



RANI CHANNAMMA UNIVERSITY, BELAGAVI

B. Sc. GEOINFORMATICS SYLLABUS

1st SEMESTER THEORY PAPER – 1.1: Fundamentals of Cartography

(w. e. f. 2025-26 and onwards)

Course Objectives: To introduce students to the fundamental concepts of geoinformatics, covering cartographic principles, digital mapping techniques, and modern geospatial technologies. It provides insights into mapping methods, spatial data management, and practical applications of GIS, preparing students for careers in geospatial analysis and cartography.

Course Structure: One Theory and One Practical

Teaching Theory: 04 hours per week

Practicals: 04 hours per week.

Examination: One Theory paper of 80 Marks and 20 Marks for internal assessment (IA). One Practical of 40 Marks and 10 Marks for internal assessment (IA) (Out of 10 IA marks 6 marks for practical record and journal and 4 marks for attendance and lab work).

Unit	Subtopics	Teaching Hours
I	Introduction to Geoinformatics Definition and Evolution of Geoinformatics, Components and Applications, Recent Trends: Global and Indian Scenario	10
II	Fundamentals of Cartography Types of Maps, Map Scale, Classification, Composition, Projection, Numbering, Label Placement, Design and Layout, Geographic Contents	14
III	Digital Cartography and Mapping Techniques Digital Mapping Process (Datum, Projection, Statistics), Principles of Cartographic Design in GIS, Computer-Aided Drawing (CAD), Electronic Atlas, Hyper Maps, Web Cartography, Conventional vs. Digital Cartography	16
IV	Map Compilation and Mapping Organizations Base Map Creation, Thematic Mapping, Large-Scale vs. Small-Scale Maps, Impact of Technology on Cartography, Comparison of Maps, Aerial Photography, and Satellite Imagery, Mapping Organizations in India (SOI, NATMO, NRSC)	12
Total Teaching Hours		52

Course Outcome:

Students understand the principles of geoinformatics, digital and conventional cartographic techniques, and spatial data applications. They will gain hands-on experience in digital mapping and GIS-based analysis, and learn about mapping organisations, enhancing their ability to interpret and create geospatial data for research and professional use.

REFERENCE BOOKS:

1. Digital Cartography, Robert G. Cromley
2. Elements of Cartography - A H Robinson & R D Sale
3. Fundamentals of Cartography - R P Mishra and A. Ramesh (1989).
4. General Cartography - E Raisz



RANI CHANNAMMA UNIVERSITY, BELAGAVI

B. Sc. GEOINFORMATICS SYLLABUS

1st SEMESTER PRACTICAL PAPER – 1.2: Cartography

(w. e. f. 2025-26 and onwards)

Course Objectives: To equip students with essential cartographic skills including scale conversion, map reading, height interpolation, and digital mapping techniques. It focuses on practical applications such as georeferencing, vectorization, field-based map interpretation, and satellite imagery-based map updating, preparing students for professional geospatial analysis.

Course Structure: One Practical

Practicals: 04 hours per week.

Examination: One Practical of 40 Marks and 10 Marks for internal assessment (IA) (Out of 10 IA marks 6 marks for practical record and journal and 4 marks for attendance and lab work).

Units	Topic	Teaching Hours
I	Type of scale, scale Conversion.	8
II	Map reading, computing the distance and direction.	4
III	Height interpolation, Volume calculation.	4
IV	Design the layout of map	4
V	Digital mapping – projection, georeferencing, vectorisation creation of cell library.	12
VI	Map Interpretation on the Ground (Field) a) Topographical map for features identification b) Cadastral / Revenue Map for identification of Individual Survey number.	12
VII	Map Compilation through Reduction scale	4
VIII	Map updation through High Resolution Satellite Imagery	4
Total Teaching Hours		52

Course Outcome: students get proficient in handling various scales, reading and interpreting maps, performing height interpolation, and calculating volumes. They will develop expertise in digital mapping, georeferencing, and field-based map interpretation, enabling them to update and compile maps by using high-resolution satellite imagery and cadastral mapping techniques.



RANI CHANNAMMA UNIVERSITY, BELAGAVI

B. Sc. GEOINFORMATICS SYLLABUS

IInd SEMESTER THEORY PAPER – 2.1 Remote Sensing

(w. e. f. 2025-26 and onwards)

Course Objectives: To introduce students to remote sensing concepts, focusing on electromagnetic spectrum fundamentals, sensor technologies, and data interpretation techniques. It emphasises practical applications in land, ocean, and atmospheric studies, equipping students with the skills to extract, analyse, and apply remote sensing data in geospatial studies.

Course Structure: One Theory and One Practical

Teaching Theory: 04 hours per week

Practicals: 04 hours per week.

