COURSE INFORMATION SHEET

SEMESTER I

Course code: GI 501
Course title: PRINCIPLES OF REMOTE SENSING

Pre-requisite(s): Basic Sciences
Co- requisite(s):

Credits:	L:	T:	P:	C:
	3	0	0	3

Class schedule per week: 3
Class: M.Sc.
Semester / Level:01/05 (Monsoon)
Branch: Geoinformatics
Name of Teacher:

Course Objectives

This course aims to:

1.	Disseminate basic concepts and applications of Electromagnetic Spectrum in Remote Sensing, Data acquisition platforms, sensors and their characterstics
2.	Enhance student's knowledge about optical, thermal and microwave based Remote Sensing and its Applications for solving real life problems

Course Outcomes(CO)
On completion of this course, students should be able to:

CO1	Explain basic physical principles of remote sensing
CO2	Understand the basic difference between various kinds of satellites and sensors
CO3	Know the appropriate use of satellite data for different applications
CO4	Explain the principles of thermal and microwave satellites, sensors and their nature of the data
CO5	Apply remote sensing in different thematic studies

MODULE 1: BASIC CONCEPTS

Remote Sensing: History, Development, Definition, Concept & Principles, Electromagnetic Radiation (EMR) and Its Characteristics, Wavelength Regions, and their Significance, Interaction of EMR with Atmosphere and Earth's Surface: Absorption, Reflectance and Scattering, Atmospheric Windows, Spectral Response and Spectral Signature, Spectral, Spatial, Temporal and Radiometric resolutions

MODULE 2: REMOTE SENSING SATELLITES AND SENSORS

Satellites and their Characteristics: Geo Synchronous and Sun Synchronous,Weather & Communication Satellites: Introduction NOAA, TERRA, MOS, INSAT, GOES etc., Remote sensing systems, Platforms and their characteristics, Balloon, Rocket, Helicopter, Aircraft and Spacecraft, Introduction to commonly used multispectral and hyperspectral satellite system.
Sensor classification: Active, Passive, Opto-Mechanical Scanners and push broom scanners.
Sensor specification: MSS, TM, LISS (I, II, III, IV). PAN, WiFS, AWiFS, MODIS.

MODULE 3: DATA RECEPTION AND DATA PRODUCTS

Data Formats: BIL, BSQ, BIP,TIFF, Geo-TIFF, HDF, NetCDF, Ground segment organization, Pre-processing, Referencing Scheme, Data product generation, Data product output medium, Open Data Sources

MODULE 4: THERMAL AND MICROWAVE REMOTE SENSING

Thermal Properties of Terrain: Thermal Capacity, Thermal conductivity, Thermal Inertia, Kinetic heat, Temperature, radiant energy and flux, Thermal IR multispectral spectral scanner, Thermal Infrared remote sensing examples,Microwave Remote sensing concepts: Backscattering, Range Direction, Azimuth Direction, Incident Angle, Depression Angle, Polarization, Dielectric Properties, Surface Roughness and Interpretation, resolutions Speckle and Its Reduction, Passive and active microwave sensors. SLAR and Scatterometer, Applications of thermal and microwave remote sensing images,

MODULE 5: GROUND TRUTHING AND REMOTE SENSING APPLICATIONS

Importance of Ground Truthing in Remote Sensing, Ground Truth Radiometer (GTR),Radiometric Calibration, Digital and Analog Methods, Spectral Response Patterns: Soil, Vegetation, Rocks and Water, RS Applications in Agriculture, Forestry, Land cover/Land use, RS Applications in Water resources and Earth Science

TEXT BOOKS

1. Jensen, J.R., (2006). "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi.

2. Lillesand, Thomas M. and Kiefer, Ralph, W., (2007). "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York

3. George Joseph & C Jeganathan (2017). Fundamentals of Remote Sensing 3rd edition, Universities Press, India

REFERENCE BOOKS

1. Sabins, F.F. Jr. (2007). 'Remote Sensing – Principles and Interpretation", W.H. Freeman & Co.

2. Reeves, R. G. (1991). "Manual of Remote Sensing, Vol. I, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia, USA

3. Paul, J. C.(2005). Geographical Information Systems and computer Cartography, Longman.

Course Evaluation:
Individual assignment, Theory (Quiz, Mid and End semester) examinations

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Institutional visits/field visit
CD6	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	1	3	2	
CO2	2	2	3	2	
CO3	2	2	3	2	
CO4	2	1	3	2	
CO5	3	2	3	3	1

