



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Mining Engineering

Course / Subject Code: DI03022041

Course / Subject Name: Mining Machineries

w. e. f. Academic Year:	2024-25
Semester:	3 rd
Category of the Course:	PCC

Prerequisite:	Nil
Rationale:	<p>Mining is a complex and challenging process requiring specialized equipment to extract a huge amount of valuable and non-valuable minerals from below the earth surface. The grade values of mineral are segregated in nature, the geological conditions are also varying from place to place. So, for achieving a targeted high-grade production a keen knowledge of specialized heavy duty standard excavating and transporting equipment is required to be implemented in mines to achieve maximum profit.</p> <p>For designing a perfect layout of an underground or surface mine a proper selection of excavating equipment matching with the transport equipment is very much essential. The transport machineries should be selected depending upon the loading capacity of excavators and targeted production.</p> <p>This course is designed to explain the major function and application of various excavating and transporting equipment used in surface as well as underground mines such as drills, excavators, dumpers, haulages, conveyors, pumps, etc. Their selection procedure and automation to enhance safety and efficiency. After completing this course, the student will able to select suitable equipment in varying condition in mines.</p>



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Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level
01	Select suitable underground transport system to match the targeted output.	R, U, A
02	Justify the suitability of various mine machinery as per geo-mining conditions.	R, U
03	Design a work layout for various underground machineries.	R, U, A
04	Understand and selection of Wire Rope.	R, U, A
05	Identify the suitability of mine pump as per the needs of dewatering.	R, U, A

*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA(M)	PA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Underground Transport Machineries: 1.1 Rope Haulages: Applicability Conditions, Constructional and Operational Features with all operational safety measures taken while using it: <ul style="list-style-type: none">• Direct Rope Haulage• Main & Tail Rope Haulage• Endless Rope Haulage• Gravity Rope Haulage 1.1.1 Safety devices on Haulage tracks and roadways.	14	30



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	<p>1.2 Locomotive Haulage: Constructional and Operational Features:</p> <ul style="list-style-type: none">• Diesel Locomotive• Electric Battery Locomotive• Trolley Wire Locomotive• Compressed Air Locomotive <p>1.3 Conveyors: Constructional and Operational features of:</p> <ul style="list-style-type: none">• Belt Conveyor• Chain Conveyor• Shaker Conveyor		
2.	<p>Mine Machineries: Working Principle, Construction, Operation while using these machines:</p> <p>2.1 Rock Drill, Excavator, Dozer, Dumper, Dragline, Surface Miner</p> <p>2.2 Coal Drill, Continuous Miner, Shearer, Armored Face Conveyor, Jack Hammer, Stoper, Drill Boom Jumbo, Low Profile Dump Truck</p> <p>2.3 Rocker Shovel, Gathering Arm Loader, Scraper, Load Haul Dump Machine, Shuttle Car</p>	08	18
3.	<p>Hoisting Machineries:</p> <p>3.1 Headgear: Purpose, Main Equipment, Height & Design of Headgear, Headgear Pulley, Angle of Fleet</p> <p>3.2 Cage, Skip with construction and difference, Cage Accessories,</p> <p>3.3 Detaching Hook, Distributing Plate, Cage Chain, Safety Catches, Keps</p> <p>3.4 Winding Engines: Constructional features of Winding Drum, Types of Winding, Winding Engine Brakes</p> <p>3.5 Shaft Guides: Rigid & Rope type</p> <p>3.6 Multi-rope Winding, Advantages & Disadvantages</p> <p>3.7 Pit Top and Pit Bottom Circuits.</p>	12	28
4.	<p>Wire Rope:</p> <p>4.1 Wire Rope: Selection, Material of Construction, Types with advantages & disadvantages, Factor of Safety</p>	06	12



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	4.2 Use and Care of Wire Ropes 4.3 Rope Capping with types 4.4 Rope Splicing		
5.	Mine Pumps: 5.1 Sources of Water in Mines, Purpose of Dewatering 5.2 Construction, Operation & Application with all safety measures taken while using it with Advantages and Disadvantages of Mine Pumps: <ul style="list-style-type: none">• Ram Pump• Centrifugal Pump• Turbine Pump• Borehole Pump	05	12
Total		45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
35	45	20	0	0	0

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Elements of Mining Technology Vol.ume-1 & 3	D. J. Deshmukh	Centre Techno Publication, Nagpur.
2	Mine Pumps and Haulages	S. Ghatak	Lovely Prakashan, Dhanbad
3	UMS Mining Series		UMS Mining Series
4	Mine Drainage	Behr & Hans C.	Sacramento



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(b) Open-source software and website:

1. <http://www.phmining.com/>
2. <http://dhi.nic.in/MINING-CONSTN-EQUIPMENT.pdf>
3. http://bemlindia.com/product_mc.php
4. [http://en.wikipedia.org/wiki/Heavy_equipment_\(construction\)](http://en.wikipedia.org/wiki/Heavy_equipment_(construction))
5. <http://catalogs.indiamart.com/manufacturers/earth-moving-heavy-equipment.html>

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Determine number of tubs required to haul a given quantity of material by Direct Rope Haulage System.	I	06
2	Determine the productivity of Dumper by field data and time and motion study to get actual number machine required in mine.	II	06
3	Design a suitable Pit Top circuit layout used for Cage winding system depending upon various space limitations.	III	06
4	Measurement of mass and breaking strength of given Wire Rope samples.	IV	06
5	Determine the pumping cost for displacement of water up to a certain height. IV 6	V	06
			30 Hrs.

Suggested Project List:

1. Prepare a chart of various mining machineries with its figure and technical specifications.
2. Visit nearby mines and prepare list of machineries with specification and working layout.
3. Draw a labeled sketch of any mining machineries on sheet.



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Suggested Activities for Students:

1. Prepare a list of latest mining machineries used in opencast as well as underground mines with its specification.
2. Presentation on any mining machinery with its application in mining.
3. Visit any nearby mines and submit a report on it.
