GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology					Branch/Spec.	Computer Engineering/ Information Technology/ Computer Engineering(Artificial Intelligence)		
Semester	VIII					Version	1.0.0.0		
Effective from Academic Year	2025-26					Effective for the Batch admitted in			July 2022
Course Code	2CEIT8PE3	Course Name				Satellite Data Analysis			
Teaching Scheme						Examination Scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	-	1	-	3	Theory	40	60	100
Hours	2	-	2	-	4	Practical	30	20	50

Pre-requisites

Basic knowledge of python programming and statistics

Course Outcomes

On successful completion of the course, the students will be able to:

CO1	Explain the fundamentals of GIS and spatial data representation in the preparation of thematic maps.
CO2	Analyze various land features and spectral characteristics using satellite imagery interpretation techniques.
CO3	Design and implement techniques for land feature recognition and image mosaicking using remote sensing principles.
CO4	Evaluate satellite data processing techniques and their applications in environmental monitoring and spatial analysis.

Theory Syllabus

Unit	Content	Hrs.
1	**Fundamentals of GIS Data and Mapping:** GIS Data Representation, Geospatial data for GIS applications, Digital representation of geospatial data, Mapping, Paper based maps vs digital maps, Map scale, Cartography, Electromagnetic spectrum, Pre-processing of Satellite Images, Georeferencing, Image enhancement, Ground Control Points collection, Satellite Image Interpretation, Raster Based GIS, Raster representation of data grid size and resolution, Data capture/preparation, Raster to vector conversion, Vector based GIS, Vector representation of data, Spatial data Collection, Sampling, Scaling.	04
2	**Remote Sensing Concepts and Image Analysis:** Type of Spatial Data, Geospatial Analysis, Mobile Geospatial Computing, Spatial Database Management, Standard Data Formats, Modelling Features, Spatial Data Analysis and Modelling, Proximity Analysis, Overlay Analysis, Buffer Analysis Network Analysis, Interaction mechanisms of EM radiation with ground, Spectral response curves, Multi-spectral scanning, Salient characteristics of Satellites.	07
3	**Raster and Vector Spatial Data Models:** Different types of resolutions in Remote Sensing, Image interpretation of different geological landforms, rock types and structures, Remote Sensing integration with GIS and GPS, SAR Technique and its applications, Hyperspectral Remote Sensing, Integrated RS and GIS, Limitations of Remote Sensing Techniques, 3-dimensional viewing of land features, Spatial maps and Geoservers, Image mosaicking, Keypoint Detection, Projective Layouts, Image interpretation.	08
4	**Spatial Analysis and Modeling Techniques:** Onboard data handling in LandSat 8 and 9, Handling reflective bands, Handling thermal infrared bands, Liner adaptive contrasting, Non-linear adaptive contrasting (25), Hubble telescope images, Data Calibration and Pipeline reduction, Chandra X-ray Observatory, Processing False Color Images, 3-Color Composite Image Reduction, Google Earth Engine for large scale and multi-temporal data analysis (25) Limitations and future of satellite Image analysis.	06

5	**Integration of Remote Sensing, GIS and GPS:** Reading and writing the individual Bands in satellite images, Pre-processing of Satellite Images, Generation of Natural color composite and False color composite images, Measurement from the orthorectified Satellite Images, Digitization, adding attribute information in spatial data, Computation of Various indices for vegetation and water estimation, Publishing spatial layers in Geoserver, Development of Web-GIS applications.	05
Practical Content		
Practicals, assignments and tutorials are based on the above syllabus.		
Text Books		
1	Introduction to geographic information systems by Chang, K. T., McGraw-Hill Higher Education.	
2	Artificial Intelligence Techniques For Satellite Image Analysis by D. Jude Hemanth, Springer.	
Reference Books		
1	"Satellite Communications" by Timothy Prat and Charles W. Bostian, Wiley.	
ICT/MOOCs Reference		
1	https://www.coursera.org/learn/spatial-analysis-satellite-imagery-in-a-gis	
2	https://onlinecourses.nptel.ac.in/noc19_ce38/preview	

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	0	0	0	1	2	0	1	1	2	1
CO2	3	3	1	2	3	0	0	0	1	2	0	1	2	1	1
CO3	2	2	3	1	3	0	0	1	2	2	2	1	3	2	3
CO4	3	3	2	3	3	1	1	0	2	2	1	2	2	3	2