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD3
CO2	CD1
CO3	CD1, CD2, CD3,CD4
CO4	CD1, CD3,CD6
CO5	CD1,CD2,CD3,CD5,CD6

Course code: GI 502
Course title: GEOGRAPHIC INFORMATION SYSTEM

Pre-requisite(s): Basic physical laws of nature, Geography
Co- requisite(s):

Credits:	L:	T:	P:	C:
	3	0	0	3

Class schedule per week: 3
Class: M.Sc.
Semester / Level: 01/05 (Monsoon)
Branch: Geoinformatics
Name of Teacher:

Course Objectives:

This course aims to:

1.	Introduce the students to the basic concepts of GIS and making the students familiar with the spatial data and spatial data creation and organisation.
2.	Teach various GIS based approaches and techniques to visualise and solve real life natural, environmental and societal problems.

Course Outcomes (CO):

After the completion of this course, students should be able to:

CO1	Differentiate GIS and cartography, normal vs. spatial data
CO2	Georeference the spatial data and handle spatial and non-spatial database
CO3	Describe various GIS tools and techniques within spatial analytical framework
CO4	Visualize GIS outputs in different dimensions
CO5	Apply spatial data analysis to solve natural, environmental and societal problems and challenges

SYLLABUS

MODULE 1: INTRODUCTION

Definition, Philosophy & Historical evolution of GIS, Basic concepts about spatial information, Spatial vs. non-spatial data, Spatial data models – Raster and Vector, Components of GIS, Hardware/software requirements for GIS,GIS Vs Cartography, Basics of Cartography: Map Scale, Categories of Maps, Grids and Graticules

MODULE 2: DATA STRUCTURE & FORMAT

Raster Data & its Representation: Data Structure, Data Compression (block code, chain code, run length code, quadtree, MrSID) ,Raster file formats,Vector data representation: Data Structure, Non-topological and topological vector data models ,Non-topological and topological vector file formats, Comparison between Raster & Vector Data

MODULE 3: DATA INPUT AND GEO-CORRECTION

Sources of Spatial Data (Raster and Vector),Data Acquisition Through Scanners and Digitizers, Methods of Digitization (Manual vs. Automated),Geometric Transformations of Raster and Vector Data (Affine Transformation and Transformation Coefficients). RMS Error, Sources of Errors in spatial data and, Spatial Data Quality: Accuracy, Precision, Error and Uncertainty

MODULE 4: DATABASE MANAGEMENT SYSTEM

Advantage of DBMS in context of GIS,RDBMS: Concepts and specific features, Object-Oriented approach to GIS data management, Basic Concepts of Geodatabase, Linkage between spatial and non-spatial data

MODULE 5: SPATIAL DATA ANALYSIS AND VISUALIZATION

Raster Data Analysis Techniques – Local, Focal, Global and Zonal ,Vector Data Analysis- Map Manipulation Techniques, Buffering Overlay Analysis, Distance Measurements, Measuring and Mapping Change,Interpolation (DEM Generation).Vector and Raster Data Query: Logical Expressions,Geographic Visualization: Socio-economic thematic maps,The dimensions of spatial data: 2D, 2.5D, 3D and 4D GIS,Current Issues and Trends in GIS

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TEXT BOOKS

1. Kang-tsung Chang, (2007).'Introduction to Geographic Information Systems' Tata McGraw Hill, New Delhi.
2. C.P.Lo and Albert K.W.Yeung (2006). "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India,New Delhi.
3. Burrough, Peter A. and Rachael McDonnell, (1998).' Principles of Geographical Information Systems' Oxford University Press, New York.

REFERENCE BOOKS

1. Magwire, D. J., Goodchild, M.F. and Rhind, D. M. (2005).Geographical Information Systems: Principles and Applications, Longman Group, U.K.
2. N.K.Agrawal (2004). Essentials of GPS, Spatial Network Pvt.Ltd.
3. Sathish Gopi (2000). GPS and Surveying using GPS
4. Leica. A. (2003). GPS Satellite Surveying, John Wiley & Sons, New York
5. Terry-Karen Steede (2002). Integrating GIS and the Global Positioning System, ESRI Press

Course Evaluation:
Individual assignment, Theory (Quiz, Mid and End semester) examinations

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids

CD4	Industrial/guest lectures
CD5	Institutional visits/field visit
CD6	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	1	3	2	
CO2	2	1	3	2	
CO3	2	1	3	3	
CO4	2		3	3	
CO5	3	2	3	3	1

