

# GUJARAT TECHNOLOGICAL UNIVERSITY

## CHEMICAL ENGINEERING (30) STORAGE & HANDLING OF MATERIALS SUBJECT CODE: 2723016 SEMESTER: II

**Type of course:** Chemical Engineering (Major Elective-III)

**Prerequisite:** Mechanical Operations

**Rationale:**

Content focuses on sound engineering principles and practices as they apply to industrial situations, project design, risk mitigation, process and equipment integrity, and engineering codes and standards.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
ESE	OEP	PA			RP					
3	2#	0	4	70	30	30	0	10	10	150

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
1	Objectives of material storage and handling. Characteristics of particulate solids: angle of repose, stress development, etc. Considerations in the storage of bulk solids. Flow behavior of bulk solids in bins and through apertures.	7	13
2	Mechanical design of bins. Design principles of open and closed stock pile.	6	11
3	Feeding of materials: Belt feeder, Apron feeder, Rotary table feeder, Screw feeder, Vibratory feeder, Reciprocating feeder, etc. and their design and specific applications in chemical and allied industries.	7	13
4	Conveying of materials: Mechanism of bulk material conveying. hazards associated with hoisting and conveying	7	13
5	Classification and selection of conveying equipment, their characteristics and applications. Design features of Belt conveyor, Elevating conveyor, Screw conveyor, etc.	7	13
6	Pipe-line transport of materials: Importance and applications of pneumatic and hydraulic conveying, their advantages, disadvantages and limitations. Sizing of pipe-line transport systems.	7	13
7	identify hazards associated with handling acetylene, oxygen, or hydrogen, specify how to detect leaks, recognize materials that may be flammable and/or combustible	6	11
8	Mechanical and process Design of storage tanks	7	13

**Reference Books:**

1. Charles Reese, Materials handling systems: Designing for Safety and Health, CRC Press.
2. Center for Chemical Process Safety (CCPS), Guidelines for safe storage and handling of reactive materials., Wiley-AIChE.
3. Don W. Green, Robert H. Perry, Perry's Chemical Engineers' Handbook, Eighth Edition, McGraw Hill

**Course Outcome:**

After learning the course the students should be able to:

1. Explain precautions and controls to eliminate injuries due to manual material handling and storage.
2. Describe the safe work practices utilizing ropes, chains and slings
3. Describe the safe work practices utilizing various types of hoisting and conveying equipment.
4. Identify toxic hazards of handling materials and establish the necessary precautions
5. Identify industry regulations necessary for formal training for material handling operations.
6. Describe material handling equipment preventative maintenance procedures and requirements.
7. Describe the Department of Transportation fleet vehicle safety requirements, including driver training and preventative maintenance scheduling

**Major Equipments:** Not applicable

**List of Open Source Software/learning website:**

1. Literature available for process and mechanical design of equipment in plant / industry
2. NPTEL
3. MIT open course lecture on equipment design.

**Review Presentation (RP):** The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website