Course Type	Course Code	Name of Course	L	T	P	Credit
DE12	MND 411	ADVANCED UNDERGROUND MINING METHODS (Modular)	3	0	0	9

Course Objective
To provide knowledge on advanced underground mining methods for coal mining as well as mining of metalliferous deposits.
Learning Outcomes
On successful completion of this course, the students will be able to understand the application of different advanced method of underground coal and non-coal miing, particularly the mass production technologies and mining under difficult geo-mining conditions.

Sl. No.	Course Contents	Lecture hours	Learning Outcome
	Section A (Coal)		
1	**Mining of thick and steep seams**: Problems of mining thick seams; Longwall based multi-slice methods:- Inclined slicing, horizontal slicing and cross-slicing in ascending and descending sequence Under winning methods:- sub-level caving, integral caving Longwall Top Coal Caving	5	Students will get an overview of different methods of thick coal seams and its problems.
2	**Infrastructure for Underground Mass Production Technologies**: Features of high capacity underground coal mining equipment High Capacity Hoisting / Conveying of coal; Mass inertization plant; Pre-drainage of methane; Conveyance of man; Heavy material handling – Multi-utility vehicle, Air Chilling Plant Case studies of high capacity underground coal mines	8	This unit will help he students to learn about the infrastructure requirement for achieving high production and productivity in underground coal mining. Students will be given examples of high production underground coal mines through case studies
4	**Hydraulic Mining of Coal**: Conditions suitable for hydraulic Mining of Coal, Hydraulic Mining Operation; Layout of workings for hydraulic mining of moderately thick seams.	2	This unit deals some special method of mining and the students will have an overview of the methods and its application.
5	**Mining of thin seams**: Problems in Mining thin seams; Equipment and methods for thin seam extraction.	3	the students will understand the problems of thin seam mining and the mining methods
6	**Underground Coal Gasification**: Conditions suitable for Underground Coal Gasification; Basic principle and technology of underground coal gasification, Advantage and disadvantage of UCG: Scope of application of UCG in Indian conditions.	2	the students will learn the non-conventional method of caol mining using the process of underground coal gassification and its relative merits and demerits.
7	**Other variants of underground coal mining layout:** Highwall Mining: Introduction, Applicability and Method Punch Longwall: Applicability condition, Layout, Advantages and Problems	3	the students will other variants of underground coal mining method
	Section-B (Metal)		

Sl. No.	Course Contents	Lecture hours	Learning Outcome
8	**Planning, design and execution of different underground stopes for production**: General excavation design in mines, Design method of different stopes, input parameter for stope design, geological, rock mass, geo technical consideration, economic consideration, environmental considerations, safety considerations, logistic parameters, Sequence of stope development and peroration, stope layout, optimization of stope operation, development of complex method for achieving higher return, design of stope ventilation, supply, power, communication, drainage, selection of machinery and tools and maintenance, consideration of multiple stopes design for better productivity, filling of stopes, design of draw point ore transfer arrangement, ore handling arrangement, recovery, dilution problem, mining of multiple veins together, drilling, blasting, supporting, stope design for deep mines, rock burst prone area for following stopes Open Room & Pillar, Shrinkage, Cut - fill, Sublevel Caving, Sublevel stoping, Block Caving, Top Slicing, Resuing, Rill Stope, Vertical Crater Retreat Method, Squire Set Method,	14	Students shall learn different techniques for mine planning, designing, execution and commissioning. Practical problem and possible solution infield. Example from real field problem along with causes. Stope planning and design with available information. Flexibility in stope design to opt best possible option. Design acceptability to adopt future change in technology. Different method of working. Possible changes in stoping system in future. Effect of technology in other field in stoping.
9	**Mine Closure:** Legal requirement for mine closing, provision for mine closing in different reports, commitments, provision of fund for mine closing, Sealing and Abandonment, consideration of different feasible method of mines closing and selection of the best, monitoring after closure of mine, provision for corrective action after closer of mines, arrangement for alternative source of income for the work force deployed in mines, best possible use of resources / infrastructure of mines, land use after closer of mines.	5	Student will learn different problem in mine closure along with different technical, political technical problem. Mine closure example and problem faced in the process. Learning of best possible way of clouser.

Text Books

1. Introduction to Mining Engineering by Ratan Raj Tatia.
2. Introductory Mining Engineering by Howard L Hartman
3. Principles and Practices of coal mining by R.D.Singh
4. Underground Winning of Coal by T N Singh

Reference Book

1. Underground Mining Methods by W.Hustrulid and Richard L. Bullock, SME 2001
2. SME Mining Engineering Hand Book by Howard L Hartman.
3. Longwall Mining by Peng and Chiang
4. Coal Mine Ground Control by Syed Peng