course provides hands on experience on ACAD and ArGISS software.

Course Outcome:

CO1. Apply the tools of AutoCAD in georeferencing and digitizing the map   Apply
CO2. Understand the use of basic tools of ArGISS   Understand
CO3. Analyze the data in ArGISS with appropriate tools   Analyze
CO4. Design and layout a map   Apply

1. Appreciation of General purpose/ thematic maps and their interpretation – spatial objects – data dictionary
2. AutoCAD: data input – georeference – digitization – export to GIS.
3. Rectification: Survey of India toposheet – satellite image – large scale map - setting projections – GIS database creation
4. Spatial and attribute data entry, editing and their joining in GIS
5. Working with tables and layer properties – creation of new layer based on selection
6. Methods of data analysis I : Measurement - Buffer – overlay– spatial interpolation – reclass – TIN – DEM
7. Methods of data analysis II: Network analysis - – surface analysis tools - hydrology tools
8. Map algebra – building models
9. Geo statistical analysis
10. Map Design and Layout

18GISP0107	Lab – II Programming Languages for Geoinformatics	2 Credit

Course Objective:

The course imports basic programming knowledge using C, Visual Studio, Python and MySQL for Geoinformatics.

Course Outcome:

CO1. Develop programs using decision making, functions, Structures
and Union in C   Apply
CO2. Develop simple applications in Visual Studio   Apply
CO3. Write basic program Python programming   Apply
CO4. Write simple MySQL queries   Apply

C – Programming

1. Use of simple statements and expressions
2. Problem solving using decision making and looping.
3. Implementation of one dimensional and two dimensional arrays.
4. Problem solving using String functions
5. Programs with user defined and Recursive functions – Includes Parameter Passing
6. Programs using structures and unions.

Visual Studio

1. Create programmes using VB.Net controls
2. Implementing class library object, Inheritance
3. Building graphical inheritance controls
4. Creating Menu and Menu items
5. Creating Multiple-Document-Interface (MDI)
6. Event Handling
7. Exceptions
8. Data Access with ADO.Net
9. Using XML Data with VB.Net
10. Finding and Sorting data in Datasets

Python

1. Control structures
2. Looping statements
3. Functions and Strings
4. Data structures
5. Class and objects
6. Files opening and Closing

MySQL

1. Creation of Table with Keys
2. Selection operations with conditions
3. Set operations and Aggregate functions
4. Modification operations
5. Join operations

SEMESTER – 2
First Year

18GISP0208	Core Course Remote Sensing and Photogrammetry	3 Credits

Course Objective : The course enables the students to understand the basic concepts of remote sensing, systems and techniques of data acquisition, LiDAR, Hyperspectral remote sensing and data products of different satellites.

Course Outcome :

CO1. Understand the basic concepts of remote sensing.	Understand
CO2. Understand aerial photography, types, planning and execution.	Understand
CO3. Apply different photogrammetric techniques.	Apply
CO4. Understand the basics of LiDAR, RADAR, Microwave remote sensing and its principles.	Understand
CO5. Understand various satellite and sensors.	Understand

UNIT I Remote sensing basics	History and development - Electro Magnetic Spectrum - Components and types of remote sensing – Energy interaction with atmosphere and Earth - Resolutions (Spectral, Spatial, Temporal & Radiometric) - Platforms – Sensors - Scanning & Orbiting Mechanism of Satellites and Data Acquisition. - Optical Remote Sensing: Basic concepts - Optical sensors and scanners
UNIT II Aerial photography	Historical development - definition - types of aerial photography and uses - aerial videography - airborne imaging spectrometer - airborne visible - infrared imaging spectrometer (AVIRIS) Aerial Cameras - Components of Aerial Cameras - Planning and execution – ground control for aerial photography.
UNIT III Photogrammetry	Definition, history of photogrammetry - Geometry of vertical aerial photograph, scale of vertical aerial photograph, relief displacement - Stereoscopic parallax - Aerial triangulation - Digital photogrammetry - use of GPS in photogrammetry
UNIT IV Thermal, Microwave & Hyper spectral Remote Sensing	Thermal Remote Sensing: Basic concepts - Thermal sensors & scanners - Thermal Inertia - Microwave Remote Sensing: Basic concepts - Microwave sensors and Radiometers - Geometric characters RADAR - Radargrammetry (SLAR / SAR) - LiDAR – LiDAR system - components - operating principles – LiDAR data characteristics - advantages – limitations – comparison with RADAR and photogrammetry – uses of LiDAR data. Hyper spectral Remote Sensing: basic concepts hyperspectral sensors, data formats and systems, AVIRIS, CASI, MODIS and Hyperion.
UNIT V Satellites	Types of satellites – environmental, resource survey satellites, weather and communication satellites, GPS satellites and Shuttle Mission - Major satellite systems: Sensors and data products of IRS, LANDSAT, SPOT, ERS, IKONOS, Quik Bird, ORBVIEW, ASTER, MODIS, WORLD VIEW and others

Text Book

1. Lillesand M. Thomas and Ralph W.Kiefer, Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons, New York, 2017

Reference Books

1. Sharma V.K., Remote Sensing for Land Resources Planning, Concept Publishing Company, New Delhi, 1991.
2. Paul J. Curran, Principles of Remote Sensing, English Language Book Society, Longman, 1985.
3. Paul J. Gibson, Introductory Remote Sensing: Principles and Concepts, Routledge, London, 2000.
4. Jensen R. John, Remote Sensing of the Environment: An Earth Resource Perspective, Pearson Education Pvt. Ltd., Delhi, 2006.
5. Gottfried Konency, Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems, Second Edition, CRC, 2nd edition 2009

E-Learning Resources

1. http://nptel.ac.in/courses/105108077/
2. http://nptel.ac.in/courses/105107160/,
3. https://www.class-central.com/course/nptel-introduction-to-remote-sensing-7918
4. https://www.gisresources.com/wp-content/uploads/2013/11/Introduction-to-Photogrammetry-LPS.pdf

18GISP0209	Core Course Digital Image Processing	Credits : 3

Course Objectives : The course introduces the digital data, digital image processing techniques and outputs.

Course Outcome

CO1.	Understand digital data, format, acquisition and interpretation of various remotely sensed satellite images	Understand
CO2.	Understand maps preprocessing and enhancement.	Understand
CO3.	Understand various image classification techniques	Understand
CO4.	Understand various DIP techniques used in Hyperspectral Images.	Understand
CO5.	Understand various outputs and other techniques.	Understand

UNIT I Introduction to Digital data	Digital Data: Basic Characteristics of digital image - data type and file format. Data acquisition and interpretation - Image display systems - Image sampling and quantization - Basic relationship between pixels
UNIT II Image Preprocessing and Enhancement	Digital Image Processing: Introduction - stages in digital image processing - Preprocessing: geometric correction, atmospheric correction and radiometric correction - Image Enhancement: stretch, Single Band Enhancement (Image reduction & Magnification, Contrast Stretching, Filtering & Edge enhancement) - Multiband Enhancement (Band ratioing, color composite generation, Principal Component Analysis, NDVI).
UNIT III Image Classification	Image Classification: Unsupervised classification - Supervised classification technique - training sites - classification stage - minimum distance to mean classifier – parallelepiped classifier - maximum likelihood classifier - Hybrid Classification – Sub Pixel Classification - Fuzzy Classification - accuracy assessment
UNIT IV Hyperspectral Image Processing	Hyperspectral Image Processing: Data cube, Hyperspectral Profiles, Data Redundancy, - Problems with Dimensionality, Principal Component, Minimum Noise Fraction (MNF) - Atmospheric Correction, Pixel Purity Index, Empirical line Calibration - Reflectance Transformation, Continuum Removal - Spectral feature Fitting, Spectral Angle mapper
UNIT V DIP outputs & other Techniques	Output Generation: graphic products - tabular data - digital files -post classification smoothing - data merging - change detection procedures - image transmission and compression.

