



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Program Name: Diploma in Engineering**

**Level: Diploma**

**Branch: Civil Engineering**

**Course / Subject Code : DI02006011**

**Course / Subject Name: Basic Surveying**

w. e. f. Academic Year:	2024-25
Semester:	2 <sup>nd</sup>
Category of the Course:	ESC

<b>Prerequisite:</b>	Students must have proficiency in Mathematics. Students have a keen interest in surveying and problem-solving skills.
<b>Rationale:</b>	Before starting any civil engineering or mining project, it is essential to conduct a field survey of the area and prepare various survey maps. These maps are crucial for planning, design, estimation, and Construction decisions. Diploma holders need to understand different surveying methods and equipments. They should also be skilled in using and operating these equipments. This course is designed to help diploma holders easily conduct surveys using equipments like chain/tape, prismatic compass, dumpy level, or digital auto level. They will learn to measure dimensions, calculate areas and volumes, and prepare accurate drawings, enhancing their practical knowledge and field competency.

## Course Outcome:

After Completion of the Course, the Student will able to:

No	Course Outcomes	RBT Level
01	Explain the basic concepts, classification of surveying, objectives, and principles of surveying and use various scales in practical surveying tasks.	R & U
02	Select the appropriate equipment for conducting surveys based on linear measurements, identify and compute the error, and calculate the area of a given drawing.	R, U, & A
03	Apply traverse surveying techniques using a compass and plane table to complete the survey project, removing errors and plotting the traverse.	R, U, & A
04	Apply leveling techniques to carry out levelling projects using Dumpy level/ Digital level/ Auto level and prepare contour drawing.	R, U, & A
05	Identify parts of theodolite and perform temporary adjustments	R & U

*\*Revised Bloom's Taxonomy (RBT)*



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## Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
02	0	02	03	70	30	20	30	150

## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	<b>Introduction to Surveying:</b> 1.1 Definitions, Objectives, and uses of surveying, Classification of Survey, Principles of Survey. 1.2 Types of Scale and selection of scale, Construction of diagonal scale	02	7
2	<b>Linear Measurement:</b> 2.1 Methods & Accessories of Linear Measurement, Principle of Chain Surveying, Method of Chaining on Level Ground. 2.2 Errors and Mistakes in Chaining and Precautions Against it, Chain and Tape Corrections, Ranging. 2.3 Well-Conditioned and Ill-Conditioned Triangles, Selection of Survey Stations, Equipments for Chain Survey. 2.4 Procedure of Field Work, Conventional Symbols, Procedure & Equipments for Plotting. 2.5 Computation of Area from Plotted Plan using Planimeter. 2.6 Calculation of Area by The Mid-Ordinate Rule, The Average-Ordinate Rule, The Trapezoidal Rule, and Simpson's Rule. Computation of Volume using the Prismoidal Rule and Trapezoidal Rule	03	10



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3	<p><b>Traverse by Compass and Plane Table</b></p> <p><b>3.1 Compass:</b></p> <p>3.1.1 Introduction, Purpose, Definitions &amp; Principle of Compass Surveying, Traversing, Methods of Traversing, Types of Compasses, Temporary Adjustment of Prismatic Compass.</p> <p>3.1.2 Field Procedure for Observing Bearings, Problems with Whole Circle Bearings and Quadrantal Bearings.</p> <p>3.1.3 Problems on Fore and Back Bearings, Problems on Magnetic Declination.</p> <p>3.1.4 Problems on Included Angle, Problems on Local Attraction.</p> <p>3.1.5 Field Procedure of Chain and Compass Traversing, Plotting of Compass Traverse, Adjustment of Closing Error, Sources of Error in Compass, Precautions to be Taken in Compass Surveying.</p> <p><b>3.2 Plane table:</b></p> <p>3.2.1 Principles &amp; Accessories of Plane Table.</p> <p>3.2.2 Procedure of Setting up Plane Table over a Station, Methods of Plane Tabling.</p> <p>3.2.3 Advantages and Disadvantages of Plane Tabling.</p>	11	36
4	<p><b>Levelling and Contouring:</b></p> <p>4.1 Introduction Basic terminology related to Leveling.</p> <p>4.2 Types of Level: Dumpy Level, Tilting Level, Auto Level, Digital Level.</p> <p>4.3 Components of Dumpy Level, Auto Level, Digital Level with neat Sketch, Types of Levelling Staffs.</p> <p>4.4 Temporary adjustment of Level, Classification of Levelling.</p> <p>4.5 Finding out the R. L. in Level Book by H.I. Methods with necessary check with examples.</p> <p>4.6 Finding out the R. L. in Level Book by Rise &amp; Fall Method with necessary check with examples.</p> <p>4.7 Correction for Curvature and refraction and related examples, Errors in Levelling.</p> <p>4.8 Contour, its Uses &amp; Characteristics.</p> <p>4.9 Methods of Contouring, Interpolation of contours.</p> <p>4.10 Preparing drawings &amp; estimation of gradients, Calculation of capacity of reservoirs &amp; related examples.</p>	12	40



