GANPATUNIVERSITY

FACULTYOFENGINEERING&TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Chemical Engineering
Semester	IV	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the batch Admitted in	July 2025
Subject code	2CH4101	Subject Name	Mechanical Unit Operations

Teaching scheme						Examination scheme(Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

Course Outcomes

CO1: Analyze and design mechanical operations for particulate handling.
CO2: Perform calculations for filtration and filter design.
CO3: Apply principles of fluidization and sedimentation in industry.
CO4: Evaluate and select appropriate mixing systems for liquid operations.

Theory syllabus

Unit	Content	Hrs
1	Introduction: Unit operations and their role in chemical industries; Types of mechanical operations;	9
2	Properties and handling of particulate solids: Characterization of solid particles, Properties of masses of particles, Mixing of solids, Size reduction, Ultrafine grinders.	8
3	Screening: Screening equipment, Screen capacity effectiveness of screens, sieve analysis, average diameter and specific surface. Size reduction, types of equipments used in the various stages of reductions. Laws of crushing & grinding power requirements.	7
4	Filtration theory, equipments for filtration and classification, constant rate and constant pressure filtration, filter calculation optimum filtration and filter aid, equipments used for filtration, cyclone and hydrocyclone, flotation cells and calculation for flotation cell.	9
5	Fluidization: Introduction to Fluidization, Types of Fluidization, Fluidization Regimes and Flow Characteristics, Applications of Fluidization in Industry	5
6	Sedimentation: Gravity sedimentation processes, Centrifugal sedimentation processes. Agitation and mixing of liquids: Agitated vessels, Blending and mixing, Suspension of solid particles, Dispersion operations, Agitator selection and scale up, Power Number, Mixing Index.	7

Practical content

The Practical/term work shall be based on the topics mentioned above and will be defended by the candidates.
NAME OF PARCTICALS

1. Jaw Crusher
2. Crushing Rolls (Roll Crusher)
3. Ball Mill
4. Sieve Analyser (Sieve Shaker)
5. Plate and filter frame press
6. Centrifuge (Basket Centrifuge)
7. Cyclone Separator
8. Hammer mill
9. Froth Floatation cell
10. Rotary Vacuum Filter(Rotary drum filter)

Text Books	
1	McCabe W. L., Jullian Smith C. and Peter Harriott - Unit operations of Chemical Engineering, 7th Edition, McGraw-Hill international edition, 2005.
2	Coulson J.M., Richardson J.F, Chemical Engineering, Vol.II, 4thEdition, Elsevier India, 2006.
Reference Books	
1	Transport Processes and Separation Process Principles by Christe John Geankoplis, PHI Learning, Fourth Edition 2003.
2	Narayanan, C.M.;Bhattacharyya, B.C. *Mechanical* Operations for Chemical Engineers; 3rd ed; Khanna Publishers: New Delhi,2014
ICT/MOOCs references	
1	https://nptel.ac.in/courses/103107123/
2	https://nptel.ac.in/courses/103103155/
3	https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ch05/

Mapping of CO with PO and PSO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	2	2	2	1	2	2	2	2	3	3	2
CO2	3	3	3	3	3	2	2	1	1	1	1	2	3	2	2
CO3	3	3	3	3	3	2	3	1	1	1	2	2	3	3	3
CO4	3	3	3	3	3	2	2	1	2	2	2	2	3	3	3