Course Type	Course Code	Name of Course	L	T	P	Credit
Open Elective	MNO 201	Mine Surveying	3	0	0	9

Course Objective

The course will give a brief overview of basic surveying followed by application of the modern mapping techniques in mine surveying. The course will also give an insight into the best surveying practices in mines including legislation requirements. The course has been designed taking into the need of capturing 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
- 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	**Surveying:** Definition, Objective, Classification and principles, Errors	3	Understanding of basic principles and need of surveying.
2	**Conventional Surveying Methods**: Linear Measurements, Angular Measurements, Levelling and Plane table surveying.	10	Knowledge on 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	5	An in-depth knowledge of working with Total stations and their application in mines.
5	**GPS:** Theory and principles of GPS & DGPS Surveying and its applications.	4	Principle and application of 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**: General requirements about mine plans and sections, Types of plans and sections, Specification of Limits of Error.	3	Plans and sections to be maintained as 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.	4	Orientation and alignment surveys for mine development, depillaring, stoping and tunnelling operations.
9	**Monitoring of Open Pit Slopes and**	3	Techniques and guidelines for dump

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Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
	Subsidence through Advanced Surveying Techniques: Geodetic approaches in slope monitoring		slope, rock slope and subsidence monitoring.
10	**Development and Stope Surveying:** Control of direction and gradient in drifts, tunnels, raises, winzes, Methods of survey in moderately and steeply inclined ore bodies, flat and vertical ore bodies/seams	3	Underground stope surveying techniques
	Total	42	

Text Books

1. Punmia, B. C. (2005), Surveying Vol. 1 and II
2. Schofield, W. and Breach M. (2006), Engineering Surveying

Reference Books

1. Bannister, A. and Raymond S., Surveying
2. Advances in Surveying Technology: Lecture Notes by faculty