Course Type	Course Code	Name of Course	L	T	P	Credit
DC	MME 306	OPENCAST MINING EQUIPMENT	3	0	0	09

Course Objective

The objective of the course is to introduce students to the constructional details, operation, design and maintenance related aspects of various Heavy Earth Moving Machineries (HEMMs) used in opencast mining operation

Learning Outcomes

Upon successful completion of this course, students will:

- Have a conceptual understanding of the different types of Intermittent Excavators (Shovel and Draglines) and continuous operation type excavators (Bucket Wheel Excavators and Surface Miner) used in Opencast Mining. In addition to that they will be able to understand the underlying principles behind the design of the excavator boom, bucket and teeth
- Get introduced to different types of transport equipment's like Dumpers (Intermittent type) and Belt conveyors (Continuous discharge type)
- Get an understanding of the equipment used as partly Excavator and partly transport purposes like Scrapper and pay loaders
- Get introduced to different road making and maintenance equipment like Dozers and Graders
- Understand the working principle and constructional features of different drilling equipment
- Selection and applicability of opencast mining equipment

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Introduction to surface mining equipment:** Classification of equipment, Different combinations of excavators and transport equipment and their specifications etc.	2	Get introduced to the different types of surface mining equipment
2	**Shovel:** Types, Applicability of different types of shovel, Principles of cutting and digging of shovel by dipper, Construction of hoist, drag, swing and propel mechanism, Fluid coupling and torque converter, Study of hydraulic systems used in shovel, Comparison of various types of shovel, Maintenance of shovel, Shovel-dumper calculation, safety features of shovel, Calculation of operating cost.	4	Get introduced to the constructional features, operation, hydraulic circuits of shovels.
3	**Dragline:**Types of dragline, Components of dragline, Constructional aspects of bucket, boom, hoist, swing, propel mechanism, Operational practices, Maintenance of dragline.	2	A clear concept regarding constructional features, working principle and maintenance related aspects of a Dragline
4	**Bucket Wheel Excavator:** Various types of bucket-wheel excavators, Construction of different mechanisms of luffing, swinging and travel operations, Operation and Maintenance of bucket wheel excavator,	3	To understand constructional features, working principle and maintenance related aspects of a Bucket Wheel Excavator.
5	**Surface Miner:** Introduction, Applicability of surface miners, Construction and operation of different mechanisms of surface miners.	2	To understand constructional features, operating principle and different mechanisms of a Surface Miner
6	**Drill machine:**Types of drill machines and their applicability, Principles of rock breakage by drilling, Construction and operation of Jack Hammer, Down the hole and rotary blast hole drills, Construction of drill bits, Maintenance of drilling machines.	4	To understand the different types of drill bits and drilling machines. To understand the principle behind rock breaking through rock-drill bit interaction.

7	**Scraper:** Types of scraper, Applicability of scraper, Construction and application of different mechanisms of scraper, Power transmission system, Maintenance of scraper.	2	To develop the concept regarding constructional features, working principle and maintenance related aspects of a Scraper
8	**Prime movers used in surface mining equipment:** Various types of engines used in surface mining equipment, cooling system, lubrication system, fuel system, starting system, Trouble shooting and maintenance of engine used in surface mining equipment.	2	Get introduced to the different types of prime movers used in opencast mining and their maintenance aspects.
9	**Front End loader:** Constructional aspects of loader, various mechanisms, such as bucket hoist control, power transmission systems, steering mechanism, selection and maintenance of loader, Loader-dumper calculation.	3	Understand the classification, construction and mechanisms of a FEL as well as its maintenance
10	**Dozer and Ripper:** Various types of dozers, component details such as blade, blade arms, blade control circuit, power transmission system, steering mechanism, undercarriage unit, various activities of dozer, capacity, dimension, maintenance and selection of dozer,Productivity of Dozer, Ripper: Types; Construction of Ripper Tools; Productivity estimation by Ripper tool; Maintenance of Ripper tool, Productivity of Ripper	5	Get an overview of the constructional details, power transmission system, Maintenance and selection of a Dozer and a Ripper
11	**Grader:** Various types of grader, constructional details of blade, blade operational mechanism, power transmission system, activities of grader, maintenance of grader.	3	Understand the classification, construction, mechanisms and power transmission system of a Grader
12	**Dumper:** Different types, constructional details of dumper – chassis, dump body, component details of transmission, system, suspension system, Hydraulic circuit details of hoisting and power steering, Air system details, different types of dumper brake and their uses, constructional details of tyres and tyre maintenance, dumper maintenance. Shovel-dumper calculation, Truck navigation system.	4	Understand the classification, constructional details, hydraulic circuit and maintenance of a Dumper, Selection of Dumper
13	**High angle belt conveyor:** Applicability; Construction and operation of high angle belt conveyor; advantages and disadvantages.	2	Constructional details and operating principle of high angle belt conveyors
14	**Force analysis and Design of Front attachments of an Excavator:** Kinematics, Force analysis and Design of the front attachments like Bucket, Arm and Boom.	4	Force analysis and Design aspects of front attachments due to rock-machine interaction.

Text Books:

1. Amitosh De : “Latest Development of Heavy Earth Moving machinery”, Galgotias

Reference Books:

1. J. Singh, “On and with the Earth”
2. Nicholas, “Moving the Earth”