SMRJ Government College, Siwani (Bhiwani)

(Affiliated to Chaudhary Bansi Lal University, Bhiwani)

Session: 2025-26

Lesson Plan (Department of Geography)

Teacher: Mr. Mukesh Kumar
Class: M.Sc. Previous
Semester: 2nd
Maximum Marks: 100
End Term Exam Marks: 70

Course Type & Title: C.C. – Remote Sensing & GIS (Theory)
Course Code: 25 PG GEO 204
Credits: 4
Internal Assessment Marks: 30
Practical Marks: NIL

Course Outcomes: After completing the course, a student will be able to:

- Understand the principles, platforms, sensors, and data characteristics of remote sensing systems.
- Understand the concepts, data structures, and analytical techniques of Geographic Information Systems.
- Analyze spatial data using digital image processing and GIS-based analytical methods.
- Apply Remote Sensing and GIS techniques for resource assessment, environmental analysis, and regional planning.

Sr. No.	Week/Month, 2026	Unit/ Topic/ Chapter to be covered	Assignment/ Test/ Remarks, if any
1	19 Jan. - 24 Jan.	**General Introduction**	
2	27 Jan. - 31 Jan.	**Fundamentals of Remote Sensing:** Nature, scope, and development of remote sensing, Radiation principles and laws of black body radiation: Planck's Law,	
3	02 Feb. - 07 Feb.	Stefan–Boltzmann Law, Wien's Displacement Law, and Kirchhoff's Law, Electromagnetic radiation and the electromagnetic spectrum,	
4	09 Feb. - 14 Feb.	Energy–matter interaction, Atmospheric effects on electromagnetic radiation, Spectral reflectance characteristics of Earth surface features,	
5	16 Feb. - 21 Feb.	Platforms and sensors: ground, airborne, and satellite platforms, Types of sensors: passive and active sensors, Spatial, spectral, radiometric, and temporal resolutions.	
6	23 Feb. - 28 Feb.	**Remote Sensing Data and Image Interpretation:** Satellite systems and sensors: Landsat, IRS, Sentinel, MODIS, Cartosat, Data products and formats,	
7	06 Mar. - 07 Mar.	Visual image interpretation elements: tone, texture, shape, size, pattern, association,	
8	09 Mar. - 14 Mar.	Digital image processing concepts: image enhancement, filtering, classification (supervised and unsupervised), Accuracy assessment,	

9	16 Mar. to 21 Mar.	Applications of remote sensing in land use/land cover mapping, agriculture, water resources, forestry, and disaster management.	
10	23 Mar. - 28 March	**Fundamentals of Geographic Information Systems (GIS):** Concept, components, and functions of GIS,	
11	30 Mar. - 04 Apr.	Spatial data models: vector and raster data structures, Attribute data and database management systems,	
12	06 Apr. - 11 Apr.	Data input, editing, and topology, Coordinate systems, map projections, and georeferencing, Spatial data quality and errors, GIS software overview (Open Source Softwares)	**Assignment**
13	13 Apr. - 18 Apr.	**Spatial Analysis, Modeling, and Applications of GIS:** Spatial analysis techniques: overlay, buffering, network analysis, surface analysis,	
14	20 Apr. - 25 Apr.	Digital Elevation Models (DEMs) and terrain analysis, Spatial interpolation techniques, GIS modeling and decision support systems,	
15	27 Apr. - 02 May	Integration of Remote Sensing and GIS, Applications of GIS in urban planning, environmental management, resource planning, climate studies, and regional development,	
16	04 May - 06 May	Emerging trends: Web GIS, GPS integration, and geospatial governance.	**Test**

Suggested Readings:

- Jensen, J. R. (2016). *Introductory Digital Image Processing: A Remote Sensing Perspective*. Pearson.
- Campbell, J. B., & Wynne, R. H. (2011). *Introduction to Remote Sensing*. Guilford Press.
- Burrough, P. A., McDonnell, R. A., & Lloyd, C. D. (2015). *Principles of Geographical Information Systems*. Oxford University Press.
- Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic Information Systems and Science*. Wiley.
- Aronoff, S. (1995). *Geographic Information Systems: A Management Perspective*. WDL Publications.
- DeMers, M. N. (2008). *Fundamentals of Geographic Information Systems*. Wiley.
- NRSC. (2019). *Remote Sensing Applications in India*. National Remote Sensing Centre, ISRO.
- Chang, K. T. (2018). *Introduction to Geographic Information Systems*. McGraw-Hill Education.