Text Books

1. John R Jenson, "Introducing Digital Image Processing", Prantice Hall. New Jersy 1986.
2. Lillesand M. Thomas and Ralph W.Kiefer, Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons, New York, 2017

Reference Books

1. Jensen R. John, Remote Sensing of the Environment An Earth Resource Perspective, Pearson Education Pvt. Ltd., Delhi, 2006.
2. Paul J. Curran, Principles of Remote Sensing, English Language Book Society, Longman, 1985.
3. John A. Richards, Springer-Verlag, Remote Sensing Digital Image Analysis, 1999.
4. Digital Image Processing (3rd Edition) Rafael c.Gonzolez,
5. Richard E.Woods Prentice Hall, 2007.

E-Learning Resources

1. Hyperspectral Image Processing http://elearning.irrs.gov.in
2. Image Classification http://onlinecourses.nptel.ac.in, http://earthexplorer.usgs.gov.in

18GISP0210	**Core Course** **Programming Languages for Geoinformatics**	**3 Credits**

Course Objective: This course offers Object Oriented Programming concepts in C++ and basic knowledge on Python and R languages.		

Course Outcome:
CO 1. Understand the basic concepts of object oriented programming in C++   Understand
CO 2. Write simple programs using C++.   Apply
CO 3. Understand the basics of Python and R languages.   Understand

UNIT I Introduction C++	Introduction to OOPs - Concept - benefits - applications - C++ programming basics - Constants, variables, keywords - Data types, derived data types - Managing Input and Output Operations - Decision Making and Branching - Looping statements - Solving simple scientific and statistical problems.
UNIT II C++ Arrays and Functions	Arrays - Initialization – Declaration – One and Two dimensional arrays. Strings: Operations – Arrays – Function: Definition– Declaration - Pass by value – Pass by reference – Recursion Functions- Function Overloading - Solving simple programs on sorting, searching and matrix operations.
UNIT III OOPs Concepts in C++	Classes and Objects – Member Functions – Nesting of Member Functions – Constructors – Destructors – Inheritance – Base class – Derived Class – Visibility modes – Single Inheritance – Multilevel Inheritance – Multiple Inheritance – Polymorphism - File Opening and closing.
UNIT IV Python	Introduction to Python – Variables - control structures – looping statements – functions – Strings - Data structures - classes – objects - Inheritance - polymorphism - Files reading and writing - Exception handling.
UNIT V R	R-Language – overview – Data types - Operators – Control structures – Looping statements – Functions – Strings – Vectors – List – Matrix – Arrays – Data Interfaces - Chart and Graphs – Statistics Operations.

Text Book
1. Balagurusamy E., Object Oriented Programming with C++, Tata McGraw Hill, 2001.

Reference Books
1. Toby Donaldson, Visual Quick start Guide Python, 2e, Perason Education Inc, South Asia, 2009.
2. Norman Matloff, The Art of R programming A Tour of Statistical Softeare Design, No starch press, 2011.
3. Rober Lafore, Object Oriented Programming in Turbo C++, Galgotia Publication, 2002.
4. Mark Summerfield, Programming in Python 3, Pearson Education Inc, South Asia, 2009
5. Andrie de Vries and Joris Meys, R for Dummies, A John Wiley and Sons, Ltd. Pubications 2012.

E- Learning Resources
1. R-Programming - http://nptel.ac.in/courses/102101056/9
2. Applied Spatial Data Analysis with R pdf, http://gis.humboldt.edu/OLM/r/Spatial%20Analysis%20With%20R.pdf
3. ArcPy and ArGISS, http://www2.arinigeo.com/wp-content/uploads/2016/05/ArcPy-and-ArGISS-Geospatial-Analysis-with-Python-by-Silas-Toms.pdf
4. Programming ArGISS 10.1 with Python Cookbook, http://pdf.th7.cn/down/files/1312/Programming%20ArGISS%2010.1%20with%20Python%20Cookbook.pdf
5. Python, http://www.davekuhlman.org/python_book_01.pdf
6. Python Scripting for ArGISS , http://darrylmcleod.com/wp-content/uploads/2016/06/Python-Scripting-for-ArGISS.pdf
7. The C++ Programming Language, https://is.muni.cz/www/408176/38744863/The_C__Programming_Language__Stroustrup_.pdf
8. C ++ – www.nptel.ac.in/courses/106105151/

18GISP0211	**Practical -III** **Remote Sensing, Digital Image Processing and Photogrammetry**	**2 Credits**

Course Objective: The course provides hands on experience on visual interpretation of different satellite images and digital image processing techniques.

Course Outcome

CO1.	Interpret aerial photographs, satellite images	Apply
CO2.	Transfer of information from image to base map	Apply
CO3.	Preprocessing and enhancement of satellite data.	Apply
CO4.	Apply unsupervised and supervised classification techniques and analyze the accuracy.	Apply & Analyze
CO5.	Apply change detection technique.	Apply
CO6.	Analyze hyperspectral image.	Analyze

REMOTE SENSING AND PHOTOGRAMMETRY

1. Streovision Test and Anatomy of pocket & Mirror Stereoscopes.
2. Decoding, Marking & Transfer of Principal Points, Base line drawing, Flight line marking, 3D Observation, Tracing details, Transfer the details to base map.
3. Interpretation of Aerial photographs
4. Study of various visual Remote Sensing Equipments
5. Decoding of different satellite data
6. Interpretation of Black & White and false color multi band imagery
7. Interpretation of thermal and microwave imagery
8. Transfer of information from Imagery to Base map

DIGITAL IMAGE PROCESSING

1. Reading and displaying satellite data from BIL,BSQ and BIP formats
2. Generating True, False and Pseudo Colour Composite (FCC)
3. Extracting / Subset, Area of Interest (AOI)
4. Measuring length, distance and area.
5. Generating histograms of various bands
6. Georeferencing the base image, Image to Image, Map to Image – Geometric correction of satellite image
7. Mosaic
8. Enhancement using different filtering techniques, Image Fusion
9. Principal Component Analysis (PCA)
10. Band ratio and NDVI
11. Unsupervised Classification – Cluster - Iso cluster
12. Supervised Classification
13. Accuracy Assessment
14. Change detection study
15. Layout Preparation
16. Hyper spectral Image Analysis

18GISP0212	Practical - IV Customization of GIS Software	2 Credits

Course Objective: The major objective of the course is to learn scripting languages such as VBA, Python, Matlab/ Scilab, R, HTML, PHP, Java Script and utilizing them for customizing Geoinformatics Software.

Course Outcome

CO1.	Understand ArcObjects and various scripting languages	Understand
CO2.	Write simple programs to customize GIS software	Apply
CO3.	Develop new tools/ toolbars using scripting languages	Apply
CO4.	Develop as interactive webpage to process and display maps	Apply

ArcObjects with VBA

1. Create simple toolbar in ArGISS
2. Customize a button control
3. Simple programs using ArcObjects

Python

1. Python fundamentals for GIS
2. Basics geoprocessing scripts with ArcPy
3. Managing map documentation and layers
4. Querying and Selecting data
5. Customizing ArGISS interface with Add-In

MatLab/ Scilab

1. Introduction to Matlab/ SciLab.
2. Program to display and enhance an image
3. Use of algorithms in image analysis
4. Creating three dimensional maps

R

1. Introduction to R
2. Visualizing spatial data in R
3. Interpolation and Geostatistics using R
4. Spatial Autocorrelation in R

Java Script /HTML/PHP

1. Programme to create a simple webpage in HTML
2. Create a registration form for Gmail/Yahoo/Rediff Using HTML and Java script
3. Create simple applications using PHP
4. Create simple database applications using PHP and Mysql
5. Develop a webpage to display maps using PHP.
6. Project to create a dynamic websites using HTML-JavaScript/PHP

