GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mining Engineering

Subject Code: DI04022011

Subject Name: Mine Surveying II

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	PCC

Prerequisite:	Basic knowledge of surveying instruments like tape, compass, and levelling instrument. Understanding of basic trigonometry and geometry used in distance and angle measurements. Fundamental skills in field observation, data recording, and plotting.
Rationale:	Mining operations require accurate determination of positions, directions, and elevations both on the surface and underground. With the advancement of technology, modern instruments such as Total Station, Tacheometer, and Photogrammetry systems have enhanced precision and efficiency in mine surveying. This course provides students with the essential theoretical knowledge and practical skills in surveying methods like Triangulation, Tacheometry, Photogrammetry, Correlation, and Underground Surveying. It aims to prepare students to perform accurate surveys for mine planning, development, and control, ensuring safe and efficient extraction of minerals.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level
01	Operate Total Station to measure distance, angles, and elevations accurately.	R, U, A
02	Explain basic concept and application of triangulation survey.	R, U, A
03	Explain the principles and applications photogrammetry in mining surveys.	R, U
04	Use tacheometric methods to determine horizontal distances and elevations efficiently in the field.	R, U, A
05	Classify the right procedure to be followed for correlation survey.	R, U
06	Describe various procedure used for surveying in underground survey.	R, U

**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
				Theory		Practical		
L	T	PR	C	ESE (E)	PA (M)	PA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Basics of Total Station:** 1.1 Introduction to Electromagnetic Distance Measurement (EDM) 1.2 Introduction to Total Station 1.2.1 Application of Total station in Mining 1.2.2 Parts of Total Station (TS) 1.2.3 Set up of Total station over a survey station 1.2.4 Measurements: Horizontal and Slope distance, Horizontal angle, and Vertical angle, Elevation 1.2.5 Precautions to be taken while using Total Station 1.2.6 Merits of total station 1.2.7 Drawback of Total station	06	13
2.	**Triangulation:** 2.1 Basic concept of Triangulation survey 2.2 Classification of triangulation survey/system 2.3 Triangulation figures 2.4 Well-conditioned triangle 2.5 Application of Sine rule 2.6 Routine of triangulation survey: 2.7 Reconnaissance, Erection of signals and towers, Measurement of base line and its extension & Azimuth of Base line, Satellite station, Measurement of horizontal angles, computations	12	27
3.	**Basics Photogrammetry:** 3.1 Introduction 3.2 Classification of photogrammetry 3.3 Application of photogrammetry in mining	04	9

	3.4 Terrestrial photogrammetry 3.4.1 Definition 3.4.2 Principle 3.4.3 Merits and Demerits 3.5 Aerial Photogrammetry 3.5.1 Definition 3.5.2 Principle 3.5.3 Merits and Demerits		
4.	**Tacheometric Survey:** 4.1 Basic concept of tacheometric surveying 4.2 Instruments: Tacheometer, Levelling staff, and Stadia Rod 4.3 Anallatic lens 4.4 Methods of Tacheometry 4.5 Determination of Tachometric constants with problem and solution 4.6 Field work, Errors, and precision	08	18
5.	**Correlation:** 5.1 Introduction 5.2 Purpose of Correlation of survey 5.3 Classification of Correlation survey 5.4 Direct traversing through Adit or Incline 5.5 Correlation by Two wire in a single Shaft 5.5.1 Shaft Plumbing for correlation 5.5.2 Method: 5.5.2.1 Coplaning method 5.5.2.2 Weisbach Triangle method 5.5.2.3 Weiss Quadrilateral Method 5.6 Correlation of mine survey to the National Grid	10	22
6.	**Underground Survey:** 6.1 Curve: Definition and Classification of Circular curves: Simple, Compound, Reverse 6.2 Elements of a simple circular curve 6.3 Procedure of maintaining direction and gradient of Drivage 6.4 Measurement of distance and difference in elevation 6.5 Stope Surveying: Introduction and Purpose of stope surveying	05	11
	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**
10	**36**	**54**	**0**	**0**	**0**

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:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Mine Surveying and Levelling - Vol.1	S.Ghatak	Lovely Prakashan, Dhanbad
2	Mine Surveying and Levelling - Vol.2	S.Ghatak	Lovely Prakashan, Dhanbad
3	Surveying - Vol.1	Dr. B.C.Punmia, Er. Ashok K. Jain, Dr. Arun kumar Jain	Laxmi Publication, New Delhi ISBN: 9788170088530
4	Surveying - Vol.2	Dr. B.C.Punmia, Er. Ashok K. Jain, Dr. Arun kumar Jain	Laxmi Publication, New Delhi

(b) Open-source software and website:

1. **Virtual Lab:**

   Vertical and horizontal angles using total station -

   https://sl-iitr.vlabs.ac.in/exp/exp-total-station-iitr/theory.html

2. **Total Station Set up**

   https://www.youtube.com/watch?v=iAQgFFHBiPo

   https://www.youtube.com/watch?v=h10qLC_iilg

3. **Horizontal Angle measurement by Total Station**

   https://www.youtube.com/watch?v=n3HKG_ouPEU

   https://www.youtube.com/watch?v=1KCqxx8r5Y4

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Measurement of Horizontal Distance, Slope Distance, and Horizontal & Vertical Angles using Total Station.	1	04
2	Prepare a plan of given area showing all surface features using triangulation method. (Drawing Sheet)	2	08
3	Prepare of a Contour Plan of a given area using the Tacheometric Method. (Drawing Sheet)	4	08
4	Measure horizontal distance and elevation of given survey stations by using Tangential method of Tacheometry.	4	04
5	Establish an underground baseline by measuring its azimuth using the correlation method suitable for Incline or Adit. (Drawing Sheet)	5	06
			30 Hrs.

Suggested Project List:

1. Visit nearby mines survey office and make a layout of it.
2. Draw a labeled sketch of any survey instrument on sheet.

Suggested Activities for Students:

1. Prepare a list of latest instruments used in surveying with its specification.
2. Presentation on any survey instrument with its application in mining.
3. Visit any survey office and submit a report on it.

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