Examination: One Theory paper of 80 Marks and 20 Marks for internal assessment (IA). One Practical of 40 Marks and 10 Marks for internal assessment (IA) (Out of 10 IA marks 6 marks for practical record and journal and 4 marks for attendance and lab work).

Units	Topic	Teaching Hours
I	Introduction to Remote Sensing 1.1. Definition of terms, evolution of remote sensing technology 1.2. Stages in remote sensing technology 1.3. Applications of remote sensing. Advantages of RS technology.	10
II	Electro Magnetic Spectrum 2.1. Basics of Electro Magnetic Spectrum (EMS), Interactions between matter and electro-magnetic radiation; atmospheric windows 2.2. Types of remote sensing with respect to wavelength regions, Definition of radiometry. 2.3. Spectral signatures of land cover types (reflectance, emissivity and backscatter).	16
III	Sensors & Platforms: 3.1. Types of Platforms: Ground-based RS sensors, Orbits, Swath, FOV and IFOV. 3.2. Airborne RS sensors, Unmanned Aerial Vehicles (Drones), Space-borne sensors, characteristics of optical sensors (VNIR), Sensor resolutions, Panchromatic, Multispectral. 3.3. Scanning methods (Data Acquisition), Indian satellites for Land, Ocean, Meteorology and Atmospheric studies	14
IV	Information Extraction 4.1. Elements of image interpretation; 4.2. Techniques of Visual interpretation; 4.3. Preparation of Thematic maps, Importance of reference data collection, geo-tagging,.	12
Total Teaching Hours		52

Course Outcome: students have a thorough understanding of the principles of remote sensing, electromagnetic interactions, and sensor technologies. They will develop skills in image interpretation, thematic mapping, and data extraction using various remote sensing platforms, preparing them for application in environmental monitoring, resource management, and urban planning.

REFERENCE BOOKS:

1. Elements of Photogrammetry by P R Wolf
2. Fundamentals of Remote Sensing: George Joseph
3. Introduction to Remote Sensing: J.B. Campbell.
4. Introductory Digital Image Processing: A Remote Sensing Perspective, John R Jensen, 4th edition
5. Introduction to modern photogrammetry by Edward M Mikhail
6. Physical aspects of Remote Sensing: PJ Curran.
7. Remote Sensing and Image Interpretation: Lillesand & Keifer.
8. Remote Sensing Principles and Interpretation: F.F. Sabins.



RANI CHANNAMMA UNIVERSITY, BELAGAVI

B. Sc. GEOINFORMATICS SYLLABUS

IInd SEMESTER PRACTICAL PAPER – 2.1: Remote Sensing Practical's (w. e. f. 2025-26 and onwards)

Course Objectives: To develop students' ability to analyse the spectral and image characteristics of optical data for land-cover identification. It provides hands-on experience in spectral radiance measurement, aerial photograph interpretation, and high-resolution satellite image analysis for cultural and land use classification.

Course Structure: One Theory and One Practical

Teaching Theory: 04 hours per week

Practicals: 04 hours per week.

Examination: One Theory paper of 80 Marks and 20 Marks for internal assessment (IA). One Practical of 40 Marks and 10 Marks for internal assessment (IA) (Out of 10 IA marks 6 marks for practical record and journal and 4 marks for attendance and lab work).

Units	Topic	Teaching Hours
I	Study of spectral and image characteristics of optical data for identification of major land cover features.	8
II	Measuring spectral radiance using ground based spectro-radiometer / thermometers.	8
III	Identification of Features on single vertical aerial photograph.	4
IV	Study of panchromatic, visible, IR, true color composite, false colour composite imageries.	8
V	Interpretation of cultural details in urban environment from High resolution Satellite image data.	12
VI	Interpretation of land use land cover types (Up to level II)	12
Total Teaching Hours		52

Course Outcome: Students get proficient in interpreting spectral signatures, using spectro-radiometers, analysing aerial and satellite imagery, and identifying land-cover features. They will develop skills in remote sensing applications, including cultural and urban landscape interpretation and land-use classification at different levels.



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B. Sc. GEOINFORMATICS SYLLABUS

IIIrd SEMESTER THEORY PAPER – 3.1: GIS

(w. e. f. 2025-26 and onwards)

Course Objectives: To understand the fundamental concepts of GIS with reference to History, Concepts, interdisciplinary nature, and applications and to know the sources of data types, advantages, and limitations. To explore the practical applications of GIS in addressing rural development, public health, and infrastructure planning.

Course Structure: One Theory and One Practical

Teaching Theory: 04 hours per week

Practical's: 04 hours per week.