18EXNP02F1	Extension / Field Visit

▪ Creation of GIS for all UBA villages

SEMESTER – 3
Second Year

18GISP0313	Core Course Global Navigation Satellite System	3 Credits
Course Objective: The course provides the basics of GPS, surveying and its applications.		
Learning Objectives		
CO1. Understand fundamental of GPS.		Understand
CO2. Understand different GPS satellites and systems.		Understand
CO3. Understand different types of GPS and its techniques.		Understand
CO4. Analyze error and basics of LASS & WASS.		Analyze
CO5. Apply GPS in various field		Apply
UNIT I Basics of GNSS	History of GPS - Advantages and limitations of GPS - Segments of GPS - Control segment - Space segment - User segment - Geo positioning: Point positioning - Relative Positioning. Static Positioning – Kinematics Positioning - Uses of GPS	
UNIT II GPS systems	NAVSTAR GPS – GALILEO – GLONAAS – IRNSS – MTSAT - Beidou - Compass. GPS receivers based on: data type and yield - realization of channel –user community. Signal structure: carrier ranging, - ranging code and navigational message - WAAS & LAAS	
UNIT III GPS surveying	Basic modes of GPS surveying: Differential GPS surveying, Static GPS surveying, Rapid static positioning technique -Reoccupation technique- Stop & go technique Kinematic positioning technique - Relative advantages and disadvantages - Data transfer and analysis	
UNIT IV Sources of error	Ionospheric and atmospheric delays - satellite and receiver clock error - anti spoofing - selective availability - multi path - dilution of precision - Error correction - Number and geometry of visible satellites - location of GPS receiver - distance between base station and rover receiver - signal to noise ratio - occupation time at a point - differential correction	
UNIT V GPS applications	Siting and routing - surveying - navigational application - vehicle tracking - mobile computing - military application - Precision Farming - Utilities	

Text books

1. Satheesh Gopi, Global Positioning System Principles and Applications. Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005.
2. Ahmed el Rabbany,Engineer\'s Guide to GPS (Mobile Communications Library) (English) 1st Edition, Artech House Publishers , 2002

Reference Books

1. Hofmann-Wellwnhof.B, Lichtenegger.H, and Collins.J, GPS theory and Practice, Spinger (India) Private Limited, New Delhi, 2007.
2. http://www.palowireless.com/gps/
3. Michael Kennedy, 'The Global Positioning System and GIS: An Introduction', Taylor and Francis Inc. New York, 2002.
4. Leick Alfred, GPS Satellite Surveying, Third Edition, John Wiley & Sons, Inc., Hoboken, New Jersey, 2004.
5. http://www.maps-gps-info.com/ed-resources.html

E-learning Resources

1. Basics of GNSS http://www.palowireless.com/gps/
2. GPS applications http://www.maps-gps-info.com/ed-resources.html

18GISP0314	**Core Course** **Geoinformatics in Resource Management**	3 Credits

Course Objective: The course enables the students to apply various tools of geoinformatics in different fields.

Course Outcome:

CO1.	Apply Geoinformatics in Land resource management	Apply
CO2.	Apply Geoinformatics in Water Resources Management	Apply
CO3.	Apply Geoinformatics in Agriculture and Forestry	Apply
CO4.	Apply Geoinformatics in Utility management	Apply
CO5.	Apply Geoinformatics in Environmental and Oceanography	Apply

UNIT I Land Resource Management	Introduction – importance – problems - soil erosion estimation using RUSLE/ USLE Land Classification System – FAO- USDA- land capability assessment – crop suitability – Land use / Land cover – classification – change detection - land use planning: Rural and urban - Land Reclamation –Land Information System - DSS for Land use planning and management
UNIT II Water Resource Management	Introduction – Water Conservation - Ground water investigation - artificial recharge zone identification – Command area Program - water quality monitoring - surface water harvesting structure - flood prediction - Model - sedimentation evaluation - watershed approach for natural resource management – runoff and hydrological modeling
UNIT III Agriculture & Forestry	Introduction , Spectral properties of crops, crop canopy , identification & inventory, Yield modeling, crop production forecasting through digital analysis, crop condition assessment and monitoring, land use and land cover analysis, Microwave RS for crop inventory & case studies.precision forming Introduction, Forest taxonomy, inventory of forestlands, forest types and density mapping using RS techniques, Forest stock mapping, factors for degradation of forest, - Forest change detection and monitoring , Forest fire mapping & damage assessment , LiDAR remote sensing for Forest studies.
UNIT IV Facilities Management	Infra structure demand analysis - Transportation interaction models – intelligent transportation systems - Transportation planning – mapping transportation - network – classification – optimum route – alignment planning – traffic and parking studies accident analysis - Water utility and electrical utility -telecommunication – tower spotting – route optimization – other utilities - Sitting a new facility - customer loyalty studies - health information system - Crime Analysis: mapping crime data - hot spot analysis - solid waste management
UNIT V Environmental & Oceanographic applications	Environmental types and components – pollution: Air – Water – Soil and Noise – Environmental Impact Assessment - Environmental Information System - GIS and RS in Environmental Studies - Environmental and ecological concerns – resource development in remote areas - impacts of anthropogenic activities Introduction – Major issues/problem – wetland classification - Thematic maps on coastal resources – site suitability analysis for aquaculture – Coastal Regulation zone – Coastal aquifer modelling using GIS – Integrated coastal Zone Management

Text Book

1. Fundamentals of Remote Sensing. George Joseph. Universities Press (India)Pvt Ltd, 3-5-819 Hyderguda, Hyderabad500 029. 2003. 433 pp.

Reference Books

1. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996.
2. Laura L.,Managing Natural Resources with GIS, ESRI Press, 1998.
3. Amim Hammad, Hassan karimi, Telegeoinformatics: Location-based Computing and Services, CRC Press, 1st Edication, 2004
4. Allah Brimicomber, GIS Environmental Modeling and Engineering, Taylor and Francis, 2003
5. Juliana Maantay, John Ziegler and John Pickles, GIS for the Urban Environment, ESRI Press, 2006.

E-Learning Resources

1. Facilities Management http://elearning.irrs.gov.in, www.geospatialworld.net/edu.
2. Water Resource Management, Forestry http://onlinecourses.nptel.ac.in

18GISP0315	Core Course Geoinformatics in Disaster Management	3 Credits

Course Objective: The course enables the students to apply various tools of geoinformatics in different fields.

Course Outcome:

CO1. Apply Geoinformatics in Disaster mitigation and management   Apply

UNIT I	Disaster Management Concepts of disaster; Types of disaster Natural and manmade : Definition - Classification – Causes - Earthquakes – Landslides - Volcanism - Tsunami-Cyclones – Floods - Drought - Forest Fire
UNIT II	Vulnerability – Hazard – Risk Assessment - Natural Disaster Mapping, Management and mitigation using Geoinformatics Technology.
UNIT III	Remote sensing in Damage assessment, Land use planning and regulation for sustainable development. Pre-disaster and post disaster planning for relief operations, Development of Disaster management plan.
UNIT IV	Emergency Support Functions and their coordination mechanism. Resource & Material Management. Management of Relief Camp
UNIT V	Information systems & decision making tools - Rehabilitation Programs

Text Books
1. Bell, F.G. Geological Hazards: Their assessment, avoidance and mitigation. E & FN SPON Routledge, London. 1999.
2. Nick Carter. W. Disaster Management -A Disaster Manager's Handbook. Asian Development Bank, Philippines. 199.

Reference Books
1. Sisizlatanova& Andrea Fabbrijonathanli, Geometrics solutions for Disaster management, Springer Verlag, 2007.
2. C.EmdadHaque, Mitigation of natural Hazards & disasters, Klwuer Acadamic publishers group, 2005. 3. Linda C. Bottersl l& ponald A. wilhite, From Disaster response to Risk management. Klwuer Acadamic publishers group, 2005.
3. Gerard Blokdijk, Disaster recovery planning and services, Gennaio publishers, 2008. 5. Mohamed Gad Large scale disasters : prediction, control and mitigation, Cambridge university press, 2008

E-Learning Resources
1. http://elearning.irrs.gov.in
2. http://onlinecourses.nptel.ac.in
3. www.imd.gov.in

18GISP0316	**Core Course** **Practical V – Geoinformatics in Resources** **and Disaster Management**	**3 Credits**

Course Objective: The course aims at utilizing the tools of GIS in various fields such as in land and water resource management, disaster management, network and drainage analysis, environment management etc.