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5	<b>Introduction to Theodolite:</b> 5.1 Introduction to theodolite and its types, Uses of theodolite, and parts of Transit Vernier theodolite. 5.2 Reading of main and vernier scale on a horizontal and vertical plate 5.3 Temporary adjustment of a theodolite.	02	7
<b>Total</b>		<b>30</b>	<b>100</b>

## Suggested Specification Table with Marks (Theory): (in %)

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	50	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

## References/Suggested Learning Resources:

### (a) Books:

S. No.	Title of Book	Author	Publication with place, year, and ISBN
1	Surveying and levelling Vol-I	T. P. Kanetkar & S. V. Kulkarni	Puna Vidyarthi Griha Prakashan
2	Surveying and Levelling Vol-I	Dr. B. C. Punamia	Laxmi Publications Pvt.Ltd.
3	Surveying and Levelling Vol-I	Hussain & Nagrani	S. Chand New Delhi
4	Surveying	Mimi Das Saikia	PHI Learning Pvt. Ltd
5	Fundamentals of Surveying	S. K. Roy	PHI Learning Pvt. Ltd
6	Surveying and Levelling, 2 <sup>nd</sup> Edition	N N Basak	McGraw Hill Education Pvt. Ltd
7	A Textbook of Surveying and Levelling	R. Agor	Khanna Publishers

### (b) Open-source software and website:

1. [www.nptel.iitm.ac.in](http://www.nptel.iitm.ac.in).
2. Auto CAD, Civil Architect
3. [www.Autodesk.com](http://www.Autodesk.com).



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## Suggested Course Practical List:

Exp. No.	List of Practicals	Unit No.	Approx. hrs. Required
1	Perform ranging and chaining operations in different field conditions.	2	02
2	Take offsets (Perpendicular and Oblique) in different field conditions.	2	02
3	Compute the area of the given plan by Mechanical/ Digital Planimeter	2	02
4	Perform temporary adjustments of the Prismatic Compass	3	02
5	Determine bearings of different survey lines and calculate included angles by using Prismatic Compass	3	02
6	<b>Project 1:</b> Conduct a traverse survey using Chain and Compass and prepare a drawing.	3	04
7	Introduction and setting out of a plane table in the field.	3	02
8	Introduction of dumpy level/Digital Automatic level and perform temporary adjustments of level. Take and record the level reading in the level book. Determine Reduced level using rise and fall and H.I. methods by applying checks	4	04
9	Carry out fly levelling and profile levelling in different field conditions.	4	02
10	<b>Project 2:</b> Conduct the levelling survey on the undulated ground and prepare a detailed contour map using a grid layout	4	06
11	Identify various parts of the theodolite and Temporary Adjustment of Theodolite	5	02
		<b>Total</b>	<b>30</b>

## List of Laboratory/Learning Resources Required:

S. No.	Equipment Name	Experiment No.
1	Metric Measuring Chain (20m and 30m) M.S. Arrows, Pegs	1,2,6
2	Measuring tape such as Metallic tape, fiberglass tape, invar tape, steel tape, linen tape, etc. (5m, 10m, 20m, 30m & 50m)	1,2,5,6,7,9,10, 11
3	Ranging Rods as per IS 2288 - 1963	1,2,4,5,6,7,9,1 0
4	Mechanical Planimeter	3



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S. No.	Equipment Name	Experiment No.
5	Digital Planimeter	3
6	A Prismatic Compass	4,5,6
7	Plane table	7
8	Dumpy Level	8,9,10
9	Digital Level	8,9,10
10	Auto Level	8,9,10
11	Leveling Staff	8,9,10
12	Vernier Theodolite	11

**Note:** It is recommended that the standards specified in the relevant I.S. Codes should be met by surveying equipment to ensure accuracy and reliability.

**Suggested Project List:** As per the Suggested Course Practical List

**Suggested Activities for Students:**

- (A) Survey a nearby open plot, mapping its boundaries in relation to adjacent roads or walls using chain/tape or compass traverse methods.
- (B) Complete a micro-project given.
- (C) Deliver a seminar on a relevant topic of your choice.

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