Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NMND503	Modern Blasting Technology in Mining	3	0	0	3

Course Objective
Drilling and blasting are the most prominent methods of rock breakage in surface and underground mining, quarrying and construction industries. This course will equip the mining engineers to understand the dynamic fracture behaviour of rock while subjected to blasting.
Learning Outcomes
Upon successful completion of this course, students will: • Be able to understand the dynamic behaviour of rock mass during blasting. • Be able to evaluate and optimise blast performance and productivity improvement • Be able to reduce drilling and blasting costs by using realistic estimates and techniques, manage fly rock and other hazards associated with blasting operation, limit vibration levels in accordance with existing rules and regulations and control costs by managing risk.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Explosives:** Chemistry and physics of explosives; Properties of explosives; Explosives and blasting agents; bulk explosives, special types and their properties; Explosives selection for different rock types; specific problems related to the use of explosives such as desensitisation, sympathetic detonation; performance and sensitivity of explosives. Bulk explosives manufacturing and loading systems.	05	Students will learn about various types of explosives and their properties.
2	**Introduction to Production drilling**	04	Students will learn about different drills and their use in the production drilling of ore/rock
3	**Explosive initiating devices/systems**: Electric, non-electric initiating system, digital detonators, and selection of initiating system. Safety in usage and handling of explosives & initiating systems **Priming and charging:** Selection of primer and its effect on the blast performance. Influence of shape, size and quantity of primer on explosive performance	06	Students will learn various types of initiation systems and their properties and the priming concept.
4	**Rock breakage by explosives:** theories, laws of comminution, methods for prediction and assessment of fragmentation	03	Students will learn the rock breakage concept.
5	**Designing blasting rounds:** Design objectives, Design of blasting rounds for surface and underground excavations, Powder factor/specific charge, Energy factor and performance assessment	06	Students will learn blast design
6	**Influence of rock mass characteristics on blasting:** Introduction, Strength properties, Elastic properties, Wave velocity, Rock density, Porosity, Mineral composition, grain size and internal friction, Structural discontinuities, Presence of cavities, Variability of strata, Groundwater and moisture content,	04	Students will be exposed to rock parameters effecting blasting.

	Conductivity.		
7	**Special blasting techniques:** Advanced theory and application of explosives in excavation. Secondary breakage, trenching, throw/cast blasting, and blasting in mixed and hard/soft rock types. **Controlled blasting Techniques:**Advanced theory and application of explosives in excavation, damage and special blasting techniques used in Controlled blasting.	07	Students will learn the specialised blasting techniques and controlled blasting techniques.
8	**Environmental considerations:**Understanding the generation of Air Over Pressure, blast-induced ground vibration, and fly rock in blasting and their mitigation measures. **Blast Instrumentation:**Blast instrumentation for blast performance assessment and modification.	07	Students will learn various issues due to blasting and will also expose to various instruments used in blast design and monitoring.
	Total	**42**	

Text Books:

1. Drilling and blasting of rocks – Jimeno, Carcedo, Jimeno

Reference Books:

1. Rock Blasting and Overbreak Control- C.J. Konya
2. Blasting principles for open pit mining- William Hustrulid