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1
CO2	CD1,CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD4, CD5
CO5	CD1,CD2,CD3, ,CD6

Course code: GI 503
Course title: DIGITAL CARTOGRAPHY AND GLOBAL POSITIONING SYSTEM
Pre-requisite(s): Basic Science & Computer Knowledge
Co- requisite(s):

Credits:	L:	T:	P:	C:
	3	0	0	3

Class schedule per week: 3
Class: M.Sc.
Semester / Level: 01/05 (Monsoon)
Branch: Geoinformatics
Name of Teacher:

Course Objectives:

This course aims to:

1.	Teach the students to the basic concepts of behind conventional cartography and latest digital developments.
2.	Teach various digital techniques to aesthetically visualise qualitative, quantitative data with appropriate spatial resolution, and projections.
3.	Impart fundamental principles behind utilisation and analysis of data acquired using Satellite based Positioning System for surveying and navigation purposes.

Course Outcomes(CO)

After the completion of this course, students should be able to :

CO1	Understand concept behind conventional and modern map making process
CO2	Understand the scale and spatial resolution relationship, and Create digital maps with appropriate projections
CO3	Efficiently present qualitative and quantitative data in the form of maps using digital cartographic principles
CO4	Explain the fundamental principles of GNSS positioning
CO5	Explain various datums, coordinate systems, Differential positioning concepts and associated surveying techniques.

SYLLABUS

MODULE 1: CONVENTIONAL AND DIGITALCARTOGRAPHY

Introduction to cartography-Nature, scope and its role.Basic characteristics of a map, different types of map and scale, Basic Geodesy, Map projections, Digital Cartography: its comparisons with conventional cartography and GIS

MODULE 2: DIGITAL MAPPING

Sources of data: GNSS, remote sensing, Census etc. Geographic and Cartographic Data bases, Spatial and non-spatial databases, Large data base management, Data measurement and basic statistical processing, Analogue and digital conversion process, DPI, Scale, Pixel size

MODULE 3: PERCEPTION AND MAP DESIGN

Cartographic design, Color theory and models, Map design, Map lettering and its placement in map compilation, Graphic symbology and visual variables, GIS and Maps, Visualisation process, strategy, Cartographic toolbox, Overall Map Cosmetics, Mapping qualitative and quantitative data, Bertins cartographic variables and its association with data types

MODULE 4:SATELLITE POSITIONING SYSTEM - AN OVERVIEW

Introduction to Global Navigation Positioning System, Various Global/Regional Satellite constellations, NAVSTAR GNSS signals, Geopositioning - Basic Concepts, Pseudo Range Measurement, Phase Difference Measurement, Sources of GNSS errors, DOP, Geoid, Datum/Ellipsoid - definition and basic concepts, Global Datum vs. Indian Geodetic Datum, Coordinate Systems, Transformation of coordinates, GNSS Remote Sensing

MODULE 5: POSITIONING AUGMENTATION AND GNSS APPLICATIONS

Differential positioning concept, Various Differential survey Methods. GNSS Survey Planning, Data Processing, Site characteristics of Reference Station, Reference Station Equipment, Augmentation Systems (IRNSS, GAGAN, WAAS, LAAS, etc.) Basic concepts, Applications

TEXT BOOKS

1. Robinson, A.H. and Morrison, J.L.(1995). Elements of Cartography, John Wiley and Sons
2. Gopi, Satish (2005). Global Positioning System: Principles and Applications, Tata Mac-Grow Hill
3. Agrawal, N.K. (2004). Essentials of GPS, Spatial Network Pvt. Ltd
4. Sathish Gopi, (2000). GPS and Surveying using GPS

REFERENCE BOOKS

1. Anson, R.W. and Ormeling, F.J. (2008). Basic Cartography, Vol. 1, 2nd ed., Elsevier Applied Science Publishers, London.
2. Gunter Seeber (2003). Satellite Geodesy Foundations-Methods and Applications.

3. George Joseph & C Jeganathan (2017). Fundamentals of Remote Sensing 3rd edition, Universities Press, India.
4. Hofmann W.B &Lichtenegger, H. Collins (2001). Global Positioning System – Theory and Practice, Springer-Verlag Wein, New York,.

