

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. (Chemical Engineering)
Course Code:	2CH202CC23
Course Title:	Solid Fluid Operations
Course Type:	Core
Year of introduction:	2023-2024

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. explain properties and ways to handle particulate solids (BL2)
2. apply size reduction concepts to related equipment and assess their performance (BL3)
3. study various mechanical separation techniques and evaluate associated design variables (BL3)
4. demonstrate the application of fluidisation (BL2)

Contents		Teaching Hours (Total 30)
Unit I	Properties and Handling Particulate Solids Characterisation of solid particles, properties of masses of particles, storage and handling of solids, mixing of solids, equipment used for mixing of solids.	05
Unit II	Size Reduction Crushing laws, classification of the size reduction equipment, principles, construction, working and application of the size reduction equipment like crushers, grinders, ultra-fine grinders and cutters.	06
Unit III	Mechanical Separations Screening and classification, capacity and effectiveness of screen, study of the filtration techniques, types of filters, filter aids, filter media, sedimentation and thickening, centrifugal sedimentation process	11
Unit IV	Fluidisation Motion of particles through fluids, drag coefficient, types of fluidisations, application of fluidisation	04
Unit V	Classification and Characterization of Slurries Classification of slurry, Characterization of slurry by flow behaviour, Slurry technologies	04

Self-Study:

Self-study contents will be declared at the commencement of the semester. Around 10 % of the questions will be asked from the self-study contents.

Laboratory Works:

Laboratory work will be based on above syllabus with minimum 10 experiments to be

incorporated.

Suggested Readings/ References:

1. McCabe, W. L., Smith, J. C., and Harriott, P., Unit operations in Chemical Engineering, McGraw Hill Publication.
2. Richardson, J. F., Harker, J. H., and Backhurst, J. R., Coulson and Richardson's Chem Engineering Vol-2, Particle Technology and Separation Processes, Butterworth-Heinem Publication.
3. Gavhane, K. A., Fluid Flow and Mechanical Operations, Nirali Prakashan.
4. Rhodes, M. J., Introduction to Particle Technology, John Wiley, Chichester, New York.

Suggested List of Practical

Sr. No.	Practical	No. of Hours
1	To determine the following by differential & cumulative analysis for a given sample: 1. Specific surface area 2. Mass mean diameter 3. Volume surface mean diameter 4. Number of particles 5. Arithmetic Mean diameter 6. Volume Mean diameter	02
2	To determine reduction ratio and constant values using Jaw Crusher for laws a) Rittinger's law b) Kick's law c) Bond's law	02
3	To determine, a) Nip Angle b) Reduction Ratio c) K_r , K_b , K_k constant – Roll Crusher	02
4	To determine the Critical speed b) Actual speed c) Optimum speed d) Reduction ratio e) Constants for i) Rittinger's Law ii) Kick's Law iii) Bond's Law – Ball Mill	02
5	To determine the constant values using Hammer Mill for a) Rittinger's law b) Kick's law c) Bond's law	02
6	To determine the constant values using Pulveriser for a) Rittinger's law b) Kick's law c) Bond's law	02
7	To determine effectiveness of a screen	02
8	To determine characteristic curve of settling of dilute aqueous slurry and to find the area of thickener	02
9	To determine the Mixing Index for the given sample using Sigma Mixer	02
10	To study plate and frame filter press	02
11	To demonstrate and study about centrifuge	02
12	To demonstrate and study the cone mixer	02