Examination: One Theory paper of 80 Marks and 20 Marks for internal assessment (IA). One Practical of 40 Marks and 10 Marks for internal assessment (IA) (Out of 10 IA marks 6 marks for practical record and journal and 4 marks for attendance and lab work).

Units	Topic	Teaching Hours
I	Introduction 1.1. Definition, History and components of GIS. Interdisciplinary nature of GIS and its Applications.	10
II	GIS Data 2.1 Data types and data representation (nominal, ordinal, interval, ratio, etc.); Raster and Vector data, advantages and disadvantages. 2.2 Models; Grid model, TIN model, Network model, Spaghetti and Topological models,	14
III	Data Sources and Data Acquisition 3.1 Primary and secondary; Maps, Aerial photographs, photogrammetry, Survey and Land records, Satellite imagery, GNSS/GPS-based survey and Internet sources (e.g., Google Earth Engine, ISRO-Bhuvan portal, USGS etc.). 3.2 Data Acquisition / Editing: Methods of data acquisition, data collection using GPS, Geo-referencing, projection & Re-projection, Geo-database Creation, Digitization, topology building, RMSE errors and linking of spatial & non-spatial data. 3.3 Data Quality and standards: Components of geographic data quality, Sources of error and uncertainty. Error propagation and management; Quality Assurance & Control (QAQC), Geographic data standards & Interoperability.	16
IV	Spatial Data Analytics & Modeling 4.1 Spatial Measurement methods (length, perimeter, area, volume), 4.2 Spatial/Non- Spatial Queries, query and report generation from attribute data, classification and reclassification. 4.3 Proximity Analysis, Overlay analysis (Raster and Vector), 4.4 Success Stories of GIS Applications: Rural development, Public health, Infrastructure planning.	12
Total Teaching Hours		52

Course Outcome: At the end of the course, students will be able to understand the basics of GIS, know the approaches to represent the real world into the computer, the merits and demerits of raster and vector formats, get exposed to data editing, quality and standards, know some basic spatial data analytics, and use GIS in rural development.

References:

1. Concepts and Techniques of Geographic Information Systems, CP Lo Albert K W Young, 2005 Prantice Hall of India.
2. Introductory Geographic Information Systems, John R. Jensen and Ryan R. Jensen, Pearson 2013,
3. Principles of GIS for Land Resources Assessment by P.A.Burrough, Oxford: Science publications, 1986.
4. Geographic Information Systems – An introduction by Tor Bernhardsen, John Wiley and Sons, Inc., New York, 2002.
5. GIS – A computing Perspective by Michael F. Worboys, Taylor & Francis, 1995.
6. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons Inc., New York, 1994.
7. Geographical Information Systems – Principles and Applications, Volume I edited by David J. Maguire, Michael F Goodchild and David W Rhind, John Wiley Sons. Inc., New York 1991.
8. Geographical Information Systems – Principles and Applications, Volume II edited by David J. Maguire, Michael F.Goodchild and David W Rhind, John Wiley Sons. Inc., New York 1991.
9. Geoinformatics, A M Chandra, New Age International Publishers, New Delhi, 2016.

RANI CHANNAMMA UNIVERSITY, BELAGAVI

B. Sc. GEOINFORMATICS SYLLABUS IIIrd SEMESTER PRACTICAL PAPER – 3.2: GIS (w. e. f. 2025-26 and onwards)

Course Objectives: To equip students with hands-on experience in geoinformatics tools and techniques. Students learn GIS software applications, spatial data handling, digitisation, and mapping methods. The course covers georeferencing, attribute data management, spatial analysis, and cartographic representation, preparing students for practical applications in geospatial sciences and decision-making.

Course Structure: One Practical

Practicals: 04 hours per week.

Examination: One Practical of 40 Marks and 10 Marks for internal assessment (IA) (Out of 10 IA marks 6 marks for practical record and journal and 4 marks for attendance and lab work).

Units	Topic	Teaching Hours
Lab 1	Introduction to GIS software; q-GIS, Arc-GIS and ERDAS	4
Lab	Georeferencing; Georeferencing spatial data in GIS software, Co-ordinate systems and projections. Georeferencing Raster data and accuracy assessment.	4
Lab 3	Digitization of point, line and polygon features and database creation; Creating Vector data (Point, Line and Polygon) attribute table creation and data entry.	8
Lab 4	Creation of Spatial data from Non-spatial data and topology building; Converting tabular data into spatial format and spatial relationship analysis.	8
Lab 5	Map Designing (layout creation) and map creation; Designing thematic and topographical maps, adding Legends, scales, North arrow and other map elements.	8
Lab 6	Performing vector analysis; Attribute query, buffering, overlay	12
Lab 7	Performing raster analysis; Classification techniques, supervised and Unsupervised classification techniques and extracting and analyzing raster information.	8
Total Teaching Hours		52

Learning Outcome:

Students will be proficient in GIS software for data visualisation, mapping, and spatial analysis. They will be able to digitise maps, perform vector and raster analyses, create thematic maps, and analyse spatial and non-spatial data. These skills will enable them to apply geoinformatics to research, environmental studies, urban planning, and resource management.