5. Paul, J. C.(2005). Geographical Information Systems and computer Cartography, Longman.
6. Keates, J.S. (2008). Cartographic Design and production, London, Longman
7. Peterson, M.P. (1995). "Interactive and Animated Cartography" Upper Saddle River, NJ: Prentice Hall.
8. Ramesh, P. A. (2000). Fundamentals of Cartography, Concept Publishing Co., New Delhi.
9. Rampal, K.K. (2004). Mapping and Compilation, Concept Publishing Co., New Delhi.
10. Singh, R.L and Dutt. P.K. (2008). Elements of Practical geography, Students Friends Allahabad.

Course Evaluation:
Individual assignment, Theory (Quiz, Mid and End semester) examinations

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Institutional visits/field visit
CD6	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	1	3	2	
CO2	2		3	2	
CO3	2	1	3	2	
CO4	2		3	3	
CO5	3	2	3	2	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD3
CO2	CD1
CO3	CD1, CD2, CD3
CO4	CD1, CD4
CO5	CD1,CD2,CD3,CD5,CD6

Course code: GI 504
Course title: ADVANCED IMAGE ACQUISITION AND INTERPRETATION FOR ENVIRONMENTAL MAPPING

Pre-requisite(s): Basic Science & Computer Knowledge
Co- requisite(s):

Credits:	L:	T:	P:	C:
	3	1	0	4

Class schedule per week: 4
Class: M.Sc.
Semester / Level: 01/05 (Monsoon)
Branch: Geoinformatics
Name of Teacher:

Course Objectives:

This course aims to:

1.	Teach the students about the basic characteristics of various terrestrial elements and their interpretation approaches using Remotely Sensed Data.
2.	Introduce students about various advanced sensors, satellite data products, their detail, availability, and their usability for various challenging real-life applications.

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Describe various geological and geomorphological characteristics of the surface of the Earth.
CO2	Visually and Digitally differentiate various terrestrial features using different interpretation keys.
CO3	Understand existing data dissemination systems and download appropriate spatial and non-spatial data using web services.
CO4	Understand principles of active sensors and platforms– LIDAR & UAV
CO5	Understand and Apply advanced sensors for various applications.

SYLLABUS

MODULE 1: REMOTE SENSING IN ENVIRONMENTAL MAPPING

Rocks types, forms, Minerals and their field characteristics, Image interpretation for delineation of lithology (Rocks) and minerals, Geological structures - Folds, Faults and Joints and their field characteristics, Various important land forms, Image characteristics of geological structures and major land forms

MODULE 2: IMAGE INTERPRETATION

Visual and Digital Satellite Image Interpretation, Elements of image interpretation, development of interpretation keys, Image interpretation for LU/LC and Vegetation mapping, Image interpretation for ocean and coastal monitoring

MODULE 3: ONLINE SATELLITE DATA AND THEIR PRODUTS

USGS Global Visualization Viewer (GloVis), NASA Earth Observation (NEO), USGS Earth Explorer, ESA's Sentinel data, NOAA, IPPMUS Terra, LANCE, VITO Vision, Bhuvan, MOSDAC, India-WRIS

MODULE 4: LIDAR AND UAV

Basics, Discrete and Full waveform LIDAR systems, LIDAR File Formats, Different commercial LIDAR sensors (Airborne and UAV borne), Regulations for UAV in India and world, Payloads and sensor integration, Navigation planning, Fundamental data acquisition modes.

MODULE 5: ADVANCE SENSORS

Earth's Gravity measuring sensor, Rainfall and soil moisture assessment sensor, Sensors for atmospheric studies, Sensors for oceanic studies, High spatial resolution sensors, High temporal resolution sensors

TEXT BOOKS:

1. George Joseph & C Jeganathan (2017). Fundamentals of Remote Sensing 3rd edition, Universities Press, India.
2. Kang-tsung Chang (2007). 'Introduction to Geographic Information Systems' Tata McGraw Hill, New Delhi.
3. C.P.Lo and Albert K.W.Yeung (2006). "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India,New Delhi.
4. Burrough, Peter A. and Rachael McDonnell (1998). 'Principles of Geographical Information Systems' Oxford University Press, New York.
5. Magwire, D. J., Goodchild, M.F. and Rhind, D. M. (2005). 'Geographical Information Systems: Principles and Applications', Longman Group, U.K.
6. Paul Longley, Michael Goodchild, David Maguire and David Rhind (2005). Geographical Information Systems. Principles, Techniques, Applications and Management. John Wiley & Sons.