Signature of the teacher concerned

Head of the Department

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Session: 2025-26

Lesson Plan (Department of Geography)

Teacher: Mr. Mukesh Kumar
Class: M.Sc. Previous
Semester: 2nd
Maximum Marks: 100
End Term Exam Marks: 70

Course Type & Title: C.C. – Remote Sensing & GIS (Practical)
Course Code: 25 PG GEO 205
Credits: 4
Internal Assessment Marks: 30
Practical Marks: 70

Course Outcomes: After completing the course, a student will be able to:

- Handle and preprocess satellite data using standard remote sensing software.
- Perform visual and digital image interpretation for thematic mapping.
- Create, manage, and analyze spatial databases using GIS tools.
- Integrate Remote Sensing and GIS techniques for applied geographical problem-solving.

Sr. No.	Week/Month, 2026	Unit/ Topic/ Chapter to be covered	Assignment/ Test/ Remarks, if any
1	19 Jan. - 24 Jan.	**General Introduction**	
2	27 Jan. - 31 Jan.	**Satellite Data Handling and Image Pre-Processing:** Introduction to remote sensing software (ERDAS Imagine /ENVI/QGIS).	
3	02 Feb. - 07 Feb.	Importing and managing satellite data (Landsat, Sentinel, IRS).	
4	09 Feb. - 14 Feb.	Image sub-setting and layer stacking, Radiometric and geometric corrections.	
5	16 Feb. - 21 Feb.	Image enhancement techniques: contrast stretching, filtering, band combinations, Preparation of false colour composites (FCCs).	
6	23 Feb. - 28 Feb.	**Image Interpretation and Digital Classification:** Visual image interpretation using elements such as tone, texture, shape, size, pattern, and association, Preparation of interpretation keys.	
7	06 Mar. - 07 Mar.	Digital image classification techniques: supervised and unsupervised classification, Accuracy assessment and error matrix,	
8	09 Mar. - 14 Mar.	Land use / land cover (LULC) mapping using satellite imagery, Change detection analysis using multi-temporal data.	

9	16 Mar. to 21 Mar.	**GIS Database Creation and Spatial Analysis:** Creation of vector and raster databases.	
10	23 Mar. - 28 March	Digitization of spatial features and attribute data entry.	
11	30 Mar. - 04 Apr.	Georeferencing of maps and images, Topology creation and error correction.	
12	06 Apr. - 11 Apr.	Spatial analysis techniques: buffering, overlay analysis, proximity analysis, Network and surface analysis, Preparation of thematic maps using GIS.	
13	13 Apr. - 18 Apr.	**Integration of Remote Sensing & GIS and Applications:** Integration of satellite data with GIS layers, Digital Elevation Model (DEM) generation and terrain analysis (slope, aspect, relief),	**Test**
14	20 Apr. - 25 Apr.	Watershed and drainage analysis, Site suitability analysis using multi-criteria evaluation,	**Assignment**
15	27 Apr. - 02 May	Application-oriented projects in urban planning, agriculture, water resources, environmental management, and disaster studies (Indian case studies),	
16	04 May - 06 May	Preparation of a mini-project and map layout for presentat	

Suggested Readings:

- Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2015). *Remote Sensing and Image Interpretation: Laboratory Manual*. Wiley.
- Jensen, J. R. (2016). *Remote Sensing of the Environment: An Earth Resource Perspective – Exercises and Applications*. Pearson.
- Sabins, F. F. (2007). *Remote Sensing: Principles and Interpretation with Practical Applications*. Waveland Press.
- Campbell, J. B., & Wynne, R. H. (2011). *Introduction to Remote Sensing: Laboratory Exercises*. Guilford Press.
- Chang, K. T. (2018). *Introduction to Geographic Information Systems: Practical Workbook*. McGraw-Hill Education.
- DeMers, M. N. (2008). *Fundamentals of Geographic Information Systems: Laboratory Manual*. Wiley.
- NRSC. (2020). *Remote Sensing and GIS Training Manual*. National Remote Sensing Centre, ISRO, Hyderabad.
- ISRO. (2019). *Manual on Satellite Data Products and Applications*. Government of India.
- QGIS Development Team. (Latest Edition). *QGIS Training Manual*. QGIS.org.
- ESRI. (Latest Edition). *ArcGIS Desktop: Step-by-Step Exercise Manual*. ESRI Press.