Course Title: GEOINFORMATICS IN DISASTER MANAGEMENT

Course code:

Type of course	Theory/ Practical	Credits	Instruction hour per week	Total No.of lectures /hours	Duration of exam	Formative assessment Marks	Summative assessment marks	Total marks
EC-1	Theory	02	03	45hrs	3hrs	10	40	50

Course Outcomes (COs): At the end of the course students will be able to:

CO1: Understand fundamental disaster concepts and frameworks.

CO2: Apply geospatial tools for disaster mapping and monitoring.

CO3: Analyze case studies using GIS and Remote Sensing for disaster management.

CO4: Identify key agencies and platforms involved in disaster resilience.

Course Title: GEOINFORMATICS IN DISASTER MANAGEMENT (45 hrs/semester)

Unit I	DISASTER MANAGEMENT CONCEPTS (15 hrs)
	Disasters: Definition, classification (natural and anthropogenic). Basic concepts: Hazard, vulnerability, risk, resilience, capacity. Phases of Disaster Management: Preparedness, Mitigation, Response, Recovery. Institutional frameworks: NDMA, SDMA, NIDM, UNDRR.
Unit II	GEOSPATIAL TECHNOLOGIES FOR DISASTER MONITORING AND MAPPING (15 hrs)
	Remote Sensing: Satellite sensors, image types, temporal resolution in disaster studies. GIS: Spatial data (raster and vector), data sources, thematic mapping for disaster risk. GPS/GNSS applications in disaster response and logistics. Geospatial data platforms: Bhuvan, USGS, Copernicus, Google Earth Engine.
Unit III	GEOSPATIAL APPLICATIONS IN MAJOR DISASTERS - CASE STUDIES(15 hrs)
	Flood mapping using DEM, rainfall data, and river catchments. Drought monitoring with NDVI, rainfall anomaly, and soil moisture. Cyclone damage assessment and storm tracking using satellite imagery. Landslide zonation using terrain and geological parameters.

Formative assessment

Assessment Occasion/type	Marks
Internal Assessment Test 1	03
Internal Assessment Test 2	05
Assignment	02
Total	10



RANI CHANNAMMA UNIVERSITY, BELAGAVI

B. Sc. GEOINFORMATICS SYLLABUS

IVth SEMESTER THEORY PAPER – 4.1: SURVEY AND GNSS

(w. e. f. 2025-26 and onwards)

Course Objectives: To provide fundamental knowledge on surveying techniques, geodesy, and Global Navigation Satellite Systems (GNSS). It covers the principles of linear and angular measurements, geodetic concepts, and the coordinate systems. In addition, it explores the working principles of GPS, DGPS, and their applications in geospatial data collection and analysis.

Course Structure: One Theory and One Practical

Teaching Theory: 04 hours per week

Practicals: 04 hours per week.

Examination: One Theory paper of 80 Marks and 20 Marks for internal assessment (IA). One Practical of 40 Marks and 10 Marks for internal assessment (IA) (Out of 10 IA marks 6 marks for practical record and journal and 4 marks for attendance and lab work).

Units	Topic	Teaching Hours
I	Basics of Survey 1.1. Definition, concept, classification of survey, principles of survey, linear and angular measurements, choice of a scale, contour interval. 1.2. Survey methods: Control survey; Field traverse, Triangulation, Trilateration, Spirit levelling, Trigonometric levelling. 1.3. Detailed survey; Plane tabling, Personal Digital Assistant (PDA); Instruments; Total station, Auto/Digital level, GPS receiver.	12
II	Geodesy 2.1 Definition, history, classification, fundamental goals of geodesy, shape and size of the earth, Co-ordinate system, Geoid, Reference Ellipsoid; Everest spheroid, WGS84, Vertical datum; Mean Sea Level. 2.2 Projection: Classification of map projection, Universal Transverse Mercator (UTM), Lambert Conformal Conic (LCC) projection, Transformation.	12
III	Global Navigation Satellite System (GNSS) 3.1 GNSS: Concept, GPS, GLONASS, GALILEO, GAGAN, India's NavIC. 3.2 Components of GPS – Space segment; control segment, user segment, GPS working principle, types of receivers; GPS satellite signals, GPS pseudo range and code phase tracking, satellite geometry and accuracy measure, signal propagation error. International GPS and Geodynamic Services (IGS).	16
IV	DGPS 4.1 Principles of DGPS, differential corrections, survey methods with DGPS (rapid static method, semi kinematic method, Real time kinematic method). GPS pseudolites Ground control provision by DGPS; types, density, field observations, criteria for selecting reference station, post processing, Receiver Independent Exchange Format (RINEX), 4.2 Applications; Continuously Operating Reference Station (COR System), applications of Location Based Services, Geo-fencing.	12

	Total Teaching Hours	52

Course Outcome: Students will gain practical knowledge of surveying methods, geodesy, and GNSS technologies. They will develop skills in GPS data collection, DGPS applications, and geospatial analysis for accurate mapping and navigation..

