GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology		Branch/Spec.	Civil Engineering	
Semester	IV		Version	2.0.0.1	
Effective from Academic Year	2026-27		Effective for the Batch admitted in	July 2025	
Course Code	2CI4111	Course Name	Surveying & Geospatial Techniques		

Teaching Scheme						Examination Scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	04	00	01	00	05	Theory	40	60	100
Hours	04	00	02	00	06	Practical	30	20	50

Pre-requisites

Course Outcomes

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

CO1	Recalling principles and applications of classical surveying and foundational geospatial technologies.
CO2	Understand the scientific foundations and operational applications of advanced techniques
CO3	Apply traditional and modern geospatial survey methods—including Total Station, GNSS, Digital Level, and electromagnetic devices—to real-world engineering challenges.
CO4	Employ GIS, QGIS, spatial analysis, database management and map production with both open-source and enterprise tools for engineering and construction applications.
CO5	Assess future trends and decision support innovations in geospatial technology, demonstrating ability to adopt best practices and new tools.

Theory Syllabus

Unit	Content	Hrs.
1	**Surveying Basics and Field Techniques:** Levelling, Theodolite, Tacheometry, Computation of Areas/Volumes	4
2	**Error & Curves:** Error types, least squares, circular/compound/transition/vertical curves	4
3	**Photogrammetry & Geodetic Surveying :** Principles, aerial photography, scale, triangulation, ground coordinates	4
4	**Remote Sensing and GNSS Fundamentals:** Remote sensing principles, GNSS, satellites, sensors, geodetic applications	3
5	**Modern Field Instruments & Techniques:** Total Station, Digital Level, Topographical Scanners, GPS, LiDAR, Bathymetry, UAV, Electromagnetic surveys	8
6	**Geospatial Data Handling & Software :** GIS principles, QGIS, spatial data types/structures, map layout	7
7	**Advanced GIS & Spatial Analysis:** Cartography, spatial stats, raster/vector analysis, topological operations	8
8	**Database Management & Open Source GIS:** GIS databases, managing spatial/attribute data, SQL queries, QGIS, Web/Enterprise/Mobile GIS	7
9	**Geospatial Decision Support & Future Trends:** Decision systems, geospatial IT, industry trends, case studies, innovation	8
10	**Integrated Project/Capstone Module:** Decision systems, geospatial IT, industry trends, case studies, innovation Practical application, integrated survey project, professional reporting	7

Practical Content (Suggestive—10 Practical):

1. Surveying practice: RL, traverses, tachometric field work
2. Error computation and curve setting (field demo)
3. Aerial photo interpretation and geodetic baseline exercise
4. Remote sensing/GNSS data demo
5. Total Station & UAV operation, LiDAR/Bathymetry demonstration
6. QGIS spatial data capture/edit
7. Cartography and advanced spatial analysis in QGIS
8. SQL/GIS database management and integration
9. Web GIS publishing and open source mapping
10. Capstone Project Presentation: Professional mapping and reporting

Learning Outcomes:

- Master classical and advanced techniques in surveying and mapping
- Operate modern geospatial tools and interpret results for civil engineering applications
- Build, analyze, and use spatial databases for information and decision-making
- Create accurate, professional maps using modern cartographic practices
- Stay abreast of technological innovations and adopt new tools for professional growth

Text Books	
1	Dr. B.C. Punamia, Surveying Vol.I, II and III, Laxmi Publications Pvt Limited.
2	Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh.
3	Surveying Vol. I, II and III by Dr. K.R. Arora, Standard Book House. New Delhi
4	Paul Wolf & Bon Dewitt, Elements of Photogrammetry (McGraw Hill)
5	Lo C.P., Yeung K.W., Concepts and Techniques of GIS (Pearson)
6	Satheesh Gopi, Advanced Surveying (Pearson)
7	QGIS Training Manual (OSGeo Foundation)
Reference Books	
1	Joseph, Fundamentals of Remote Sensing (Universities Press)
2	ESRI Guidebooks – Web GIS, Enterprise GIS, Spatial Analysis
3	K.S. Duggal, Surveying and Levelling (TMH Edition)
4	ASPRS, DEM Technologies and Applications
ICT/MOOCs Reference	
1	SURVEYING/home.htm.
2	http://nptel.iitm.ac.in/video.php?subjectId=105104101.
3	http://nptel.iitm.ac.in/courses/Webcourse-contents/IITROORKEE/.
4	NPTEL Surveying & Geospatial Technology
5	Official QGIS Tutorials
6	Open Source GIS documentation

Mapping of CO with PO and PSO:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	2	1	1	2	2	2	3	3	2
CO2	2	3	3	2	3	2	2	2	1	2	2	2	3	3	2
CO3	2	2	3	3	3	2	3	2	2	2	2	2	3	3	3
CO4	2	2	2	2	3	2	2	2	1	2	3	3	3	3	2
CO5	2	2	2	2	3	2	3	1	2	3	3	3	3	3	3