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Session: 2025-26

Lesson Plan (Department of Geography)

Teacher: Mr. Mukesh Kumar
Class: M.Sc. Previous
Semester: 2nd
Maximum Marks: 100
End Term Exam Marks: (50+20)**70**

Course Type & Title: DEC– R.S: Principles and Applications
Course Code: 25 PG GEO 210
Credits: 4
Internal Assessment Marks: (20+10)30
Practical Marks: 30

Course Outcomes: After completing the course, a student will be able to:

- Understand the physical principles, platforms, and sensors used in remote sensing.
- Interpret satellite data and imagery characteristics for geographical analysis.
- Evaluate applications of remote sensing in natural resource management and environmental studies.
- Apply digital image processing and interpretation techniques to solve real-world geographical problems.

Sr. No.	Week/Month, 2026	Unit/ Topic/ Chapter to be covered	Assignment/ Test/ Remarks, if any
1	19 Jan. - 24 Jan.	**General Introduction**	
2	27 Jan. - 31 Jan.	**Fundamentals of Remote Sensing:** Nature, scope, and significance of remote sensing in Geography and Earth System Science,	
3	02 Feb. - 07 Feb.	Electromagnetic radiation and its interaction with atmosphere and Earth surface, Spectral characteristics of vegetation, soil, and water,	
4	09 Feb. - 14 Feb.	Remote sensing platforms: ground-based, airborne, and space-borne systems, Types of sensors: passive and active sensors, Spatial, spectral, radiometric, and temporal resolution, Data products and image characteristics	
5	16 Feb. - 21 Feb.	**Satellite Systems and Data Interpretation:** Earth observation satellite systems: polar orbiting and geostationary satellites.	
6	23 Feb. - 28 Feb.	Indian Remote Sensing (IRS) satellite programme and sensors, International satellite systems (Landsat, Sentinel, MODIS).	
7	06 Mar. - 07 Mar.	Image interpretation elements: tone, texture, shape, pattern, size, association, Visual and digital image interpretation,	
8	09 Mar. - 14 Mar.	Pre-processing of satellite data: geometric and radiometric corrections, Introduction to image classification techniques	

9	16 Mar. to 21 Mar.	**Applications of Remote Sensing:** Applications in land use and land cover mapping,	
10	23 Mar. - 28 March	Agricultural resource monitoring and crop assessment, Forest and biodiversity studies, Water resource assessment and watershed management, Urban and regional planning,	
11	30 Mar. - 04 Apr.	Disaster monitoring and management, Climate and environmental change studies, Integration of remote sensing with GIS for spatial decision-making.	
12	06 Apr. - 11 Apr.	**Exercises:** Identification of satellite platforms, sensors, and data products (2) Visual interpretation of satellite images using standard interpretation keys (2)	
13	13 Apr. - 18 Apr.	Digital image enhancement techniques (contrast stretching, filtering) (2) Calculation of vegetation indices (e.g., NDVI, NDWI) (2)	**Test**
14	20 Apr. - 25 Apr.	Supervised and unsupervised image classification (2) Preparation of land use / land cover maps using satellite imagery (2)	**Assignment**
15	27 Apr. - 02 May	Change detection analysis using multi-temporal satellite data (1)	
16	04 May - 06 May	Preparation of an application-based remote sensing project using Indian datasets (1)	

Suggested Readings:

- illesand, T. M., Kiefer, R. W., & Chipman, J. (2015). *Remote Sensing and Image Interpretation*. Wiley.
- Jensen, J. R. (2016). *Introductory Digital Image Processing: A Remote Sensing Perspective*. Pearson.
- Campbell, J. B., & Wynne, R. H. (2011). *Introduction to Remote Sensing*. Guilford Press.
- Sabins, F. F. (2007). *Remote Sensing: Principles and Interpretation*. Waveland Press.
- Chuvieco, E. (2016). *Fundamentals of Satellite Remote Sensing*. CRC Press.
- Joseph, G. (2018). *Fundamentals of Remote Sensing*. Universities Press.
- Narayan, L. R. A. (2015). *Remote Sensing and Its Applications*. Universities Press.
- ISRO. (2019). *Remote Sensing Applications*. Indian Space Research Organisation.
- Mather, P. M., & Koch, M. (2011). *Computer Processing of Remotely-Sensed Images*. Wiley.
- Congalton, R. G., & Green, K. (2019). *Assessing the Accuracy of Remotely Sensed Data*. CRC

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