REFERENCE BOOKS:

1. GPS Satellite Surveying - Alfred Leick.
2. Essentials of GPS 3rd Edition – N K Agrawal.
3. Essentials of Geodesy and Map projection 1st Edition – N K Agrawal.
4. The Principles of Surveying - by J. Clendinning.
5. Basic Survey volume I and II – Clarke.
6. Geoinformatics, A M Chandra, New Age International Publishers, New Delhi, 2016.



RANI CHANNAMMA UNIVERSITY, BELAGAVI

B. A. /B. Sc. SEP-2024 SYLLABUS IN GEOGRAPHY

IVth SEMESTER PRACTICAL PAPER – 4.2 Digital Image Processing

(w. e. f. 2025-26 and onwards)

Course Objectives: Students develop competencies in data visualisation, georeferencing, image enhancement, band ratio analysis, change detection, and classification methodologies. The syllabus encompasses practical applications, including the correction of radiometric errors, implementation of spatial filters, merging of images with varying resolutions, and integration of multi-resolution data. These competencies are crucial for conducting precise analyses and interpretations within the remote sensing domain.

Course Structure: One Practical

Practicals: 04 hours per week.

Examination: One Practical of 40 Marks and 10 Marks for internal assessment (IA) (Out of 10 IA marks 6 marks for practical record and journal and 4 marks for attendance and lab work).

Units	Topic	Teaching Hours
Lab 1	Visualization and Data Handling: <ul style="list-style-type: none">Import and export of satellite data in various formats	8
Lab 2	Preprocessing Techniques: <ul style="list-style-type: none">Radiometric and atmospheric correctionsGeoreferencing of satellite imagery	8
Lab 3	Image Processing: <ul style="list-style-type: none">Creating image subsets (clipping)Resolution merging and mosaickingDisplaying individual pixel values and extracting image information	12
Lab 4	Image Enhancement Techniques: <ul style="list-style-type: none">Contrast enhancement: Histogram equalization, density slicingBand rationing and spectral enhancement (Ratio images and PCA)Spatial enhancement: Low-pass and high-pass filtering	12
Lab 5	Advanced Analysis: <ul style="list-style-type: none">Change detection techniquesMulti-resolution data fusionSupervised and unsupervised classification	12
Total Teaching Hours		

Course outcome: Students acquire practical skills in satellite data processing, image enhancement, classification, and change detection. They will be able to apply advanced remote sensing techniques for geospatial analysis and decision making.

Reference Books:

1. Lillisand T.M, R.W. Kiefer & Chipman (2015) Remote Sensing and Image Interpretation (7thedition). John Wiley & Sons, New York.
2. Jensen, J. R. (2016): Introductory Digital Image Processing: A Remote Sensing Perspective (4th Edition), Pearson Publication.

B.Sc. IV Semester – Geoinformatics

Skill Enhancement Course (SEC)

Course Title: Basics of Cartography and Geospatial Skills

Credits: 2

Instruction Hours: 2 hours/week

Total Marks: 50 (Internal: 10, Practical: 40)

Total Units: 4

Course Objective:

To develop core technical skills in cartography and geospatial mapping tools essential for careers in geoinformatics, urban planning, disaster management, and spatial data analysis.

Skill-Based Learning Outcomes:

By the end of this course, students will be able to:

- Operate basic cartographic tools and software.
- Construct and interpret thematic and topographic maps.
- Apply geospatial thinking using real-world data and map analysis.
- Perform entry-level spatial data visualization using open-source tools like QGIS.