Course Outcome :

CO1.	Prepare various thematic maps for various areas of applications	Understand
CO2.	Use various thematic maps in specific applications	Understand
CO3.	Apply the tools of GIS in various ways for different applications	Apply
CO4.	Analyze the output generated and interpret it	Analyze

1. Preparation of various thematic maps
2. Drainage – TIN – DEM – slope - aspect – land use/ land cover – depth of water table – lineament - soil – geology – geomorphology.
3. Land resource management: Change detection in various land use/ land cover types and cross tabulation - land capability assessment - soil erosion estimation - Village GIS- urban sprawl
4. Water resource management I: Watershed delineation and identification of suitable site for constructing water harvesting structures – assessing the water holding capacity of a dam
5. Water resource management II: Hydrological modeling – locating site for artificial recharge zone – water quality assessment
6. Disaster management: flood – landslide – drought assessment
7. Network Analysis - shortest path – best path – service area – OD cost matrix - Location and Allocation - route tracing – proximity analysis – site suitability –address matching –
8. Morphometric Analysis: Areal – Linear – Relief aspects
9. Environmental management: Climate change – land surface temperature – evapo-traspiration – impact – sea level rise – biomass estimation.
10. 3D mapping - Animation - hypermap

15GISP0316	**Core Course** **Practical-VI: Case Study in GIS / Remote Sensing / WebGIS**	**2** **Credits**

Course Objective: The course imparts the methods and techniques of application of various tools of GIS, DIP and WebGIS in real world spatial problems.

Course Outcome:

CO1. Apply the tools of GIS, DIP. Customization of software and WebGIS in solving spatial problems.	Apply

- Identification of a problem in consultation with internal guide
- Executing the work as per the instructions of both internal and external guide while incorporating any of the following activities or combination of activities
    - Designing of Geoinformatics
    - GIS implementation and application
    - Map server design
    - RS application
    - GPS application
    - Spatial modeling or such other related topics, which will give focus to Geoinformatics implementation
- The size of the dissertation may be between 50 and 70 pages, which is not inclusive of scripts and other appendices

The dissertation should be submitted both in print form and digital form (pdf / crystal reports).

18APRP0003	Core Course Research Methods and Statistics	4 Credits

Course Objectives:
To enable the students understand the basics of research methodology, and
To develop skill in preparing research report

Course Outcome: Upon completion of the course, the students will be able to:

1. Identify and formulate a problem for research.
2. Prepare suitable research design to study a research problem to be formulated
3. Choose appropriate methods of sampling, tools and techniques of data collection
4. Process the data collected in the field and to analyse using appropriate statistical methods
5. Prepare research report in a professional manner.

UNIT I Introduction	Research – definition - objectives-types. Research Process- Identifying and prioritizing problems - theoretical framework – review of literature, variables -its types– Hypothesis – formulation and types
UNIT II Research Design	Explorative; Experimental, descriptive, Case study and survey methods. Content Analysis, Intervention and Interdisciplinary Studies, Mixed methods.
UNIT III Data Collection	Sampling and non-sampling techniques - Data collection methods – interview, schedule, Questionnaire, and observation. Online research methods, psychological tests, projective techniques. Validity and reliability of scales - Research Report - Components and format of research report - Reference materials, quotations, bibliography, footnotes, glossary and appendix, dissemination of findings
UNIT IV Descriptive Statistics	Measures of central tendency, dispersion, skewness and kurtosis – Correlation of Analysis, Association of attributes Multiple regression and correlation analysis, concepts of Factor analysis. Statistical software and its uses.
UNIT V Inferential Statistics	Basic concepts and Hypothesis testing and Estimation; Steps in hypothesis testing. Tests for Large and small samples – Z test, t-test and F-test, Chi-square test, Mann-Whitney test, and ANOVA

Reference Books

1. Gupta S.P.& M.P.Gupta, Business Statistics, New Delhi:Sultan Chand & Sons, 2006
2. Shajahan Dr. S., Research Methods for Management (Text and Cases), New Delh: Jaico Publishing House, 2006.
3. Hooda R.P., Statistics for Business and Economics, New Delhi Macmillan Ltd., 2003.
4. Beri G.C., Marketing Research, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2000.
5. Donald R.Cooper, Business Research Methods, New Delhi: McGrew-Hill International Editions, 1998.
6. Vijayalakshmi G. & Sivapragasam C., Research Methods: Tips and Techniques, Chennai: MJP Publishers, 2009.
7. Krishnaswamy O.R, Methodology of Research in Social Sciences, Himalaya Publishing House, Bombay, 2002.
8. Kothari C.R, Research Methodology, Wishva Prakashan, New Delhi, 2001.
9. Donald R Cooper and Ramela S. Schindler, Business Research Methods, Tata McGraw Hill Publishing Company Limited, New Delhi, 2000.

18GISP03E1	**Major Elective** **Geography**	**4 Credits**

Course Objective: The course provides an outline about geography and its basic branches such as geomorphology, climatology and oceanography.

Course Outcome:

CO1.	Understand basics of Geography	Understand
CO2.	Understand the Geomorphological features and created by various weathering agents.	Understand
CO3.	Understand the concept of climate and weather & temperature	Understand
CO4.	Understand the distribution of atmosphere pressure, wind and precipitations	Understand
CO5.	Understand the surface configuration of ocean floor, distribution of temperature and salinity, circulation of ocean	Understand

UNIT I Geography	Basics of Geography – Scope – approaches to study geography: systematic – regional – regional – methods - and techniques of geography: cartography – quantitative – regional – branches of geography
UNIT II Geomorphology	Geomorphology - nature and scope – application of geomorphic techniques - earth's interior – origin of continents and ocean basins - concept of plate tectonics – earth movements: orogenetic and epirogenetic movements – Isostasy – Mountain building Earthquakes – Volcanoes – Rocks – origin – types - characteristics; Weathering - Fluvial landscape –Karst topography – Coastal topography; Glacial landscape – Eolian landscape
UNIT III Climatology I	Climate/ Weather: Significance of climatology – Climatic elements – Surface composition and structure of the atmosphere – Insolation - Horizontal and vertical distribution of temperature - Range of temperature – Diurnal, seasonal and annual
UNIT IV Climatology II	Atmospheric pressure and winds – Vertical and horizontal distribution of pressure – Planetary, periodic and local winds – Atmospheric moisture – Condensation forms and precipitation – Types – Spatial and seasonal - Air masses and fronts – Concepts – Classification and properties - Atmospheric disturbances - Tropical cyclones – Temperate cyclones and anti-cyclones
UNIT V Oceanography	Oceanography: Definition – Surface configuration of the ocean floor – Continental shelf, slope, deep sea plain and deeps –Distribution of temperature and salinity in the seas/oceans - Circulation of oceanic waters - Waves, tides and currents - Marine deposits and coral reefs.

Text Book

1. Surender Singh, Geography, Tata McGraw-Hills Series, New Delhi, 2007

Reference Books

1. Thornbury, W. D. (I960): Principles of Geomorphology, John Wiley and Sons, New York.
2. Chorley, R. J., Schumm, S. A. and Sugden, D. E. (1984): Geomorphology, Methuen, London
3. Savindra Singh (2002): Physical Geography, Prayag Pustak Bhawan, Allahabad.
4. D. S. Lal: Climatology. Sharda Pustak Bhawan ,11 , University road Allahabad- 211002 Edition 2003
5. Frederick K. Lutgen, Edward Tar buck: "The Atmosphere An Introduction to Meteorology" Prentice Hall, Englewood Cliffs ,New Jersey 0762 ,1998

E-Learning Resources

1. Fundamentals of Physical Geography, https://www.pdfdrive.net/fundamentals-of-physical-geography- d564637.html
2. Climatology, https://www.pdfdrive.net/climatology-e34719617.html
3. Introduction To Physical Oceanography, https://www.pdfdrive.net/introduction-to-physical-oceanography-e5831077.html

18GISP03E2	**Major Elective Course** **Geology**	**4 Credits**

Course Objective: The course exposes the students to geology and its branches such as landforms, minerals and rocks, geophysical exploration and its applications.

