GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Mining Engineering

Course / Subject Code:DI02C22021(Only for C to D Students)

Course / Subject Name: Basic Mine Surveying

w. e. f. Academic Year:	2024-25
Semester:	Second
Category of the Course:	PCC - 02

Prerequisite:	Nil
Rationale:	Before development and planning process for any mining project, at first, field survey of that area is carried out and various type of survey maps are prepared. These maps and drawing are used for taking various decisions regarding the planning, designing, estimation, execution and various mining operation etc. The diploma mining engineer 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. This course is therefore one of the core courses required for mining engineers. Students are advised to master the desired skills which are expected from them for survey related works in mining industry.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level
01	Understand principles and uses of surveying.	R, U
02	Select suitable scale for surveying.	R, U, A
03	Apply suitable method for linear measurement.	R, U, A
04	Use compass to survey the area.	R, U, A
05	Conduct levelling surveying for various fields condition.	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
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction:** 1.1 Definition: Surveying and Levelling 1.2 Object and uses of Surveying 1.3 Primary division of surveying: Plane and Geodetic surveying 1.4 Classification of surveying based on the: (i) Object of survey (ii) Nature of the field survey (iii) Methods employed in survey (iv) Instruments used 1.5 Principles of surveying	06	13
2.	**Scale:** 2.1 Definition: Scale 2.2 Representation of scale 2.3 Types of scales 2.4 Characteristics of scale 2.5 Definition & Difference: Plan and Map	03	06
3.	**Chain surveying:** 3.1 Methods of linear measurement 3.2 Instruments used in Chaining: Chain, Tape, Arrows, Ranging Rods, Offset rods, Cross staff or Optical Square, Plumb bob, Pegs, Wooden mallet	12	27

	3.3 Technical Terms: Survey station- Main and Tie station, Base line, Check line, Tie line, Reconnaissance, Offset 3.4 Selection of site for survey station or survey lines 3.5 Offset and its types: Perpendicular and Oblique 3.6 Ranging: Direct ranging and Indirect ranging 3.7 Method of chaining 3.8 Error in length due to incorrect length of chain or tape and related problems 3.9 Obstacles in chaining 3.10 Conventional Symbols 3.11 Recording of measurements in field Book: Single-line and double-line field book 3.12 Field work in chain surveying		
4.	**Compass Surveying:** 4.1 Introduction 4.2 Technical Terms: Angles, Bearings, Azimuth, Fore and Back Bearing, True Meridian and bearing, Magnetic Meridian and bearing, Arbitrary Meridian and bearing, Magnetic Dip, Magnetic Declination 4.3 Whole circle bearing system & Quadrantal bearing system and Conversion of bearing from one system to the other 4.4 Computation of included angles for bearings 4.5 Prismatic Compass: Construction and functions of different parts, Adjustment of Prismatic compass 4.6 Local Attraction: its detection and Elimination 4.7 Errors in Compass Survey	12	27
5.	**Levelling:** 5.1 Introduction 5.2 Object of levelling 5.3 Technical terms: Level surface, Level line, Horizontal surface, Horizontal line, Vertical surface, Vertical line, Datum, Mean Sea level, Reduced level, Bench marks, Rise, Fall, Axis of telescope, Line of collimation, Axis of bubble tube, Station, Instrument	12	27

	station, Back sight, Fore sight, Intermediate sight, Change point, Height of instrument 5.4 Levelling staff: Self reading staff and Target staff 5.5 Types of Level: Dumpy level and Auto level, Components of dumpy level 5.6 Temporary adjustment of level 5.7 Methods of levelling: Simple levelling, Differential levelling, Fly levelling, Cross sectioning, Reciprocal levelling, Profile levelling 5.8 Computations of Reduced level (R.L.): (i) Height of instrument method (ii) Rise and Fall method 5.9 Hand signals during observations 5.10 Errors in levelling		
	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**
19	**27**	**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 (Bihar)
2	Surveying - Vol.1	Dr. B.C.Punmia Er. Ashok Kr. Jain Dr. Arun kumar Jain	Laxmi Publication, New Delhi ISBN :9788170088530

(b) Open-source software and website:

1. NPTEL course: Surveying
   https://archive.nptel.ac.in/courses/105/107/105107122/
2. Virtual Lab
   (i) Auto level
   https://sl-iitr.vlabs.ac.in/exp/auto-level/index.html
   (ii) Fly levelling
   https://sl-iitr.vlabs.ac.in/exp/exp-fly-level-iitr/index.html
   (iii)Profile levelling
   https://sl-iitr.vlabs.ac.in/exp/exp-profile-levelling-method-iitr/
3. Survey of India
   https://surveyofindia.gov.in/
4. Coal Mines Regulations 2017
   https://www.dgms.net/Coal%20Mines%20Regulation%202017.pdf

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Perform ranging and chaining operations in different field conditions.	III	04
2	Take offsets (Perpendicular/Oblique) in different field conditions.	III	02
3	Perform temporary adjustments of Prismatic Compass.	IV	01
4	Measure the bearings of different survey lines and calculate included angles from measured bearings using prismatic compass.	IV	06
5	Draw a plan of a given survey area by using Chain and Compass survey method.	III, IV	08
6	Perform temporary adjustments of levelling instrument.	V	01

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
7	Determine reduced level of various location using Height of instrument method.	V	04
8	Determine reduced level of various location using Rise and fall method.	V	04
			30 Hrs.

Suggested Project List:

1. Prepare a chart of various survey instruments with its diagram and technical specifications.
2. Visit nearby survey office and make a layout of it.
3. 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.