Unit-wise Syllabus (Skill-Centric):

Unit 1: Practical Map Reading and Interpretation

- Reading SOI topographic sheets (1:50,000 & 1:25,000 scale)
- Identifying physical and cultural features (elevation, drainage, land use, transport)
- Profile drawing: cross-section and longitudinal profiles
- Skill Focus: **Toposheet interpretation, landscape visualization**

Unit 2: Scale and Distance Measurement Techniques

- Calculation and construction of different types of scales: RF, graphical, and verbal
- Measurement of real-world distances on maps
- Scale conversion and map reduction/enlargement exercises
- Skill Focus: **Measurement accuracy, map-to-ground conversion**

Unit 3: Thematic Mapping and Symbolization

- Creation of basic thematic maps: choropleth, dot, and flow maps
- Designing legends, titles, north arrows, and map balance
- Manual vs digital symbolization methods
- Skill Focus: **Visual communication, data-to-map translation**

Unit 4: Introduction to Digital Mapping Tools (QGIS Focus)

- Overview of QGIS interface and layer handling

- Loading and viewing shapefiles and raster maps
- Basic symbology and attribute table interpretation
- Exporting simple maps as PDFs/images
- Skill Focus: **Hands-on GIS tool operation, basic digital cartography**

Internal Assessment (10 Marks):

- One quiz/test on mapping concepts (5 marks)
- One short assignment/practical skill review (5 marks)

Practical Evaluation (40 Marks):

- **Toposheet interpretation:** Identification and mapping (10 marks)
- **Scale drawing and distance calculation** (10 marks)
- **Thematic map design and legend creation** (10 marks)
- **Basic QGIS operation and map export** (10 marks)

Practical record book and viva voce are compulsory for all students.

Essential Tools & Software:

- Topographic maps (SOI sheets)
- Graph papers, color pencils, scales, protractors
- Open-source QGIS software (latest version)

Suggested Readings & Resources:

1. Misra, R.P. & Ramesh, A. – *Fundamentals of Cartography*
2. Kraak, M.J. & Ormeling, F. – *Cartography: Visualization of Spatial Data*
3. QGIS Documentation – <https://docs.qgis.org>
4. Sharma, J.P. – *Practical Geography*

B.Sc. Geo-informatics (Semester-V)

Discipline Specific Course (DSC)

Department of Geography

Course Title: PAPER 5.1: Advanced Remote Sensing

Course code: -

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total no of Lectures/Hours /Semester	Duration of Exam	Formative assessment marks	Summative assessment marks	Total marks
DSC	Theory	04	04	56 hrs	3hrs	20	80	100

Course Outcomes: After completion of this course students will be able to:

CO1: Understand advanced remote sensing principles.

CO2: Analyse satellite data using classification techniques.

CO3: Interpret multispectral and microwave imagery.

CO4: Apply remote sensing in real-world applications.

Unit	TITLE: - ADVANCED REMOTE SENSING	56hrs/sem
Unit I	Fundamentals of Advanced Remote Sensing: Electromagnetic Radiation and Energy Interactions. Spectral Reflectance of Vegetation, Soil and Water. Atmospheric Scattering and Absorption. Spectral Signatures and Spectral Libraries.	14hrs
Unit II	Sensors & Platforms: - Passive and Active Remote Sensing, Optical Sensors and Thermal Sensors. Microwave Remote Sensing – RADAR, SAR. Satellite Platforms: Indian Space Research Organisation (ISRO), National Aeronautics and Space Administration (NASA), European Space Agency (ESA).	14 hrs
Unit III	Image Interpretation and Analysis: - Visual Interpretation; DIP Basics; Sampling; Frequency Domain Filtering; Image Classification.	14 hrs
Unit IV	Applications of Remote Sensing: - Agriculture-crop monitoring, Disaster Management- Floods and Landslides. Environmental Monitoring- Land Use/Land Cover (LULC).	14 hrs

General Instructions: Conduct all exercises with Goal, Procedure, devices, findings and diagram.**Reference Books**

1. Lillesand, T.M. & Kiefer, R.W. – Remote Sensing and Image Interpretation.
2. Jensen, J.R. – Introductory Digital Image Processing.
3. Sabins, F.F. – Remote Sensing: Principles and Interpretation.
4. Chandra, A.M. & Ghosh, S.K. – Remote Sensing and GIS.

Formative Assessment for theory	
Assessment Occasion/Type	Marks
Internal Assessment Test 1	05
Internal Assessment Test 1	05
Total	10 Marks
Formative Assessment as per guidelines.	

B.Sc. Geo-informatics (Semester-V)

Discipline Specific Course (DSC)

Department of Geography

Course Title: PAPER 5.2: Spatial Analysis and Geostatistics

Course code: -

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total no of Lectures/Hours /Semester	Duration of Exam	Formative assessment marks	Summative assessment marks	Total marks
DSC	Theory	04	04	56 hrs	3hrs	20	80	100

Course Outcomes: After completion of this course students will be able to:

CO1: Understand spatial data structures and models.

CO2: Perform spatial analysis using GIS tools.

CO3: Apply geostatistical techniques for spatial prediction.

CO4: Develop GIS-based decision support systems.

