

## GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

### Course Curriculum

#### MINING MACHINERIES-I (Code: 3332204)

Diploma Programme in which this course is offered	Semester in which offered
Mining Engineering	3rd Semester

### 1. RATIONALE

The diploma holders in mining engineering will be responsible to supervise the working of the mine machineries in mine. They should be able to select the proper machine and tools for mining operations. This subject provides them basic knowledge and skills about different types of machineries like rock drill machines, excavators, pumps, rope haulage, conveyors, locomotive, etc, which will make them able to supervise mine machinery. Thus knowledge and skills developed by this course would be helpful to mine engineers in their day to day working in mines.

### 2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Select, operate and maintain surface and underground mining machines.**

### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
4	-	2	6	70	30	20	30	

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

#### 4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in cognitive domain according to NBA)	Topics and Sub-topics
<b>Unit – I: Mining machineries</b>	1.a List mine machinery for surface and underground working. 1.b Describe construction & working of different types of Rock Drilling machines and Compressors. 1.c Describe construction & working of different types of excavators.	1.1 Mine machinery: Underground mines- drills, rope haulages, Air compressors, Scraper chain conveyors, pumps, etc. Surface mines- Drill machines, Air compressors- (Reciprocating, Slide Van, Screw type), excavators, dozers, dumpers, draglines, etc. 1.2. Construction & operations of Rock Drills, Air compressors, and excavators.
<b>Unit – II: Transport - machineries</b>	2.a Describe construction & working of different types of Rope-haulages 2.b Describe construction & working of different types of Mine locomotives. 2.c Describe construction & working of different types of Conveyors. 2.d Calculate amount of minerals transported based on load and speed of conveyors.	2.1 Rope Haulages: types, construction, & operations 2.2 Locomotive Haulage: Construction & application for Diesel, Electric, Battery, & trolley wire types, Flame traps & exhaust conditioner box. 2.3 Conveyor –its types (i) Belt Conveyors:- drives, loops take-up arrangement, troughed belt, carrying capacity. (ii) Chain – types- (Scraper & Flexible), operation, construction, application, merits & demerits (iii) Shaker conveyor- principle, construction, Merits & Demerits. 2.4 Numerical problems.
<b>Unit – III: Mine track &amp; safety devices</b>	3a. Describe construction & safety of Mine tracks. 3b. Describe safety in surface mining equipment.	3.1 Mine tracks: Rail & its joints, Sleepers, Ballast, Curves, Crossings & turnouts. 3.2 Safety devices on haulage roads. 3.3 Safety in surface mining equipment- excavators, dozers, dumpers, draglines,
<b>Unit – IV: Mine dewatering machineries</b>	4a. Explain sources of water in mines. 4b: Describe construction & working of different types of Mine Pumps. 4c. Calculate flow rate, time, power for pumps.	4.1 Sources of water in mines. 4.2 Mine pumps: Classification, <ul style="list-style-type: none"> <li>• Siphon: Applicability conditions, Principle &amp; uses.</li> <li>• Ram pump: construction -features - working &amp; its use.</li> <li>• Centrifugal turbine pump: constructional Features, working &amp; use. Balancing axial Thrust, characteristic curves for turbine pumps.</li> </ul>

Unit	Major Learning Outcomes (Course Outcomes in cognitive domain according to NBA)	Topics and Sub-topics
		<ul style="list-style-type: none"> <li>• Roto pump - construction features, working and use.</li> <li>• Submersible/bore hole pump constructional feature, working, installation and use.</li> </ul> 4.3 Trouble in pumps & remedial measures. 4.4 Balancing Axial-end Thrust 4.5 Pump calculations, numerical problems.

### 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Mining machineries	05	2	4	4	10
2	Transport - machineries	17	4	8	8	20
3	Mine track & safety devices	14	3	6	6	15
4	Mine dewatering machineries	20	6	9	10	25
<b>Total</b>		<b>56</b>	<b>15</b>	<b>27</b>	<b>28</b>	<b>70</b>

**Legends:** R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### 6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

**Note:** Here only course outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

<b>S. No.</b>	<b>Unit No.</b>	<b>Practical/Exercise</b> (Course Outcomes in Psychomotor Domain according to NBA Terminology)	<b>Approx. Hrs. Required</b>
1	II	Demonstrate working of different types of rope haulages	4
2	II	Demonstrate working of diesel locomotive flame traps & exhaust conditioner box	2
3	II	Demonstrate working of different types of belt & chain conveyors	4
4	III	Demonstrate working of loops take-up arrangement	2
5	III	Draw sketches of various haulage track safety devices	4
6	III	Demonstrate working of various types of rope couplings	4
7	IV	Demonstrate working of Ram pump	2
8	IV	Demonstrate working of Centrifugal Turbine pump	2
9	IV	Demonstrate working of Roto pump	2
10	IV	Demonstrate working of Bore hole pump	2
<b>Total</b>			<b>28</b>

#### 7. SUGGESTED LIST OF STUDENT ACTIVITIES:

- i. Mini Project on study of different mining machines with the help of internet, library and other resources such as brochures of suppliers of these machines.
- ii. Visit to underground and surface mines for observing mining equipment and operations and writing reports.

#### 8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any):

- i. Demonstration with the help of models of different machineries.
- ii. Videos/animation films to explain the working and maintenance of machineries.

#### 9. SUGGESTED LEARNING RESOURCES:

##### (A) List of Books:

<b>S. No.</b>	<b>Title of Books</b>	<b>Author</b>	<b>Publication</b>
1	Elements of Mining Technology	D.J. Deshmukh	Centre Techno Publication, Nagpur.
2	Mine Pumps and Haulages	S.Ghatak	Lovely Prakashan Dhanbad
3.	UMS Mining Series		
4.	Mine Drainage	Behr & Hans C.	Sacramento

**B. List of Major Equipment/Materials:**

- i. Mine haulage Models
- ii. Rope coupling models
- iii. Dumper models
- iv. Shovel models.
- v. Dozer models.
- vi. Rock drill machines.
- vii. Jack Hammers.
- viii. Air compressor for Jack Hammer.

**C List of Software/Learning Website**

- i. <http://www.phmining.com/>
- ii. <http://dhi.nic.in/MINING-CONSTN-EQUIPMENT.pdf>
- iii. [http://bemlindia.com/product\\_mc.php](http://bemlindia.com/product_mc.php)
- iv. [http://en.wikipedia.org/wiki/Heavy\\_equipment\\_\(construction\)](http://en.wikipedia.org/wiki/Heavy_equipment_(construction))
- v. <http://catalogs.indiamart.com/manufacturers/earth-moving-heavy-equipment.html>

**10. COURSE CURRICULUM DEVELOPMENT COMMITTEE****Faculty Members from Polytechnics**

- **Prof. S.G. Srivastav**, I/c HOD, Department of Mining Engineering, G.P. Bhuj
- **Prof. P.Y. Trivedi**, Lecturer, Department of Mining Engineering, G.P. Bhuj
- **Prof. M .V. Ramanuj**, Lecturer, Department of Mining Engineering, G.P. Bhuj
- **Prof. R.G. Prajapati**, Lecturer, Department of Mining Engineering, G.P. Bhuj

**Coordinator and Faculty Members from NITTTR, Bhopal**

- **Dr. C. K. Chug** Professor. Dept. of Mechanical Engineering
- **Prof. P. Verma**, Professor and Co-ordinator for State of Chattishgarh,