AMIRAJ

COLLEGE OF ENGINEERING & TECHNOLOGY

LABORATORY MANUAL

BASIC CIVIL ENGINEERING

SUBJECT CODE: 3110004

CIVIL ENGINEERING DEPARTMENT

B.E. 1st YEAR

NAME: _____

ENROLLMENT NO: _____

BATCH NO: _____

YEAR: _____

Amiraj College of Engineering and Technology,

Nr.Tata Nano Plant, Khoraj, Sanand, Ahmedabad.

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COLLEGE OF ENGINEERING & TECHNOLOGY

Amiraj College of Engineering and Technology,

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CERTIFICATE

This is to certify that Mr. / Ms. _____

Of class_____ Enrolment No _____has

Satisfactorily completed the course in _____as

by the Gujarat Technological University for ____ Year (B.E.) semester___ of Civil Engineering in the Academic year_____.

Date of Submission:-

Faculty Name and Signature

(Subject Teacher)

Head of Department

(Civil Department)

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List Of Experiments

Sr. No.	Title	Date of Performance	Date of submission	Sign	Remark
1.	Introduction To Surveying Instruments				
2	Chaining And Offsetting				
3	Compass Survey				
4	To Determine Reduced Level				
5	Civil Engineering Sketches				
6	Civil Engineering Material Rate				

PRACTICAL : 1	INTRODUCTION TO SURVEYING INSTRUMENTS

Object: To study various Surveying Instruments

a) Instruments Used for Linear Measurements

- Chain or Tape
- Arrows
- Pegs
- Ranging Rods
- Offset Rods
- Plumb Bob
- Optical Square
- Line Ranger

b) Instruments Used in Angular Measurements

- Prismatic Compass
- Surveyors Compass

c) Instruments Used in Vertical Measurements

- Leveling Staff
- Dumpy Level
- Theodolite

PRACTICAL : 2	CHAINING AND OFFSETTING

OBJECT:
To measure horizontal distance between two points by chaining and totake perpendicular offsets

INSTRUMENTS:
Metric Chain, Tape, Ranging rods, Arrows, Cross Staff, Lineranger, Optical Square.

PROCEDURE:

- Two chain men are required in this process. The chain men are called as
  Leader and follower. The chain man at the forward end of the chain is calledleader and chain man at the zero or rear end of the chain is called asfollower.
- Fix station A and B at some distance by fixing wooden peg to determinehorizontal distance between them.
- Position of station A, and B is fixed by measuring their position from at leastthree permanent objects and location sketch of station A and b are drawn.
- The follower holds one handle of the chain in contact with peg at station A.
- The leader takes the other handle of the chain, arrows and ranging rod &walks in the forward direction dragging chain with him.
- After the chain is stretched completely along the line the follower steps onone side of the line with the ranging rod touching the handle.
- The follower directs the leader to stand exactly in the line. The leader puts ascratch at the position & inserts an arrow.
- He then moves forward with thechain handle with the remaining arrows and ranging rod till the followerreaches the next arrow point.
- During this procedure details which are along the side of the chain line are located by lateral measurement with the help of offset and

tape. The points located are known as perpendicular offsets.

- All the perpendicular offsets are measured till station B is reached.
- All the measurements recorded in the field book.

Conclusion:

Use A2 size sheets For Drawing

PRACTICAL : 3	COMPASS SURVEY

OBJECT:
Study of Prismatic Compass & to determine fore and back bearing of survey line AB, BC, CA Included Angles.

INSTRUMENTS:

Tripod, Prismatic Compass, Ranging rods, Measuring Tapes,Wooden Pegs, Hammer.

THEORY:

- Fore Bearing: The bearing of a line measured in the direction of progress ofsurvey is called fore bearing.
- Back Bearing: The bearing of a line measured in the opposite direction ofprogress of survey is called fore bearing.

PROCEDURE:

- TEMPORARY ADJUSTMENTS OF A PRISMATIC COMPASS
  The Prismatic Compass is set up at a point say station A.
  The following temporary adjustments are needed to be carried out at each setUp of Instrument

- Centering: Centering is the process of keeping the instrument exactly overthe station. It is carried out by dropping a piece of stone so that it falls on thetop of the pegs fixed at station point.

- Leveling: Prismatic compass is leveled by means of ball and socketarrangement so that the graduated ring may swing freely.

- Focusing the prism: The reflecting prism is adjusted to the eye sight of theobserver by rising or lowering then stud until the graduations are seen sharpand clear.