Course Outcome:

CO1. Understand structure of earth, geological structures and tectonic activities	Understand
CO2. Understand various geomorphic units, unconformity	Understand
CO3. Understand distribution of minerals, rock types, occurrence and distribution and economic minerals in India	Understand
CO4. Apply various geophysical methods for resources inventory	Apply
CO5. Apply geological techniques for natural resources inventory	Apply

UNIT I Introduction to Geology	Introduction: Geology for natural resources inventory - Branches of geology – Scope - Interior of the Earth - Stratigraphic sequence, Geological Time scale - Weathering, - Introduction to geological structures - Plate Tectonics – Earthquake and volcanic belts in India
UNIT II Geomorphic and Structural landforms	Landforms and geomorphic process – Classification - Description of Structural, Denudational, Tectonic Fluvial, Glacier, Aeolian and Coastal landforms - Drainage pattern and Morphometry - Primary and Secondary structures - Dip - Strike - Foliation and Lineation – Folds - faults – Joint – Unconformity
UNIT III Minerals & Rocks	Introduction to Minerals – Physical properties - Chemical properties - Rock Cycle – Classification and description of rocks - Forms and mode of occurrence of rocks – Physical properties of important rocks and ore forming minerals - Distribution of economic minerals in India.
UNIT IV Geophysical Exploration	Geophysical methods - Seismic, Electrical, Gravity - Magnetic and aeromagnetic methods - their bearing on Resources Inventory
UNIT V Applications	Resources Inventory: Mineral – Water – hydrocarbon – Soil resources - Natural Disaster Management and Mitigation – Engineering Applications : Site selection & Construction of major structures like Dam, Tunnel, Road, Railway etc. - Artificial recharge structure, Natural disaster mitigation structures

Text books

1. Frank Press Raymond Siever: Understanding Earth (3rd ed). W.H. Freeman and Company. New York 2000
2. B. J. Skinner and S.C. Porter: The Dynamic Earth – An Introduction to Physical Geology 3rd edition. John Wiley & Sons, New York. 1995

Reference Books

1. Arthur Holmes, (1992) Principles of Physical Geology, Edited by Duff.P.Mcl.D.4th Ed. Chapman and Hall, London.
2. Billings, M. P. Structural Geology, Prentice-Hall, Inc, New Jersey, USA, 1972
3. George Joseph, Fundamentals of Remote Sensing, Second Edition, Universities Press (India) Private Limited, 2005 ISBN 8173715351, 9788173715358.
4. Lillesand M. Thomas and Ralph W.Kiefer, Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons, New York, 2017
5. Ravi P. Gupta, Remote Sensing Geology, Springer-Verlag New York, 2002.

E-Learning Resources

1. Introduction to Geology http://www.tulane.edu/-sanelson/eens1110/
2. Applications www.gisdevelopment.net/books/mapping/bmap0010.htm

18GISP03E3	**Major Elective Course** **Watershed Management**	**4 Credits**

Course Objective: The Course explains about the meaning of watershed, watershed development programmes, use of Geoinformatics in watershed planning, monitoring and evaluation

Course Outcome:

CO1.	Able to define goals and objectives of watershed management.	Understand
CO2.	Understand the national, state, regional, and local policies of watershed management.	Understand
CO3.	Application the tools of Geoinformatics in delineation of watershed	Apply
CO4.	Develop and implement a watershed management plan with the use of various thematic maps.	Apply
CO5.	Apply various tools of PRA and Geoinformatics in monitoring and evaluation of watershed plans.	Analyze

UNIT I Introduction	Watershed – definition – causes and consequences of watershed deterioration - Watershed delineation and codification – watershed approach – advantages – watershed as a unit of planning - Watershed management – approaches to watershed development – principles and components of watershed management
UNIT II IWMP	Integrated Watershed Management Programme: Introduction – institutional arrangements – livelihood orientation – cluster approach – scientific planning – capacity building – multi tier approach - Criteria for selection of watershed projects – project management: Preparatory phase – work phase – consolidation and withdrawal phase.
UNIT III Planning	Role of Geoinformatics in scientific planning: watershed delineation - Baseline survey/ bench mark survey - evaluation of deterioration – acquiring data – preparation of various thematic maps – scientific planning
UNIT IV Monitoring	Monitoring: Meaning – factors – indicators - learning outcome/ result
UNIT V Evaluation	Evaluation: Focus – need for – types of evaluation:Community participation – PRA methods of Evaluation; Areas of Evaluation: Depth of water table – cropping pattern – area under biomass – various Land use/ land cover – water body

Text Book

1. N.D. Mani, Watershed Management: Principles, Parameters and Programmes, Dominant Publishers and Distributors, New Delhi, 2005

Reference Books

1. Paul A.DeBarry, PE,PH,APSS, "Watersheds Process, Assessment and Management", Wiley Student Edition, New Jersy, 2004
2. Srivastava, O.N. and Y.V. Rao, "Impact of Integrated Wasteland Development Programme (IWDP) - A Study in Uttar Pradesh, National Institute of Rural Development, Hyderabad, 2001.
3. Raj Vir Singh, "Watershed Planning and Management", Yash Publishing House, Bikaner, 2001.
4. E.M. Tideman, " Watershed Management gudelines for Indian Conditions", Omega Scientific Publisher, New Delhi, 2006
5. J.V.S.Murty, "Watershed Management", New Age International, New Delhi, 2007

E-Learning Resources

1. Land Stewardship in the 21st Century: The Contributions of Watershed Management, https://www.pdfdrive.net/land-stewardship-in-the-21st-century-the-contributions-of-watershed-management-e36318879.html
2. Watershed Management Guidebook – Integrated Environmental, https://www.pdfdrive.net/watershed-management-guidebook-integrated-environmental-e15279893.html

18GISP03E4	**Major Elective Course** **Web Technology for Geoinformatics**	**4 Credits**

Course Objective:
This course provides the basic knowledge about the Internet & Web Technology for Geoinformatics

Course Outcome:

CO 1. Understand the basics of Internet	Understand
CO 2. Knowledge about markup and scripting languages	Understand
CO 3. Understand the basic concepts on PHP and AJAX	Understand
CO 4. Describe about WebGIS	Understand

UNIT I Internet	Internet – overview – Networks – TCP-IP – web organization and address - ports – packets – routers and routing – Web browser and Servers – Client Server architectures – Security
UNIT II Markup languages	Markup Languages - HTML- XML – DHTML – XHTML - Style sheet technologies – creating dynamic web pages
UNIT III Scripting Languages	Scripting languages: Introduction- Java script, VB script, ASP, Java script: Introduction, documents, forms, control structure, functions, and objects
UNIT IV PHP and AJAX	Introduction – PHP - variables – Control statements – Functions – Built-in-function-Data base connections. AJAX: Introduction, advantages & disadvantages, Purpose, AJAX based web application, alternatives of AJAX
UNIT V WebGIS	WebGIS: basics and services - components of WebGIS - concept of map and software repository - scripts and data management system uses and limitation

Reference Books

1. Andrew S. Tanenbaum, David J, Computer networks, Pearson, 2011.
2. Pinde Fu, Jiulus S: Web GIS: Principle and Applications, ESRI Press, 2011.
3. Powel, HTML and CSS: The Complete Reference, 5th Edition, Tata McGraw Hill.
4. David Flanagan Java Script: The Deinitive Guide O' Reilly
5. Antbony T Holdener Ajase the Definitive Guide O'Reilly