REFERENCE BOOKS:

1. Laurini, Robert and Derek Thompson (1992). Fundamentals of Spatial Information Systems. Academic Pr., London
2. Kluwer Fotheringham A S, O'Kelly M E. (1998).Spatial Interaction Models: Formulations and Applications.
3. Thanappan Subash (2011). Geographical Information System, Lambert Academic Publishing.
4. John E. Harmon & Steven J. Anderson (2003). The design and implementation of Geographic Information Systems, John Wiley &Sons,.
5. ArcGIS 10.1 Manuals, 2013.
6. Agrawal, N.K. (2004). Essentials of GPS, Spatial Network Pvt. Ltd

7 Sathish Gopi (2000). GPS and Surveying using GPS
8. Leica. A. (2003). GPS Satellite Surveying, John Wiley & Sons, use. New York
9. Terry-Karen Steede (2002). Integrating GIS and the Global Positioning System, ESRPress.
10. Hofmann W.B &Lichtenegger, H. Collins (2001). Global Positioning System – Theory and Practice, Springer-Verlag Wein, New York,.
11. Gunter Seeber (2003). Satellite Geodesy Foundations-Methods and Applications.

Course Evaluation:
Individual assignment, Theory (Quiz, Mid and End semester) examinations

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Institutional visits/field visit
CD6	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	1	3	2	
CO2	1		3	3	
CO3	3	1	3	3	
CO4	1		3	3	
CO5	3	2	3	2	1

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD3,CD5
CO2	CD1,CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD4
CO5	CD1,CD2,CD3,CD5,CD6

LABORATORIES

Course code: GI 505

Course title: PRINCIPLES OF REMOTE SENSING LABORATORY

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**	**4**	**2**

Class schedule per week: 4

Class: M. Sc.

Semester / Level: 01/05 (Monsoon)

Branch: GEOINFORMATICS

Name of Teacher:

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Interpret hard copy satellite FCC images
CO2	Understand the effect of different resolutions of satellite image on identifying different terrestrial features.
CO3	Generate field spectra for various land cover features and draw inferences.
CO4	Extract different features from satellite image

List of Laboratories

Sl.No.	**Name of the Laboratories**
Lab 1	Familiarization with the various remote sensing softwares and Hard copy images
Lab 2	Downloading satellite data from various sources in the world wide web
Lab 3	Displaying satellite image in different colour composites
Lab 4	Familiarisation with Ground truth radiometer/ Spectro Radiometer
Lab 5& 6	Field Spectra Collection: vegetation, bare soil, and concrete using Spectro Radiometer and analyse it with satellite data.
Lab 7	Compare reflectance values from MODIS satellite image and field collected spectra for same land feature
Lab 8 &9	Thermal data exploration
Lab 10& 11	Microwave Data exploration
Lab 12	Extraction of Water bodies and Agricultural land use from a given satellite image
Lab 13	Discriminate Land surface features using spectral, thermal and microwave satellite images.

Course Evaluation:

Individual Experiment, Lab Quiz, Lab Record, End Sem Lab Examination and Viva

Course Delivery Methods

CD1	Laboratory experiments

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAMME OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2		3	2	
CO2	2		3	3	
CO3	3	2	3	3	1
CO4	3	1	3	3	1

< 34% = 1, 34-66% = 2, > 66% = 3

Course code: GI 506

Course title: GEOGRAPHIC INFORMATION SYSTEM LABORATORY

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**	**4**	**2**

Class schedule per week: 4

Class: M. Sc.

Semester / Level: 01/05 (Monsoon)

Branch: GEOINFORMATICS

Name of Teacher:

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Georeference the spatial data and handle huge spatial and non-spatial database
CO2	Concept of errors in spatial data and their removal
CO3	Apply spatial data analysis to solve natural,environmental and societal problems and challenges
CO4	Design and produce thematic maps

List of Laboratories

Sl.No.	**Name of the Laboratories**
Lab 1	Familiarization with the GIS software
Lab 2	Georeferencing of spatial data in GIS software
Lab 3	Geodatabase creation and Digitization of point line and polygon features
Lab 4	Creation of Spatial data from Non-spatial data
Lab 5	Topology creation of spatial data
Lab 6	Removing topological error
Lab 7	Attribute data Integration with spatial data
Lab 8	Map Designing(layout creation)
Lab 9	Thematic Map creation
Lab 10,11	Performing vector analysis; Atrribute query, buffering, overlay
Lab 12	Generation of Digital Elevation Model from spot height
Lab 13	Performing raster analysis

Course Evaluation:

Individual Experiment, Lab Quiz, Lab Record, End Sem Lab Examination and Viva

Course Delivery Methods

CD1	Laboratory experiments

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAMME OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	1		3	2	
CO2	1		3	3	1
CO3	3	2	3	3	3
CO4	2	1	3	3	

< 34% = 1, 34-66% = 2, > 66% = 3

Course code: GI 507

Course title: DIGITAL CARTOGRAPHY AND GNSS LABORATORY LABORATORY

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**	**4**	**2**

Class schedule per week: 4

Class: M. Sc.