- **CALCULATION OF FORE AND BACK BEARING**

- Suppose the bearing of line AB, BC, CA of a triangle is to be observed. Setup the instrument at station A and carry out all the temporary adjustments.
- Fix the ranging rod at B.
- Turn the prismatic compass until the ranging rod at station B is bisected bythe horse hair when seen through the vertical slit above the prism.
- When the needle comes to rest bisect ranging rod at B exactly and note thereading. The reading observed is the Fore bearing of line AB i.e. Anglemeasured with respect to north.
- Now shift the prismatic compass at station B perform all temporaryadjustments and from station B bisect station A towards backward, thereading observed in prismatic compass is the Back Bearing of line AB.
- Now from the same setup of the instrument Bisect station C and note downthe reading of prismatic compass as fore bearing of line BC. Transfer theinstrument to station C to obtain back bearing of line BC. Similarly observeFore Bearing and back bearing of line CD.
- Check the Difference of Fore bearing and back bearing of each line it shouldbe equal to 180^0

- **TO FIND INCLUDED ANGLES**
- Included Angles of a triangle are calculated from observed FB and BB ofline AB,BC,CD,DA
- Included angle is determined by following formula
- Angle = Back Bearing of Previous Line- Fore Bearing of next line

- Check: Sum of all included angles Should be Equal to (2n-4) x 900

Observation table:

Sr. No	Line	Length	F.B	B.B	Difference	Included Angle
1	AB					A =
2	BC					B =
3	CD					C =
4	DA					D =
					Sum of angle	

PRACTICAL : 4	TO DETERMINE REDUCED LEVEL

OBJECT:
To find reduced level of various points by simple leveling.

INSTRUMENT: Dumpy level, Tripod, leveling staff, pegs, Hammer

PROCEDURE:

- Simple leveling: - It is the simplest method of leveling used, when it is requiredto find the difference in elevation between 2 points.

TEMPORARY ADJUSTMENT OF DUMPY LEVEL:

- The Dumpy Level is fixed on the tripod at station say O.

SETTING UP THE LEVEL

- The tripod legs are adjusted at a convenient height.
- Any two legs ofthe tripod are fixed on the ground by pressing the tripod into theground. The movement of the third leg is made in such a way that thebubble remains in the center.
- LevelingThe actual leveling is then done by moving foot screw on the levelinghead. Instrument ‘s telescope is kept Parallel to two foot screws andboth the foot screws are either moved inward or outward till thelongitudinal bubbles is in the centre of its run.
- The telescope is then turned through 900 so that the telescope is nowparallel to third foot screw. Now move third screw inward or outwardtill bubble is in center. Then the telescope is brought in its originalposition.
- The procedure is carried out till the bubble remains in the center inboth the position.

REMOVAL OF PARALLAX

Focusing the eye piece

- To focus so that the cross hairs for distinct vision hold a sheet of white paper in front of objective glass, and move the eye piece till theimage of cross hair are seen distinct and sharp.

Focusing of objective glass

- The telescope is then directed towards the staff held vertically atbench mark (B.M.) say station A and by turning the focusing screw.Parallax is removed by moving focusing screw till the image of staffis seen distinct and clear.

- **HEIGHT OF INSTRUMENT METHOD**
- In this method the height of instrument is calculated for each setting by adding Back sight to the elevation of bench mark i.e. = Reduced Level (R.L.) of B.M. + B.S.
- The R.L. of Intermediate points is calculated by subtracting the HI-IS(Intermediate sight).
- The process is continued till the R.L. of last point is obtained bysubtracting the staff reading from height of last setting of instrument.
- i.e. HI – FS
- Apply the arithmetic check to verify the calculation by height oInstrument

- **RISE & FALL METHOD**
- In rise & fall method, the height of Instrument is not at all calculated but thedifference of level between consecutive points is found by comparing the staffreadings on the two points for the same setting of the instrument. Rise and fallis calculated using following formula.
- BS-IS or BS-FS if +ve then Rise and if BS-IS or BS-FS is –ve then fall i.e.
- If the reading is positive then it is rise and if the reading is negative then thereading is called fall. The figure for rise & fall worked out thus for all the pointsgive the vertical distance of each point above or below the preceding one, and ifthe level of any one point is known then the level of the next will be obtainedby adding its rise or subtracting its fall, as the case may be.

Observation Table

HI method

Inst. Station	Staff Station	Staff Reading			RL OF H.I	R.L OF POINTS	REMARKS
		B.S	I.S	F.S			

Rise and Fall Method

Inst. Station	Staff Station	Staff Reading			Rise	Fall	R.L Of points	REMARKS
		B.S	I.S	F.S				

PRACTICAL : 5	CIVIL ENGINEERING SKETCHES

1) Draw a neat sketch of cross section of trunk of tree and show the details

2) Draw the sketches of isolated stepped footing and show the details

3) Draw the sketches of isolated sloped footing and show the details

4) Draw the sketches of lintle and show the details

5) Draw the sketches of one way RCC Slab and show the details

6) Draw the sketches of cross section of stair case and show the details

Practical : 6	CIVIL ENGINEERING MATERIAL RATE

SR. NO	MATERIAL	UNIT	RATE
1	Cement		
2	Sand		
3	Aggregate		
4	Steel		
5	Glass		
6	Timber		
7	Binding Wire		
8	Wood		
9	Lime		
10	Bitumen		
11	Brick		
12	Concrete Block		