Unit	TITLE: - SPATIAL ANALYSIS AND GEOSTATISTICS	56hrs/sem
Unit I	Spatial Data Models: Raster/Vector Models, Spatial Data Structures, Topology, Spatial Database Management Systems (DBMS).	14hrs
Unit II	Spatial Analysis Techniques: Buffering and Overlay Analysis, Network Analysis. Interpolation Methods. Surface Analysis	14 hrs
Unit III	Geostatistics: Spatial Autocorrelation. Moran's I and Geary's C. Semivariogram and Kriging. Trend Surface Analysis.	14 hrs
Unit IV	Advanced GIS Applications: Urban Planning, Resource Management, Climate Change Analysis. Web GIS and Spatial Decision Support System (SDSS).	14 hrs

Reference Books

1. Yongwan Chun and Daniel A. Griffith- Theory and Applications for GIS (2013/2015)
2. Noel Cressie- Statistics for Spatial Data (Revised Ed)
3. De Smith, Goodchild, and Longley- A Comprehensive Guide (7th Ed, 2025)

Formative Assessment for theory	
Assessment Occasion/Type	Marks
Internal Assessment Test 1	
Internal Assessment Test 1	
Total	
Formative Assessment as per guidelines.	

B.Sc. Geo-informatics (Semester-V)

Discipline Specific Course (DSC)

Department of Geography

Course Title: PAPER 5.3: GIS application in agriculture and forestry**Course code: -**

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total no of Lectures/Hours /Semester	Duration of Exam	Formative assessment marks	Summative assessment marks	Total marks
DSC	Practical	02	04	56 hrs	3hrs	10	40	50

Course Outcomes: After completion of this course students will be able to: develop advanced skills in application in forestry and agriculture.

Unit	TITLE: - GIS application in agriculture and forestry	56hrs/sem
Unit I	Vegetation Indices: NDVI, SAVI, RVI and DVI	14hrs
Unit II	Image classification for agriculture (Supervised and unsupervised classification).	14 hrs
Unit III	Forest Fire Detection.	14 hrs
Unit IV	Change detection in coastal vegetation.	14 hrs

Reference Books

1. D.K. Shannon, D.E. Clay, and N.R. Kitchen- Precision Agriculture Basics (2019)
2. Tom Mueller and Robert Wadsworth- Conservation Planning (2015)

Formative Assessment for theory	
Assessment Occasion/Type	Marks
Internal Assessment Test 1	05
Internal Assessment Test 1	05
Total	10
Formative Assessment as per guidelines.	

B.Sc. Geo-informatics (Semester-V)

Discipline Specific Course (DSC)

Department of Geography

Course Title: PAPER 5.4: GIS application in Earth and Atmospheric science (SKILL)**Course code: -**

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total no of Lectures/Hours /Semester	Duration of Exam	Formative assessment marks	Summative assessment marks	Total marks
DSC	Practical	02	04	56 hrs	3hrs	10	40	50

Course Outcomes: After completion of this course students will be able to: develop advanced skills in application in Earth and Atmospheric science.

Unit	TITLE: - GIS application in Earth and Atmospheric science	56hrs/sem
Unit I	DEM Generation and terrain analysis	14hrs
Unit II	Geomorphic Recognition.	14 hrs
Unit III	Spatial Filtering	14 hrs
Unit IV	Spatial filtering- high pass, low pass, edge enhancement filtration	14 hrs

Reference Books

1. George P. Petropoulos and Christos Chalkias (Elsevier) - Case Studies in Earth and Environmental Monitoring (2024).
2. Graeme F. Bonham Carter - Modelling with GIS.

Formative Assessment for theory	
Assessment Occasion/Type	Marks
Internal Assessment Test 1	05
Internal Assessment Test 1	05
Total	10
Formative Assessment as per guidelines.	

B.Sc. Geo-informatics (Semester-VI)

Discipline Specific Course (DSC)

Department of Geography

Course Title: PAPER 6.1: Photogrammetry and LiDAR

Course code: -

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total no of Lectures/Hours /Semester	Duration of Exam	Formative assessment marks	Summative assessment marks	Total marks
DSC	Theory	04	04	56 hrs	3hrs	20	80	100

Course Outcomes: After completion of this course students will be able to:

CO1: Understand photogrammetric principles.

CO2: Generate 3D models and orthophotos.

CO3: Process LiDAR data.

CO4: Apply 3D geospatial technologies in planning.

