



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Environmental Engineering

Course / Subject Code : DI03013031

Course / Subject Name : Surveying in Environmental Engineering

w. e. f. Academic Year:	2024-25
Semester:	3 rd
Category of the Course:	PCC

Prerequisite:	Basic Science and Civil Engineering Drawing
Rationale:	Before development and planning process for any environmental engineering project, at first field survey of that area is carried out and various type of survey maps are prepared. The diploma pass outs/technicians should therefore know the various methods and instruments required for surveying. They should also have the skill and information to handle and operate the needed survey instruments. It is also important for them to be well aware about the use of advance surveying instrument such as total station, GPS and related software to enhance the knowledge and abilities required for surveying in field.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Carry out survey of environment related project by chain or tape.	R,U & A
02	Plot traverse by performing compass survey	R,U & A
03	Prepare contour maps by performing leveling	R,U & A
04	Explain basics of remote sensing and GIS	R,U & A
05	Explain basics of Electronic distance measurement, Total station and	R,U & A

*Revised Bloom's Taxonomy (RBT)

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(M)	PA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150



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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to Surveying and Linear Measurement 1.1 Definitions, Objective and uses of surveying, Classification of Survey, Principles of Survey 1.2 Types of Scale and selection of scale, Construction of diagonal scale 1.3 Methods & Accessories of Linear Measurement, Principle of Chain Surveying, Method of Chaining on Level Ground 1.4 Errors and Mistakes in Chaining and precautions against it, Chain and Tape Corrections, Ranging, 1.5 Well-Conditioned and Ill-Conditioned Triangles, Selection of Survey Stations, Equipments for Chain Survey 1.6 Procedure of Field Work, Conventional Symbols, Procedure & Equipments for Plotting 1.7 Computation of Area from Plotted Plan using Planimeter 1.8 Computation of Area by The Mid-Ordinate Rule, The Average-Ordinate Rule, The Trapezoidal Rule and Simpson's Rule, Computation of Volume using Prismoidal Rule and Trapezoidal Rule	08	15
2.	Traverse by Compass 2.1 Introduction, Purpose, Definitions & Principle of Compass Surveying, Traversing, Methods of Traversing, Types of Compass, Temporary Adjustment of Prismatic Compass 2.2 Field Procedure of Observing Bearing, Problems on Whole Circle Bearing and Quadrantal Bearing 2.3 Problems on Fore and Back Bearings, Problems on Magnetic Declination 2.4 Problems on Included Angle, Problems on Local Attraction, 2.5 Field Procedure of Compass Traversing, Plotting of Compass Traverse, Adjustment of Closing Error, Sources of Error in Compass, Precautions to be Taken in Compass Surveying	11	25
3.	Leveling & Contouring 3.1 Introduction Basic terminology related with Leveling 3.2 Types of Level: Dumpy Level, Tilting Level 3.3 Auto Level, Digital Level 3.4 Components of Dumpy Level with neat Sketch, Types of Levelling Staffs	11	25



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	3.5 Temporary adjustment of Level, Classification of Levelling 3.6 Finding out the R. L. in Level Book by H.I. Methods with necessary check with examples 3.7 Finding out the R. L. in Level Book by Rise & Fall Method with necessary check with examples 3.8 Correction for Curvature and refraction and related examples, Errors in Levelling 3.9 Contour, its uses of & Characteristics, Methods of Contouring, Interpolation of contours, Preparing drawing & estimation of gradients		
4.	Basics of Remote Sensing and GIS and their application 4.1 History of Remote sensing, advantages and disadvantages 4.2 Passive and active remote sensing 4.3 Characteristics of ideal and real remote sensing system 4.4 Various applications of remote sensing in areas of agriculture, forest mapping, land cover mapping 4.5 Need for GIS, benefit of GIS 4.6 Raster form and vector form 4.7 Various applications of GIS in areas like Environmental Impact Analysis, Disaster management, surveying, irrigation water management, energy use tracking and planning, site suitability for waste treatment plant, environmental monitoring	11	25
5.	Electronic distance measurement, Total station and GPS 5.1 Introduction Principles of EDM 5.2 Methods of measurement like Pulse 5.3 Introduction to total station its advantages and disadvantages and various parts of total station with applications of total station 5.4 Application of GPS, advantages and disadvantages and various applications	04	10
Total		45	100

Suggested Specification Table with Marks (Theory):

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

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



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References/Suggested Learning Resources:

(a) Books:

S. No.	Title of Books	Author	Publication
1	Surveying and levelling Vol-I & II	T. P. Kanetkar & S. V. Kulkarni	Puna Vidyarthi Griha Prakashan
2	Surveying and Levelling Vol-I & II	Dr. B. C. Punmia	Laxmi Publications Pvt. Ltd.
4	Surveying and Levelling Vol-I & II	Hussain & Nagrani	S. Chand New Delhi
5	Surveying	Mimi Das Saikia	PHI Learning Pvt. Ltd
6	Fundamentals of Surveying	S. K. Roy	PHI Learning Pvt. Ltd
7	Surveying and Levelling	N. N. Basak	Tata Mc Graw Hill

(b) Open source software and website:

- www.nptel.iitm.ac.in
- www.khanacademy
- www.Autodesk.com
- www.arcgis.com

Suggested Course Practical List:

S. No.		Unit No.	Approx .Hrs. Required
1	Perform chaining and ranging in different field conditions, and where different types of Obstructions are present.	01	04
2	Take offsets (Perpendicular and Oblique) in different field Conditions.	01	02
3	Compute area of given plan by Mechanical/ Digital Planimeter	02	02
4	Perform temporary adjustments of Prismatic Compass and Determine bearings of different survey lines by using Prismatic Compass and Determine included angles from measured bearings.	02	04
5	Perform temporary adjustments of Level. Take and record the	03	04



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	level reading in the level book. Determine Reduced level using both methods by applying checks		
6	Visit existing Water or waste water treatment plant and perform levelling to generate hydraulic flow scheme.	03	04
7			
8	Carryout GPS survey by GPS receiver of the traverse surveyed earlier and Compare results obtained and find out accuracy of GPS receiver	04	04
9	Carry out GPS survey and prepare Road map of city where college is situated	04	04
10	Carry out traverse survey with the help of total station	05	02
Total Hours			30

List of Laboratory/Learning Resources Required:

S. No.	Equipment Name with Broad Specifications
1	Metric Measuring Chain (20m and 30m) as per IS 1492 - 1970. M.S. Arrows of 4 mm diameter and 40 cm height
2	Measuring Tape such as Metallic tape, fiber glass tape, invar tape, steel tape, linen tape etc (5m, 10m, 20m, 30m & 50m)
3	Ranging Rods of length 2 to 3 meters with conical metallic shoe fitted at bottom & fully painted with 20 cm. long colour bands of either a) Black & White b) Red & White as per IS 2288 - 1963
4	Mechanical Planimeter: Accuracy: +/- 0.2 %
5	Digital Planimeter: Easy conversion function of unit and scale, Accuracy: Within +/-0.2%(Within +/-2/1000pluses)
6	Prismatic Compass consisting of brass or aluminum circular box with a diameter of 100/125 millimeter. Aluminum circle consists of a needle graduated to 30'.
7	Dumpy Level: Internal Focusing, Magnification 24x to 32x, Length of telescope 300 mm, objective aperture 40 mm, field of view 1° 30', resolution 0.01 cm at 100 mt, plate bubble size 12mm x 87.5mm, circle diameter 75 mm(magnetic)
8	Digital Level: Accuracy of Height: 1 mm, Resolution of Display: 0.001 / 0.001 m Observing range: 1.6m to 100m, Zoom in: 32x
9	Auto Level: Magnification 24x to 32x, objective aperture 32 mm to 42mm, Field of view: 1° 20' to 1° 25' at 100m
10	Leveling Staff: Made of Aluminium body, Telescopic in 3 PCS, 4m in length,



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	graduated in meters, dm and cm with white background and 5 mm thick black strips with suitable locking arrangement
11	GPS receiver: Garmin or similar make, Hand held GPS receiver with preloaded worldwide base map and display, WAAS enabled, fast positioning, waterproof, support for paperless geocaching
12	Total Station with standard accessories

Suggested Project List:

- Prepare a list of tools and equipment used in chain and Tape survey
- Perform compass survey and prepare drawing of compass traverse in AutoCAD and find its area.
- Prepare a chart showing difference between WCB and Reduced bearing
- Conduct market survey and find the latest price of surveying instruments and report it.
- Perform site selection for landfill site using GIS.
- Prepare a land use/land change map of residing district using RS and GIS.
- Conduct GPS survey and prepare road network
- Overlay the road network prepared by GPS receiver on satellite image.
- Prepare a report on application of GIS in any of the field related to environmental engineering.
- Find the accuracy of GPS receiver.
- Draw layout of college with the help of Total station

Suggested Activities for Students:

- Visit a working site and calculate area of land using planimeter and compare it with actual area according to drawing
- Visit nearby open plot and plot its boundaries with respect to adjacent road/wall using chain/tape/compass surveying
- Undertake micro-project.
- Give seminar on any relevant topic.

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