### NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech. (Chemical Engineering)
Course Code:	2CH202
Course Title:	Solid Fluid Operations
Course Type:	Core
Year of introduction:	2023-2024

L	Т	Practical component			С	
		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	(BL
		2)
2.		(BL
	pply size reduction concepts to related equipment and assess their	3)
	performance	
3.	study various mechanical separation techniques and evaluate	(BL
	associated design variables	3)
4.	demonstrate the application of fluidisation	(BL

## Syllabus:

# **Total Teaching hours: 30**

2)

Unit	Syllabus	Teaching hours
Unit I	<b>Properties and Handling Particulate Solids</b>	
	Characterisation of solid particles, properties of masses of particles, storage and handling of solids, mixing of solids, equipment used for mixing of solids.	
Unit II	Size Reduction	08
	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.	
Unit III	Mechanical Separations	13
	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	
Unit IV	Fluidisation	04
	Motion of particles through fluids, drag coefficient, types	

#### of fluidisations, application of fluidisation

#### 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 Richards Chemical Engineering Vol-2, Particle Technology and Separation Proces Butterworth-Heinemann 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 (not restricted to the following) only for information

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) Kr, Kb, $K_k$ 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 lawb) 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 study about plate and frame filter press	02
10	To demonstrate and study about centrifuge	02