E-Learning Resources
1. Internet: http://nptel.ac.in/courses/106105084/25
2. Javascript: http://nptel.ac.in/courses/106105084/25

18EXNP03F2	**Extension / Field Visit**

▪ Creation of GIS for all UBA villages

18GISP00MX	**Modular Course** **Spatial Decision Support System**	**2 Credits**

Objective: The course exposes the students to decision making and concepts of spatial decision support system

Course Outcome:

CO1. Understand the concept, architecture and frame work of SDSS and decision variables

CO2. Learn about various ranking, rating and comparision methods involved in decision modeling

CO3. Gain knowledge on types of decision modeling

CO4. Apply the SDSS in specified areas

UNIT I Introduction	Introduction to Decision Making - Concept and Characteristics of Spatial Decision Support Systems (SDSS) – Architecture of SDSS - Spatial Decision Support System (SDSS) and GIS
UNIT II Decision Variables	Decision variables - Concept – Deterministric, Random - Decision Alternatives and Constraints - Efficiency and Effectiveness of Decision Making
UNIT III Estimation of Weights	Concept of Estimating Weights – Ranking Methods – Rating Methods – Pairwise comparision methods – Trade off analysis methods
UNIT IV Decision Modeling	Concept and types of Multi-attribute Decision modelling – Multi objective Decision Modelling – Sensitivity Analysis.
UNIT V Areas of Application	Land Suitability Analysis – Education and Health Care Resources location – Water Resources Management.

Text Book

1. Ramanathan Sugumaran and John Degroote, Spatial Decision Support Systems- Principles and Practices, CRC Press, Taylor and Francis Group, USA, 2011.

Reference Books

1. Bonczek, R.H., C.W. Holsapple, and A.B. Whinston, 1981, Foundations of Decision Support Systems, Academic Press, New York.
2. House, W.C. (ed.), 1983. Decision Support Systems, Petrocelli, New York.
3. Jenson, J.R. 2000, Remote Sensing of the environment – An Earth Resource Perspective, Prentice Hall Inc.
4. Malczewski, J. 1999, GIS and Multicriteria Decision Analysis, John Willey and Sons, New York.
5. Raghu Ramakrishnan, 2002, Database Management Systems, Johannes Gehrke, McGraw-Hill.

18GISP00MY	**Modular Course** **Introduction to Rural Development**	**2 Credits**

Course Objective: This course introduces principle and concepts of Remote Sensing and GIS, its applications for geology, natural hazards and environmental management.

Course Outcome:
On completion of this course, student will be able to recognize geological features using image characteristics and will be able to perform image processing and can interpret satellite images for possible earth resources.

UNIT I	Rural Development: Concept - Facets-Major issues
UNIT II	Theoretical Framework for rural development - Assets distribution- land ownership methods of production - -resource distribution- social framework of agriculture
UNIT III	Rural Development Programmes of Government of India - Past and Present programmes - Impact of rural development programmes
UNIT IV	Stakeholders in rural development: State and Bureaucracy in rural development - Panchayati Raj Institutions (PRIs) - NGOs. People's Participation - Myths and reality
UNIT V	Sustainable Rural Development - Gandhian Economic Order - Dr.J.C.Kumarappa's - Theory of Economic Permanence

Reference Books

1. Jai Narain Sharma: Alternative Economics- Economics of Mahatma Gandhi & Globalization, Deep & Deep Publications (P) Ltd., New Delhi, 2003.
2. John M. Riley: Stakeholders in Rural Development, Sage Publications, New Delhi, 2002.
3. Sartaj Aziz: Rural Development- Learning from China, Macmillan Press, 1978.
4. Sudhakar . V: New Panchayati Raj System, Mangal Deep Publications, Jaipur, 2002.
5. Ratnakar Gedam : Poverty in Indian, Deep & Deep Publications, New Delhi, 1998.

18GISP00MY	**Modular Course** **Open Source Software**	**2 Credits**

Course Objective:
This course explores the open source software available for research and development.

Course Outcome:
CO1: Understand the concept and protocols in Open Source Software.　　　Understand
CO2: Describe about various open source operating system.　　　Understand
CO3: Summarise functions of Geo apps　　　Understand
CO4: Understand the web mapping and web servers　　　Understand
CO5: Work on sample case studies using open source software　　　Apply

UNIT I Introduction and Linux	Introduction to Open source: Importance – Advantages – Applications. Open source operating systems LINUX: Introduction – General Overview – Kernel Mode and user mode – Process – Advanced Concepts.
UNIT II Open Source Software	Open source Software: GIS: Openjump – GRASS – QGIS - SagaGIS Image Processing: ILWIS, SciLab, Trivim. GIS Database: PostGIS. Compilers: Python, R. Scripting Language: Java Scripting. Mark-up languages: HTML.
UNIT III WebGIS	Web Mapping with Open source tool kit - Introduction to Web mapping – Merits and demerits of web mapping - Different kinds of web mapping – Openlayers, GeoServer – Map window- Geospatial Data Library –Open source tool kits. Project on Web mapping: A Panchayat GIS will be created by different groups.
UNIT IV Mobile Apps	Mobile GIS apps: Weather apps, Wind speed/direction, Pollution apps, Location/navigation apps, Data collection apps, Geo data collect, Geo area Map, Geo Camera, My Geo.
UNIT V GIS Customisation	GIS Customisation Programming: GIS Customisation - Needs of Scripting Language – Advantage of Macro Scripting – Sample Case studies.

Reference Books
1. Markus Neteler, Helena Mitasova, Open Source GIS: A GRASS GIS Approach, Edition, Springer 2007.
2. Neteler, M and H.Mitasova, Open Source GIS. A GRASS GIS Approach, Kluwer Academic Publishers, Bostan, USA/London, UK, 2008.
3. Qgis: https://www.packtpub.com/application-development/mastering-qgis
4. Machtelt Garrels Introduction to Lmux beginner Guide
5. Pride Fu, Jiulus S : WebGIS: Principle & Application, ESRI Press, 2011

E-Learning Resources
1. Linux Operating System: http://nptel.ac.in/courses/106106144/
2. Javascript: http://nptel.ac.in/courses/106105084/25
3. SciLab: http://nptel.ac.in/courses/113101002/5
4. R programming: http://nptel.ac.in/courses/102101056/9

18GISP00MY	**Modular Course** **LiDAR and its Applications**	**2 Credits**

Course Objective:

This course explores the open source software available for research and development.

Course Outcome:

CO1. Understand the concept and protocols in Open Source Software   Understand
CO2. Describe about various open source operating system   Understand
CO3. Summarise functions of Geo apps   Understand
CO4. Understand the web mapping and web servers   Understand
CO5. Work on sample case studies using open source software   Apply

UNIT I LiDAR	LASER, LiDAR – Principles and properties – Different LiDAR system – Applications –Advantages, Disadvantages – Space borne and airborne LiDAR missions – Typical parameters of a LiDARsystem.
UNIT II Principle of Laser Altimetry	Principle of Laser Altimetry – Components of the system – GPS, IMU, LASER, LiDAR data formats – Terrain Mapping Laser Configuration – Ocean bathymetry Laser Configuration - Limitations of the system.
UNIT III GPS and IMU	GPS and IMU data processing – Strip Adjustment – Geometric Correction – Data quality enhancement – Digital Surface Model – Filtering – Ground Point Filtering – Digital Elevation Model.
UNIT IV Areas of Application	Hydrology, Disaster Mitigation and Management – 3D city models – Telecommunication
UNIT V Modelling	Modeling – Urban planning – Coastal Zone Bathymetry Mapping – Feature extraction, vectorisation – Surface and land use classification. Orthophoto rectification using LiDAR – Integrated LiDAR and Digital PhotogrammetryTechniques – Integration of LiDAR DEM with other hyper spectral data.

