

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: MINE SURVEYING - II
(COURSE CODE:3362201)**

Diploma Programme in which this course is offered	Semester in which offered
Mining Engineering	Sixth

1. RATIONALE

The course is designed to help the student in understanding the different ways of surveying carried out before starting mine work for better planning and designing. Various practical are to be performed to help in understanding the true meridian and true north which is being found out before doing mining. This course is helpful to eliminate the errors which normally occur during surveying. This is essentially expected from expert surveyor to minimize the errors to a great extent. It is therefore important for mine engineers to learn this course by heart.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skills in the students so that they are able to acquire the following competencies:

- **Undertake surface and underground survey for mining operations using various methods and instruments.**

3. COURSE OUTCOMES (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. Provision and maintenance of statutory mine plans
- ii. Undertake triangulation survey.
- iii. Undertake the tachometric survey.
- iv. Analyze various triangulation and tachometric survey problems and corrections.
- v. Undertake underground Correlation survey and Slope survey.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	
4	0	4	8	70	30	40	60	200

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P -Practical; C – Credit; ESE -End Semester Examination; PA - Progressive Assessment

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (In the Cognitive Domain)	Topics and Sub-topics
Unit- I Overview of Mining Survey	1a. Explain the importance of national grid lines with mine surveying. 1b. Explain Photographic survey and its application. 1c. Describe responsibilities and duties of mine surveyor. 1d. Describe the provision of mine plans and survey instruments.	1.1 Correlation of mine survey to the National Grid 1.2 Principle of photographic survey and its application in Mining and other fields. 1.3 Role of mine surveyor and his legal responsibilities. 1.4 Provision and maintenance of statutory mine plans 1.5 Maintenance of survey instruments.
Unit – II Triangulation	2a. Explain the method of triangulation system with its various classifications. 2b. Solve problems based on Base Line corrections. 2c. Perform triangulation survey with all calculations and draw sheets.	2.1 Principle-purpose and classification of triangulation system. 2.2 Methods of triangulation survey- Simple chain triangulation, Double triangles. 2.3 Importance of well-conditioned triangles, Application of sine rule 2.4 Selection of base line and triangulation stations location, 2.5 Base line measurements and various corrections applied on B.L length. 2.6 Extension of base line, broken base line with problems and solutions.
Unit – III Tachometric Survey	3a. Describe the constructional features of tachometer. 3b. Explain different methods used in tachometric survey. 3c. Calculate various problems based on Tachometric Survey. 3d. Explain the method of booking the survey.	3.1 Principles of Tachometry: Difference between Theodolite and Tachometer. 3.2 Construction of Tachometer and stadia rod. 3.3 Common methods of Tachometry. Determination of Tachometric constants 3.4 Method of booking, Errors and precision, Auto reduction tachometer 3.5 Calculations of volume, mineral stock pile by taping profile and Tachometric survey.
Unit– IV Establish Underground Features	4a. Explain the underground curve with difficulties encountered during lying of curves. 4b. Solve the problems related with direction and gradient of underground roadways.	4.1. Setting out location of shaft pillar, selection and fixing of underground stations. 4.2. Types of curves, Elements of a simple circular curve, difficulties in underground curve laying 4.3. Procedure of maintaining direction and gradient for Incline, Levels.

Unit	Major Learning Outcomes (In the Cognitive Domain)	Topics and Sub-topics
Unit- V Underground Survey and Astronomy Basic	5a. Explain Correlation survey and its various methods. 5b. Explain Slope surveying and its various methods.	5.1 Purpose, advantages and methods of correlation surveys. 5.2 Slope surveying - Classification, Purpose and advantages, Various methods, their applicability 5.3 Conditions and instruments used
	5c. Explain the terms related with astronomical survey. 5d. Determine true meridian, latitude and longitude.	5.4 Determination of true meridian 5.5 Latitude and longitude.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (Theory)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1	Overview of Mining Survey	10	4	4	4	12
2	Triangulation	12	5	5	5	15
3	Tachometric Survey	12	5	5	5	15
4	Establishing Underground Features	08	3	4	3	10
5	Underground Survey and Astronomy Basic	14	6	6	6	18
Total		56	23	24	23	70

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED PRACTICAL / EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes mainly in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical /Exercise (Outcomes in the Psychomotor Domain)	Approx. Hours Required
1	I	Undertake Triangulation survey at given locations.	06
2	II	Undertake Tachometric contouring on a given locations.	06
3	II	Undertake Tangential method and Tachometry-Practice.	08
4	III	Setting out of simple circular curves by linear method	06
5	IV	Undertake Correlation survey by Co-planning method - Survey practices.	08
6	IV	Undertake Correlation survey by Weiss batch triangle method - Survey practices.	08
7	IV	Undertake Correlation survey by Weiss Quadrilateral method - Survey practices.	08
8	V	Determine of true north by astronomical survey - Survey practices.	06
Total			56

8. SUGGESTED STUDENT ACTIVITIES

- i. Survey at different locations for practice.
- ii. Survey in underground mine for practices.
- iii. Visit to survey department of a mine and study instruments and drawings.
- iv. Prepare sheets for various survey conducted.
- v. Interact with mine surveyor and their team and discuss practical problems faced by them while surveying.
- vi. Study of various mine plans and sections.
- vii. Watch surveying videos

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Arrange expert lectures by Mine Surveyors
- ii. Ask students to calculate field data by various rules and prepare sheets/charts for given data.
- iii. Arrange field visit to explain use of survey in mine design and exploration
- iv. Show Survey videos
- v. Ask students to study of actual mine plans and interpret them.

10. SUGGESTED LEARNING RESOURCES

A) Books

S. No.	Author	Title of Books	Publication
1	Kanetakar	Surveying (Vol-II and III)	Lovely Prakashan
2	Ghatak S.	Mine surveying(Vol-II and III)	Lovely Prakashan
3	Punmiya B.C	Surveying	Laxmi
4	Agor	Mine surveying	

B) Major Equipment/Instrumentwith Broad Specifications

- i. Transit Theodolite.
- ii. Instruments like measuring tape, magnetic compass, ranging rod, arrow, wooden peg, plumb-bob, etc.
- iii. Binoculars for astronomical survey.

C) Software/Learning Website

- i. <http://en.wikipedia.org/wiki/Triangulation>
- ii. <http://www.youtube.com/watch?v=CBlhQ76LAyI>
- iii. <http://www.teara.govt.nz/en/modern-mapping-and-surveying/page-3>
- iv. <http://en.wikipedia.org/wiki/Tacheometry>
- v. <http://surveying2012.blogspot.in/2013/08/tacheometry-surveying.html>
- vi. <http://nptel.ac.in/courses/105107122/modules/module11/html/38-4.htm>
- vii. <http://nptel.ac.in/courses/105107122/modules/module11/html/39-10.htm>
- viii. <http://www.youtube.com/watch?v=aHwg-1CGoTM>
- ix. <http://geosun.sjsu.edu/paula/285/285/marc.htm>

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. S.G .Srivastav**, H.O.D, Mining Engg. Dept., Govt. Polytechnic, Bhuj
- **Prof C.V. Thakor**, Lecturer, Mining Engg. Dept., Govt. Polytechnic, Bhuj
- **Prof. S.C. Dabhekar**, Lecturer, Mining Engg. Dept., Govt. Polytechnic, Bhuj
- **Prof. S.S. Shah**, Lecturer, Mining Engg. Dept., Govt. Polytechnic, Bhuj

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. C. K. Chugh**, Professor, Department of Mechanical Engineering
- **Dr. P. Verma**, Professor, Department of Vocational and Entrepreneurship Education