GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3162209
Semester – VI
Subject Name: Bulk Material Handling

Type of course: Undergraduate

Prerequisite: Zeal to learn the subject

Rationale: The course is designed to help the student in understanding the basic principles in material handling, characteristics and classification of materials, various bulk handling systems deployed in mineral industry, classification of materials handling equipment and material transportation and hoisting equipment.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to Materials Handling:** Definition and Scope of Materials Handling; Importance of Materials Handling; Systems Concept; Characteristics and Classification of Materials; Principles of materials handling. **Unit Load Concept:** Definition of Unit Load; Advantages and Disadvantages; Load Unitization Process and Handling Methods	
2	**Unit Material Handling System:** Design of bins and hopper, ore passes, Primary crushing and screening: jaw, cone, roll and gyratory crushers; Rotary breakers; In-pit crushers; single deck or double deck; scalping, vibratory and rotary screens; coal handling plants; rail wagon loading plants; chute design. **Classification Of Materials Handling Equipment:** Basic Equipment Types; Classification of Handling Equipment; Wagon tipplers; bucket elevators.	
3	**Material Transportation:** Conveyors (Belt Conveyors; Chain Conveyors Haulage Conveyors; Cable Conveyors Bucket Conveyors; Roller Conveyors; Screw Conveyors; Hydraulic and pneumatic conveying, conveyors (belt, chain, cable belt, high angle, shiftable and pipe conveyor); water transport; materials handling at jetty and barge.	
4	**Hoisting Equipment:** Parts of Hoisting Equipment; Hoists; Winches; Elevators; Different types of Cranes (Derricks, tower, radial) fork lifters, overhead gantry mat	
5	**Bulk Handling Equipment and Systems:** Storage of bulk solids; Stacking, blending and reclaiming of bulk materials; Types of stackers and reclaimers; Design of storage system: material stockpiling and stockpiles, Silos, bins and bunkers; Segregation (size wise and grade wise); Railway sidings; Rapid loading system, Merry-go-round system; Automation and online monitoring of bulk material handling system. Weighing and Control	

	Equipment; various types of weigh bridges; spillage and dust control.	

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	**15**	**15**	**10**	**10**	**8**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's 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.

Reference Books:

1. Siddhartha Ray; Introduction of Materials Handling; New Age International.
2. Rudenko;Material Handling Equipment; MIR Publishers.
3. Raymond A. Kulwiec; Materials Handling Handbook; John Wiley and Sons.
4. Sharma, S. C.; Materials Management and Materials Handling; Khanna Publishers.
5. K. C. Arora and Vikas V. Shinde; Aspects of Materials Handling; Laxmi publishers.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Familiarise with the basic principles in material handling, characteristics and classification of materials.	20
CO-2	Familiarise with the various bulk handling systems deployed in mineral industry to convey the minerals or materials from mines, plants and workshops.	30
CO-3	Select appropriate material transportation system and hoisting equipment	25
CO-4	Select appropriate bulk handling equipment and systems.	25

List of Experiments:

Following experiments are suggested for Laboratory work

1. To determine the angle of static friction between bulk material and metallic plate.
2. To study and find out the angle of repose of given samples.

3. To study the particle size distribution of given sample by sieve analysis.
4. To study the reduction ratio and power consumption of ball mill of given sample.
5. To study the reduction ratio of jaw crushers for different samples.
6. To study the flow pattern of different materials in hopper bin.
7. To study bucket elevator system
8. To study the different type of cranes and fork lifters.

Important Note:

80 % From above suggested laboratory work should be covered and remaining 20 % is as per facility available at Department

Major Equipment:

1. Working Models of bucket elevator system and fork lifter.
2. Laboratory model of jaw crusher
3. Mechanical Sieve shaker
4. Laboratory model of ball mill
5. Laboratory model of hopper bin