Text Books

1. Pinliang Dong & Qi Chen, LIDAR Remote sensing and Applications (Remote sensing Application series), CRC Press, Dec 2017. ISBN-10:1138747246.
2. Jie Shan & Charless K. Toth, Topographic Laser Ranging and Scanning: Principles and Processing, CRC Press, 2017 ISBN 1420051431.

Reference Books

1. Floyd M. Henderson; Principles & Applications of Imaging Radar, John Wiley & Sons, New York, 1998.
2. Alexay Bunkin & Konstantin Volia.K, - Laser Remote Sensing of the Ocean Methods & Publications. John & Wiley & Sons, New York, 2001.
3. Raymond M. Measures; Laser Remote Sensing: Fundamentals and Applications, John Wiley & Sons, New York, 1984.
4. Robert M. Haralick and Simmonett, Image processing for remote sensing 1983.
5. Cracknell, Arthur P.; Hayes, Ladson. Introduction to Remote Sensing (2 ed.). London: Taylor and Francis 2007

E Learning Resources

1. LiDAR http://elearning.irrs.gov.in, www.geospatialworld.net/edu
2. Areas of Applications www.lidarusa.com

SEMESTER – 4
Second Year

Core Course

18GISP0417   **6Credits**

Dissertation

- Identification of a problem in consultation with internal guide
- Executing the work as per the instructions of both internal and external guide while incorporating any of the following activities or combination of activities
    - Designing of Geoinformatics
    - GIS implementation and application
    - Map server design
    - RS application
    - GPS application
    - Spatial modeling or such other related topics, which will give focus to Geoinformatics implementation
- The size of the dissertation may be between 50 and 70 pages, which is not inclusive of scripts and other appendices
- The dissertation should be submitted both in print form and digital form (pdf / crystal reports).

Core Course   **12**

18GISP0418

Internship   **Credits**

1. It demands submission of fortnight reports on learning process and execution of desired objectives.
2. The internship is evaluated internally by the content the reports and viva voce

INTERDEPARTMENTAL – OTHER DEPARTMENTS
NON-MAJOR ELECTIVE PAPERS
FOR UG / PG PROGRAMMES

List of Non Major Elective courses

UG Level

18GISU04N1   Introduction to Geoinformatics

PG Level

18GISP02N1   Basics of Geoinformatics
18GISP02N2   Geography
18GISP02N3   Disaster Management
18GISP02N4   Natural Resource Management

18GISU04N1	**Non-Major Elective (UG Level)** **Introduction to Geoinformatics**	**3 Credits**

Course Objective:	
The course provides an introduction to various technologies of Geoinformatics and its applications.	
Course Outcome:	
CO 1. Understand the technologies of Geoinformatics CO 2. Introduce the concept of Remote Sensing and Digital Image Processing CO 3. Learn the concept of Geographical Information System CO 4. Known Global Navigation Satellite System CO 5. Apply tools of Geoinformatics in various fields	
UNIT I Introduction	Meaning - Concept of Spatial Dimension – Contributing Technologies – Earth – Shape - Spatial objects
UNIT II Remote Sensing & DIP	Definition – Components – EMR - Remote Sensing Resolutions - Aerial - Satellite Remote Sensing. Digital Image Processing: Definition - Stages in DIP – Image Classification
UNIT III Geographical Information System	Introduction – Definition - Components of GIS – Geodatabase - Analytical Tools of GIS.
UNIT IV Global Navigational Satellite System	Definition – History - Working Principles – Segments – Global – NAVSTAR, GLONASS, GALILEO; Regional – IRNSS, BEIDOU; Augmentation – WAAS, LAAS.
UNIT V Application of Geoinformatics	Natural Resources and Disasters Mapping and Management –Environmental Studies –- Urban Studies – Military – Civil Engineering – Agriculture - Navigation - Location Based Services - Facilities Management.

Text Book

1. Sailful Islam, Geoinformatics, Vayu Education of India, New Delhi, 2013

Reference Books

1. Peter A. Burrough and Rachael A. Mc. Donnell, Principles of Geographical Information System, 3rd Edition, Oxford University Press Inc., New York, 2015.

2. Ian Heywood, Sarah Cornelivs and Steve Carver, An Introduction to Geographical Information System, 3rd Edition, Pearson Education Pvt .Ltd., New Delhi, 2010.

3. LO. C.P., and Albert K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall of India, New Delhi, 2009.

4. Lillesand M. Thomas and Ralph W.Kiefer, Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons, New York, 2017

5. Satheesh Gobi, Global Positioning System – Principles and Applications, Tata McGraw – Hill Publishing Co Ltd, New Delhi, 2005.

18GISP02N1	Non-Major Elective (PG Level) **Basics of Geoinformatics**	**4 Credits**

Course Objective:

    The course provides an introduction to various technologies of Geoinformatics and its applications.

Course Outcome:

CO 1. Understand the technologies of Geoinformatics

CO 2. Introduce the concept of Remote Sensing and Digital Image Processing

CO 3. Learn the concept of Geographical Information System

CO 4. Known Global Navigation Satellite System

CO 5. Apply tools of Geoinformatics in various fields

UNIT I Introduction	Meaning – Scope - Concept of Spatial Technologies - Contributing Technologies – Earth - Projection – Representation of Spatial objects.
UNIT II Remote Sensing & DIP	Definition – Components – EMR - Remote Sensing Resolutions - Aerial Remote Sensing - Satellite Remote Sensing - Types of Satellites – Satellite Photogrammetry - Image Interpretation - Digital Image Processing: Definition, Stages in Image Processing – Image Classification.
UNIT III Geographical Information System	Introduction – Definition - Components of GIS – types of data – sources of spatial/attribute data - Geodatabase - Analytical Tools of GIS (Measurement, buffer, overlay, query, spatial interpolation, surface analysis, and network analysis).
UNIT IV Global Navigational Satellite System	Definition-History - Working Principles – Segments - Advantages – Disadvantages of GNSS - NAVSTAR, GLONASS, GALILEO; Regional – IRNSS, BEIDOU; Augmentation – WAAS, LAAS - Stand alone/DGPS - Modes of GPS Surveying.
UNIT V Application of Geoinformatics	Natural Resources Management - Environmental Studies - Disaster Management - Utilities Management - Land Parcel Based - Urban Studies - Military Applications – Navigation - Location Based Services – Civil Engineering - Agriculture.

Text Book

1. Sailful Islam, Geoinformatics, Vayu Education of India, New Delhi, 2013

Reference Books

1. Peter A. Burrough and Rachael A. Mc. Donnell, Principles of Geographical Information System, 3rd Edition, Oxford University Press Inc., New York, 2015.
2. Ian Heywood, Sarah Cornelivs and Steve Carver, An Introduction to Geographical Information System, 3rd Edition, Pearson Education Pvt .Ltd., New Delhi, 2010.
3. LO. C.P., and Albert K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall of India, New Delhi, 2009.
4. Lillesand M. Thomas and Ralph W.Kiefer, Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons, New York, 2017
5. Satheesh Gobi, Global Positioning System – Principles and Applications, Tata McGraw – Hill Publishing Co Ltd, New Delhi, 2005.