Unit	TITLE: - Photogrammetry and LiDAR	56hrs/sem
Unit I	Principles of Photogrammetry: History, Aerial Photography Geometry, Scale. Relief Displacement. Parallax.	14hrs
Unit II	Digital Photogrammetry: Interior/Exterior Orientation. 3D Mapping. Structure from Motion (SfM) Algorithms.	14 hrs
Unit III	LiDAR Technology: Principles, Airborne/Terrestrial LiDAR, Point Cloud Processing. Radar and sonar Basics.	14 hrs
Unit IV	Applications: Urban Modelling, Forestry, Flood Modelling, Smart Cities.	14 hrs

Reference Books

- Jonathan Li, Yiping Chen, and Haiyan Guan- LiDAR 3D Point Cloud Intelligent Processing (2026)
- Paul R. Wolf, Bon A. DeWitt, and Benjamin E- Elements of Photogrammetry with Applications in GIS (4th Ed)
- Pradeep K. Garg and Arti Tiwari - Fundamentals of LiDAR Remote Sensing (2026)
- Jie Shan and Charles K. Toth - Principles and Processing (2nd Ed)

Formative Assessment for theory	
Assessment Occasion/Type	Marks
Internal Assessment Test 1	
Internal Assessment Test 1	
Total	
Formative Assessment as per guidelines.	

B.Sc. Geo-informatics (Semester-VI)

Discipline Specific Course (DSC)

Department of Geography

Course Title: PAPER 6.2: Project Planning & Geospatial Apps

Course code: -

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total no of Lectures/Hours /Semester	Duration of Exam	Formative assessment marks	Summative assessment marks	Total marks
DSC	Theory	04	04	56 hrs	3hrs	20	80	100

Course Outcomes: After completion of this course students will be able to:

CO1: Design and implement geospatial projects.

CO2: Apply GIS in governance and development.

CO3: Understand emerging geospatial technologies.

CO4: Develop entrepreneurial skills in geoinformatics.

Unit	Project Planning & Geospatial Apps	56hrs/sem
Unit I	Project Planning: Research Design. Sampling Techniques . Data Collection Methods. Report Writing.	14hrs
Unit II	Governance: E-Governance. Smart Cities. LBS. Geo-fencing.	14 hrs
Unit III	Trends: Artificial Intelligence (AI) in GIS. Machine Learning (ML) for Remote Sensing. Big Data and Cloud GIS. Open-Source GIS.	14 hrs
Unit IV	Entrepreneurship: GIS Consultancy. Start-ups. Govt Policies. Ethical Issues.	14 hrs

Reference Books

1. Peter L. Croswell- The GIS Management Handbook (3rd Ed, 2024)
2. Vijay Kumar Bansal (Routledge)- Lifecycle Applications (2026)
3. Charla M. Burnett and Biswajeet Pradhan- Global Land-Ocean Geospatial Applications (2026)
4. Philippe Rigaux, Michel Scholl, and Agnès Voisard - Spatial Databases: With Application to GIS

Formative Assessment for theory	
Assessment Occasion/Type	Marks
Internal Assessment Test 1	
Internal Assessment Test 1	
Total	
Formative Assessment as per guidelines.	

B.Sc. Geo-informatics (Semester-VI)

Discipline Specific Course (DSC)

Department of Geography

Course Title: PAPER 6.3: Field Work

Course code: -

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total no of Lectures/Hours /Semester	Duration of Exam	Formative assessment marks	Summative assessment marks	Total marks
DSC	Practical	02	04	56 hrs	3hrs	10	40	50

Unit	TITLE: - Field Work	56hrs/sem
Unit I	Field data collection	14hrs
Unit II	GPS Survey	14 hrs
Unit III	Satellite data analysis.	14 hrs
Unit IV	Report writing	14 hrs

Reference Books

1. Jan Van Sickle, Alfred Leick, and Lev Rapoport - GPS & GNSS for Land Surveyors (5th Ed, 2024)
2. Marcelo de Carvalho Alves and Luciana Sanches - Remote Sensing and Digital Image Processing with R (1st Ed, 2023/2024)

Formative Assessment for theory	
Assessment Occasion/Type	Marks
Internal Assessment Test 1	05
Internal Assessment Test 1	05
Total	10
Formative Assessment as per guidelines.	

B.Sc. Geo-informatics (Semester-VI)

Discipline Specific Course (DSC)

Department of Geography

Course Title: PAPER 6.4: Dissertation preparation – Viva-Voce (SKILL)**Course code: -**

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total no of Lectures/Hours /Semester	Duration of Exam	Formative assessment marks	Summative assessment marks	Total marks
DSC	Practical	02	04	56 hrs	3hrs	10	40	50

Unit	TITLE: - Dissertation preparation - Viva Voce	56hrs/ sem
Research	Dissertation preparation	56hrs

Formative Assessment for theory	
Assessment Occasion/Type	Marks
Internal Assessment Test 1	05
Internal Assessment Test 1	05
Total	10
Formative Assessment as per guidelines.	