



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Mining Engineering

Course / Subject Code: DI03022021

Course / Subject Name: Mine Surveying I

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

Prerequisite:	Basic knowledge of chain survey, compass survey and mathematics like geometry and trigonometry to help with measurements and calculations.
Rationale:	<p>Development and planning of any mining project is start with the survey of that area and prepare plans and layouts. These plans and drawing are used for taking various decisions regarding the planning, designing, estimation, execution and various mining operation etc.</p> <p>The diploma holders in mining engineering must be able to understand and identify various features of mining field from mine plans, sections and predict future course of actions. Therefore, this course is designed to provide students with a solid foundation in essential surveying techniques and legal knowledge critical to mining operations. By including theodolite and plane table surveying, students gain practical skills in precise angular and graphical field measurements necessary for mapping and layout tasks. Theodolite traversing further enhances their ability to establish control networks. Additionally, the inclusion of mine legislation equips students with a comprehensive understanding of the legal framework, safety regulations, and professional responsibilities that govern mining activities, ensuring they are prepared to operate ethically and in compliance with industry standards.</p> <p>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.</p>



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Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level
01	Conduct field mapping and produce scaled plans using plane table surveying techniques.	R, U, A
02	Measure horizontal and vertical angle accurately and perform fields survey using theodolite.	R, U, A
03	Perform theodolite traversing to establish control points and plot accurate survey plan.	R, U, A
04	Understand various procedure of measurement for underground survey works.	R, U, A
05	Understand duties and responsibilities of surveyor and general requirements about mine plans.	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		Practical		
				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.	Plane Table Survey: 1.1 Introduction and Principle of plane table surveying 1.2 Equipment and accessories for plane table survey 1.3 Operations to set up the plane table over the station 1.4 Methods of Plane table survey: 1.4.1 Radiation method 1.4.2 Traversing method	08	18



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	1.4.3 Intersection method 1.4.4 Resection method 1.5 Advantages and Disadvantages of Plane table survey 1.6 Errors in Plane table surveying		
2.	Theodolite: 2.1 Introduction 2.2 Classification of theodolites 2.3 Construction of Transit theodolite 2.4 Technical Terms: 2.4.1 The vertical Axis 2.4.2 The Horizontal Axis 2.4.3 The axis of level tube 2.4.4 The axis of telescope 2.4.5 The line of sight or line of collimation 2.4.6 Centering 2.4.7 Transiting 2.4.8 Swinging the telescope 2.4.9 Telescope Normal 2.4.10 Telescope inverted 2.4.11 Face left observation 2.4.12 Face right observation 2.4.13 Changing face 2.5 Adjustment of theodolite: Temporary and Permanent 2.6 Measurement: 2.6.1 Horizontal angle: Ordinary method, Repetition method and Reiteration method 2.6.2 Vertical Angle 2.6.3 Magnetic bearing	13	29
3.	Traversing with Theodolite: 3.1 Introduction: Closed and Open traverse 3.2 Method of traversing: 3.2.1 The continuous azimuth method 3.2.2 The double foresight method 3.3 Latitude and Departure	10	22



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	3.4 Closing Error 3.5 Balancing the traverse: Bowditch's rule and transit rule		
4.	Underground Survey: 4.1 Shaft Depth measurement: 4.1.1 Objective 4.1.2 Methods: Direct method, Indirect method and Measurement by modern instruments 4.2 Dip and Strike problems 4.2.1 Definition: True dip, Apparent dip and Strike 4.2.2 Problems and solution related to dip and strike 4.3 Procedure for maintaining direction and gradient of drivage	08	18
5.	Legislation: 5.1 Practical experience of candidates for Surveyor's Examination 5.2 Appointment of surveyor 5.3 Duties and responsibilities of surveyor 5.4 Preparation of plans by surveyors 5.5 General requirements about mine plans 5.6 Types of plans 5.7 Survey instruments and materials 5.8 List of plans, sections and instruments and their storage	06	13
	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
18	28	54	0	0	0

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:

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	Mine Surveying and Levelling - Vol.2	S.Ghatak	Lovely Prakashan, Dhanbad (Bihar)
3	Surveying - Vol.1	Dr. B.C.Punmia Er. Ashok K. Jain Dr. Arun kumar Jain	Laxmi Publication, New Delhi ISBN: 9788170088530

(b) Open-source software and website:

1. Unit 1: Plane table Survey

NPTEL course: Surveying

<https://archive.nptel.ac.in/courses/105/107/105107122/>

2. Virtual Lab

Unit 1: Plane table survey

(i) Plane table and its accessories

<https://sl-iitr.vlabs.ac.in/exp/plane-table/>

(ii) Plane table survey: Radiation method

<https://sl-iitr.vlabs.ac.in/exp/radiation-method/>

(iii) Plane table survey: Intersection method

<https://sl-iitr.vlabs.ac.in/exp/intersection-method/>

(iv) Plane table survey: Resection method

<https://sl-iitr.vlabs.ac.in/exp/exp-resection-method-iitr/>

3. Unit 2: Theodolite



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Lesson No. 20

<https://archive.nptel.ac.in/content/storage2/courses/105107122/home.htm>

4. Unit 3: Traversing with theodolite

Lesson No. 29

<https://archive.nptel.ac.in/content/storage2/courses/105107122/modules/module9/Lesson29.htm>

5. Unit 5: Legislation

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	Prepare a survey plan of a given area by radiation method of plane table survey.	1	4
2	Prepare a survey plan of a given area by intersection method of plane table survey.	1	4
3	Perform a temporary adjustment of theodolite and measure horizontal angle.	2	6
4	Perform a temporary adjustment of theodolite and measure vertical angle.	2	4
5	Perform Closed traverse survey by theodolite and plot a sheet.	3	6
6	Perform Open traverse survey by theodolite and plot a sheet.	3	6
			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.



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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.