18GISP02N2	**Non Major Elective** **Geography**	**4 Credits**

| **Course Objective:** The course provides an outline about geography and its basic branches such as geomorphology, climatology and oceanography. |||

Course Outcome:		
CO1. Understand basics of Geography		Understand
CO2. Understand the Geomorphological features and created by various weathering agents		Understand
CO3. Understand the concept of climate and weather & temperature		Understand
CO4. Understand the distribution of atmosphere pressure, wind and precipitations		Understand
CO5. Understand the surface configuration of ocean floor, distribution of temperature and salinity, circulation of ocean		Understand

UNIT I Geography	Basics of Geography – Scope – approaches to study geography: systematic – regional – regional – methods - and techniques of geography: cartography – quantitative – regional – branches of geography
UNIT II Geomorphology	Geomorphology - nature and scope – application of geomorphic techniques - earth's interior – origin of continents and ocean basins - concept of plate tectonics – earth movements: orogenetic and epirogenetic movements – Isostasy – Mountain building Earthquakes – Volcanoes – Rocks – origin – types - characteristics; Weathering - Fluvial landscape –Karst topography – Coastal topography; Glacial landscape – Eolian landscape
UNIT III Climatology I	Climate/ Weather: Significance of climatology – Climatic elements – Surface composition and structure of the atmosphere – Insolation - Horizontal and vertical distribution of temperature - Range of temperature – Diurnal, seasonal and annual
UNIT IV Climatology II	Atmospheric pressure and winds – Vertical and horizontal distribution of pressure – Planetary, periodic and local winds – Atmospheric moisture – Condensation forms and precipitation – Types – Spatial and seasonal - Air masses and fronts – Concepts – Classification and properties - Atmospheric disturbances - Tropical cyclones – Temperate cyclones and anti-cyclones
UNIT V Oceanography	Oceanography: Definition – Surface configuration of the ocean floor – Continental shelf, slope, deep sea plain and deeps –Distribution of temperature and salinity in the seas/oceans - Circulation of oceanic waters - Waves, tides and currents - Marine deposits and coral reefs.

Reference Books

1. Thornbury, W. D. (I960): Principles of Geomorphology, John Wiley and Sons, New York.
2. Chorley, R. J., Schumm, S. A. and Sugden, D. E. (1984): Geomorphology, Methuen, London
3. Strahler A. H and Strahler, A. N. (1992) : Modern Physical Geography, John Wiley, New York
4. Savindra Singh (2002): Physical Geography, Prayag Pustak Bhawan, Allahabad.
5. D. S. Lal: Climatology. Sharda Pustak Bhawan ,11 , University road Allahabad- 211002 Edition 2003

E-Learning Resources

1. Fundamentals of Physical Geography, https://www.pdfdrive.net/fundamentals-of-physical-geography-d564637.html
2. Climatology, https://www.pdfdrive.net/climatology-e34719617.html
3. Introduction To Physical Oceanography, https://www.pdfdrive.net/introduction-to-physical-oceanography-e5831077.html

18GISP02N3	**Non-Major Elective** **Disaster Management**	**4 Credits**
Objective:	To make the students to understand the relevance of disaster management techniques in community development	
UNIT I Introduction	Nature, characteristics and types of Disasters – Causes and effects of Disaster – Disaster Profile of India – Disaster Management cycle.	
UNIT II Natural and Man Made Disasters	Geological and Mountain Area Disasters (Earthquakes, volcanic Eruption, Landslides and Snow Avalanches) – Wind and Water Related Disasters (Floods and Flash Floods, droughts, cyclones and Tsunamis) – Man Made Disasters (Fires and Forest Fires, Nuclear, Biological and Chemical disaster and Road Accidents).	
UNIT III Natural Disaster Management	Prevention and Preparedness – Preparedness Plan – Disaster Mitigation – Mitigation strategies and management – Reconstruction and Rehabilitation – Damage Assessment, Development of Physical and Economic Infrastructure, Education and Awareness – Roles & Responsibilities of Gos and NGOs.	
UNIT IV Disaster Response and Management	Communication and Activation of Emergency Preparedness Plans – Search, Rescue, Evacuation and other logistic management – Psychological Response and Rehabilitation – Trauma and Stress Management – Rumour and Panic Management – Medical and Health Response to Different Disasters – Relief and recovery management.	
UNIT V Technologies for Disaster Management	Role of IT in Disaster Preparedness – Remote Sensing, GIS and GPS – Modern Technologies for the Emergency communication.	

Text Books

1. Bell, F.G. Geological Hazards: Their assessment, avoidance and mitigation. E & FN SPON Routledge,

   London. 1999.

2. Nick Carter. W. Disaster Management -A Disaster Manager's Handbook. Asian Development Bank,

   Philippines. 199.

Reference Books

1. Sisizlatanova& Andrea Fabbrijonathanli, Geometrics solutions for Disaster management, Springer Verlag, 2007.
2. C.EmdadHaque, Mitigation of natural Hazards & disasters, Klwuer Acadamic publishers group, 2005. 3. Linda C. Bottersl l& ponald A. wilhite, From Disaster response to Risk management. Klwuer Acadamic publishers group, 2005.
3. Gerard Blokdijk, Disaster recovery planning and services, Gennaio publishers, 2008. 5. Mohamed Gad Large scale disasters : prediction, control and mitigation, Cambridge university press, 2008

E-Learning Resources

1. http://elearning.irrs.gov.in
2. http://onlinecourses.nptel.ac.in
3. www.imd.gov.in

18GISP02N4	**Non Major Elective** **Natural Resource Management**	4 Credits

Course Objectives: The course enables the students to apply various tools of geoinformatics in different fields.

Course Outcome:
CO1. Apply Geoinformatics in Land resource management
CO2. Apply Geoinformatics in Water Resources Management
CO3. Apply Geoinformatics in Agriculture and Forestry
CO4. Apply Geoinformatics in Utility management
CO5 .Apply Geoinformatics in Environmental and Oceanography

UNIT I Land Resource Management	Introduction – importance – problems - soil erosion estimation using RUSLE/ USLE Land Classification System – FAO- USDA- land capability assessment – crop suitability – Land use / Land cover – classification – change detection - land use planning: Rural and urban - Land Reclamation –Land Information System - DSS for Land use planning and management
UNIT II Water Resource Management	Introduction – Water Conservation - Ground water investigation - artificial recharge zone identification – Command area Program - water quality monitoring - surface water harvesting structure - flood prediction - Model - sedimentation evaluation - watershed approach for natural resource management – runoff and hydrological modeling
UNIT III Agriculture & Forestry	Introduction, Spectral properties of crops, crop canopy , identification & inventory, Yieldmodeling, crop production forecasting through digital analysis, crop condition assessment and monitoring, land use and land cover analysis, Microwave RS for crop inventory & case studies precision forming Introduction, Forest taxonomy, inventory of forestlands, forest types and density mappingusing RS techniques, Forest stock mapping, factors for degradation of forest, - Forest change detection and monitoring, Forest fire mapping & damage assessment, LiDAR remote sensing for Forest studies.
UNIT IV Facilities Management	Infra structure demand analysis - Transportation interaction models – intelligent transportation systems - Transportation planning – mapping transportation - network – classification – optimum route – alignment planning – traffic and parking studies accident analysis - Water utility and electrical utility -telecommunication – tower spotting – route optimization – other utilities - Sitting a new facility - customer loyalty studies - health information system - Crime Analysis: mapping crime data - hot spot analysis - solid waste management
UNIT V Environmental & Oceanographic applications	Environmental types and components – pollution: Air – Water – Soil and Noise – Environmental Impact Assessment - Environmental Information System - GIS and RS in Environmental Studies - Environmental and ecological concerns – resource development in remote areas - impacts of anthropogenic activities Introduction – Major issues/problem – wetland classification - Thematic maps on coastal resources – site suitability analysis for aquaculture – Coastal Regulation zone – Coastal aquifer modelling using GIS – Integrated coastal Zone Management

Text Book
1. Fundamentals of Remote Sensing. George Joseph. Universities Press (India)Pvt Ltd, 3-5-819 Hyderguda, Hyderabad500 029. 2003. 433 pp.

Reference Books
1. Lo.C.P. and Yeung, Albert KW, Concepts and Techniques of Geographic Information System, Prentice Hall of India, 2002.
2. Amim Hammad, Hassan karimi, Telegeoinformatics: Location-based Computing and Services, CRC Press, 1st Edication, 2004
3. Allah Brimicomber, GIS Environmental Modeling and Engineering, Taylor and Francis, 2003
4. Lisa Godin, GIS in Telecommunications Managements, ESRI Press, 1st Edition, 2001.
5. Applications in Coastal Zone Research Management, Martin, K.St. (ed), U.N. Institute for Training and Research, 1993.