



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering

Subject Code: 3134003

Semester – III

Subject Name: Geomatics Engineering

Type of course: Professional Core Course

Prerequisite: Understanding of linear and angular measurement, chain and compass survey, leveling, traversing.

Rationale: Knowledge of surveying is essential to execute civil construction work projects. Civil Engineer must have acquaintance of operation of different survey instruments and their applications on the field. To accomplish these requirements, this syllabus is framed to cater understanding and applications of theodolite, total station, aerial camera, satellites, drone, DGPS, LIDAR for the various types of survey works including the theoretical aspects.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Plane Table Survey: Introduction, Principle, Instruments, Methods of plane tabling, Advantages, Sources of errors.	3
2	Theodolite survey: Introduction, definitions, the vernier transit theodolite, temporary and permanent adjustment of theodolite, measuring horizontal and vertical angles, methods of traversing, closing error, computation of latitudes and departure, check in closed and open traverse, balancing of traverse, Gale's table, traverse area, omitted measurements.	6
3	Tacheometric Surveying : Introduction, purpose, principle, instruments, stadia constants, methods of tacheometry, anallatic lens, subtense bar, field work in tacheometry, Tangential method, reduction of readings, errors and precisions.	5
4	Trigonometric levelling: Indirect levelling, levelling on steep ground methods.	3
5	Geodetic Surveying- Principle and Classification of triangulationsystem- Selection of base lineand stations- Orders of triangulation- Triangulation figures- Station marksand signals- marking signals- Extension of base, Reduction of Centre, Selection and marking of stations	6
6	Curve Surveying: Simple Circular Curve, Compound and Reverse curves, Transition curves, Vertical curves, Elements and setting out curves.	5



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7	Hydrographic Surveying: Introduction, Sounding, Methods of Locating soundings, Tide gauges, Mean Sea Level determination.	3
8	Theory of Error: Introduction, Types of errors, Laws of errors, laws of weights, distribution of errors, determination of most probable values.	3
9	Field Astronomy: Introduction, astronomical terms, determination of azimuth, latitude and longitude.	3
10	Aerial Photogrammetry: Introduction, Aerial camera, Scale of photograph, Ground control, Procedure of aerial survey, Photomaps.	3
11	Remote sensing, GIS, GPS: Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, Key components of GIS, Functions and applications of GIS, GPS satellite system, principle, applications of GPS.	3
12	Modern Surveying Instruments: Introduction, Electromagnetic distance measurement, Total Station Surveying: Introduction, Electromagnetic distance measurement principles, horizontal & vertical angle measurements, setting up the total station, various field applications of total station surveying, data transfer mechanism and further process, advantages. Drone Survey (visual, lidar, multispectral & Thermal), DGPS survey.	3
13	Setting Out Works: Building, Culvert, Bridge, Tunnel	2

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	20	20	20	10	05

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

- T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling, Vol-I and Vol-II, Pune VidyarthiGrihaPrakshan, 1972.
- B. C. Punmia, A.K. Jain & A.K. Jain, Surveying, Vol-I and Vol-II, Laxmi Publication Pvt., 1996.
- T.M. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation, John Wiley & Sons, 1994.
- G. W. Schofield, Engineering Surveying, Butterworth, Heinemann, New Delhi, 2001.
- G. Joseph, Fundamentals of Remote Sensing, Universities Press, 2003.



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- Dr. K.R. Arora, Surveying Vol. I, II and III, Standard Book House, New Delhi
- S. K. Duggal, Surveying Vol. I and II, Tata Mcgraw Hill, New Delhi
- R. Agor, Surveying and Levelling, Khanna Publishers, New Delhi
- R. Agor, Advanced Surveying, Khanna Publishers, New Delhi

Course Outcomes: After successful completion of the course the students shall be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Carry out traversing by plane table	6%
CO-2	Carry out traversing by theodolite	12%
CO-3	Prepare contour sheet by tacheometry survey	10%
CO-4	Understand triangulation and trigonometric levelling survey	12%
CO-5	Set out different types of horizontal and vertical curves on ground	10%
CO-6	Understand hydrographic survey, theory of errors and their applications	10%
CO-7	Fix up latitude and longitude of the place by astronomical observations	6%
CO-8	Understand aerial photogrammetry, remote sensing, GIS, GPS and their applications	14%
CO-9	Carry out survey with Total station	6%
CO-10	Understand the application of drone survey, LIDAR and DGPS	6%
CO-11	Set out foundation plan of building, culvert on ground	4%
CO-12	Fix up alignment of bridge and tunnel on ground.	4%

List of Experiments:

1. Plane Table Survey
2. Theodolite Traverse Survey
3. Tacheometry Contour Survey
4. Tangential and Trigonometric survey
5. Total Station Survey
6. Setting out curve
7. Setting out building foundation plan.

Major Equipment:

1. Vernier Transit Theodolite
2. Total Station
3. DGPS

List of Open Source Software/learning website: www.nptel.ac.in/courses/