Course Type	Course Code	Name of Course	L	T	P	Credit
DC3	MNC202	Mine Surveying	3	0	0	9

Course Objective

With the advent of precise and high-speed instruments, surveying technology has undergone revolutionary changes. The mining engineers must know modern surveying instruments and technologies.

The course will briefly overview basic and advanced surveying techniques and apply modern mapping techniques to mine surveying. The course will also give an insight into the best surveying practices in mines, including regulatory requirements. Computer applications in mine surveying have added new dimensions to this branch of engineering. The course has been designed to consider the need to capture 3D data for mine modelling, planning, and visualization.

Learning Outcomes

Upon successful completion of this course, students will:

- understand the basic requirements of mine surveying
- learn the different types of measurement (linear and angular) techniques
- understand modern surveying instruments like 3D scanners, drone-based LIDAR, other aerial mapping tools, and associated software to digitize mines.
- be able to develop an in-depth understanding of modern surveying techniques and become ready for various mine survey-related applications in actual practice.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Recent Developments**: Data Acquisition technologies (Ground-based, Aerial, and Remote Sensing), Data Processing, 3D-digital mapping, etc.	3	Broad understanding of Modern tools and techniques for the digitization of mines
2	**Surveying:** Definition, Objective, Classification and principles, Errors	3	Understanding of basic principles and need for surveying.
3	**Conventional Surveying Methods**: Linear Measurements, Angular Measurements, Levelling	9	Knowledge of measurement tools and techniques for mining applications
3	**Contouring:** Concepts, Characteristics, Contour Interval, Methods of contouring and uses of contours	3	Contouring requirements for topographical surveying and mapping
4	**Total Station:** Principle of electronic measurement of distance and angles, Construction and working with Total Station, Applications and Recent Developments	4	knowledge of working with Total stations and their application in mines.
5	**GPS & GNSS:** Theory and principles of GPS & GNSS & DGPS Surveying and its applications.	3	Principle and application of GNSS/DGPS in various mining applications
6	**Digital Mine Plans and Earthwork Estimations:** Data Processing, Representation and Earthwork Calculations	4	Processing of Survey data for all statutory and planning requirements in mines, including preparation of computer-aided plans, sections, and earthwork calculations
7	**Mine Surveying – Statutory Requirements**:	3	Plans and sections to be maintained as

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
	General requirements about mine plans and sections, Types of plans and sections, Specification of Limits of Error.		per statutory requirements, Accuracy assessment of surveying work including required accuracy of plans and sections
8	**Correlation and Alignment:** Principle, Methods, Determination of Gyro-north, Modern Gyro-Laser combination Correlation; Shaft depth measurement.	3	Orientation and alignment surveys for mine development, depillaring, stoping and tunnelling operations.
9	**Monitoring of Open Pit Slopes and Subsidence through Advanced Surveying Techniques:** Geodetic approaches in slope monitoring	3	Techniques and guidelines for dump slope, rock slope and subsidence monitoring.
10	**3D Laser Scanning and Drone Surveys**	4	Point Cloud data acquisition, processing and their application
	Total	42	

Text Books

1. Punmia, B. C. (2005), Surveying Vol. 1 and II
2. Schofield, W. and Breach, M. (2006), Engineering Surveying
3. Advances in Mine Surveying Technology, Dheeraj Kumar

Reference Books

1. Bannister, A. and Raymond S., Surveying
2. Lecture Notes