Semester / Level: 01/05 (Monsoon)

Branch: GEOINFORMATICS

Name of Teacher:

Course Outcomes (CO):

On completion of this course, students should be able to:

CO 1	Explain Indian and international numbering systems of Maps
CO 2	Convert analog map in digital form
CO 3	Collect GNSS data in different survey modes and post process them to generate output to be integrated in GIS environment.
CO 4	Handle integrated geospatial techniques and apply them in solving real world problems.

List of Laboratories

Sl.No.	**Name of the Laboratories**
Lab 1	Familiarization with SOI topographical sheets and UTM Grids
Lab 2	Familiarization with different types of scale (Simple, comparative, Diagonal)
Lab 3	Familiarization with Projections(Conical, Polyconic, Cylinderical with 1 or 2 standard parallels).
Lab 4	Conversion of data from Analog to Digital form
Lab 5	Visualization of Distortions due to change in projections
Lab 6	Study of Bertin variables
Lab 7	Digital Cartography, Output Generation and Thematic map composition: eg Tourism/Geologic/Geomorphologic
Lab 8	Introduction to GNSS receivers and initial settings
Lab 9	Creating codes and attribute table in GNSS receiver
Lab 10	Data collection in Point and Line mode using GNSS with different datum
Lab 11	Data collection in Area mode using GNSS with different datum
Lab 12	GNSS Data collection in differential positioning mode
Lab13	Post processing of the GNSS data

Course Evaluation:

Individual Experiment, Lab Quiz, Lab Record, End Sem Lab Examination and Viva

Course Delivery Methods

CD1	Laboratory experiments

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAMME OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	1		3	2	
CO2	1		3	3	
CO3	3	2	3	3	1
CO4	3	1	3	3	3

< 34% = 1, 34-66% = 2, > 66% = 3

Course code: GI 508

Course title: ADVANCED IMAGE ACQUISITION AND INTERPRETATION FOR ENVIRONMENTAL MAPPING LABORATORY

Credits:	**L:**	**T:**	**P:**	**C:**
	0	**0**	**4**	**2**

Class schedule per week: 4

Class: M. Sc.

Semester / Level: 01/05 (Monsoon)

Branch: GEOINFORMATICS

Name of Teacher:

Course Outcomes (CO):

On completion of this course, students should be able to:

CO1	Download images and other spatial data from online resources
CO2	Carry out spatial data analysis to solve natural, environmental and societal problems and challenges.
CO3	Elucidate integrated geospatial techniques and apply them in solving real world problems.

List of Laboratories

Sl.No.	**Name of the Laboratories**
Lab 1	Elements of Image interpretation
Lab 2	Visual interpretation of Satellite images and composition of interpretation keys
Lab 3	Acquisition of Satellite Images: Exploration of various sites on www
Lab5	Familiarisation with Hardware and software of UAV
Lab 4	Acquisition of Satellite Images: Through UAV mode
Lab 5	Processing of UAV images
Lab 6	Understanding formats of satellite images and how to practically exchange them
Lab 7	On screen image interpretation: Comparision of images displayed on RGB and IHS display system
Lab 8	for LU/LC and Vegetation mapping Interpretation of Images with typical natural features
Lab 9	Interpretation of Images for ocean and coastal monitoring
Lab 10	Image characteristics of geological structures and major land forms
Lab 11	Exploring sample LIDAR data
Lab 12	Exploring Advance sensors
Lab 13	Thematic layer extraction from multidimensional remote sensing data from online resources

Course Evaluation:

Individual Experiment, Lab Quiz, Lab Record, End Sem Lab Examination and Viva

Course Delivery Methods

CD1	Laboratory experiments

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAMME OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	1		3	2	
CO2	3	2	3	3	3
CO3	3	2	3	3	3

< 34% = 1, 34-66% = 2, > 66% = 3