Teaching Scheme					Mechanical Operations (22PCM208T)					
					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- Understand the fundamentals associated with properties, handling and mixing particulate solids.
- Learn the principles and techniques of size reduction and screening.
- Analyze the principle and applications of filtration.
- Classify the principles and functioning of various solid-fluid operations.

UNIT I: Properties, handling and mixing of particulate solids **7 Hr.**

Characterization of solid particles, properties of particulate masses, storage of solids; Mixing of solids-Types of mixers, mixers for cohesive and free flowing solids; Conveying of solids.

UNIT II: Size reduction & screening **7 Hr.**

Principles of comminution; Size reduction equipment and their selection criteria: Crushers, grinders, ultrafine grinders, cutting machines; Screening: General factors in selecting screening equipment, industrial screening equipment, comparison of ideal and actual screens, screen efficiency.

UNIT III: Filtration **7 Hr.**

Filtration: Principles of filtration, selection criteria of filtration equipment and its operation; Sand filters; Centrifugal filtration: Selection criteria for centrifugal filters; Membrane filtration: Processes and types of membranes, operation conditions, penetration flux, microfiltration, ultra-filtration and reverse osmosis; Advanced filtration techniques.

UNIT IV: Heterogeneous separation process **7 Hr.**

Sedimentation, coagulation and clarification; Principles and working of clarifiers, thickeners sedimentation process; Gravity classifiers, sorting classifiers and thickeners; Principles of cyclones, hydroclones, scrubbers, magnetic and electrostatic separation equipment; Flocculation and froth-flotation techniques.

Max. 28 Hr.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Understand and summarize the characterization of particulate solids and equipment for solid operations.
CO2: Classify suitable equipment for size reduction and comminution.
CO3: Apply the knowledge of different screening techniques, equipment and its effectiveness.
CO4: Analyze and design various filtration and membrane processes.
CO5: Select separation equipment for different fluid-solid operations.
CO6: Identify physicochemical and magnetic methods for the separation of heterogeneous mixtures.

TEXT/REFERENCE BOOKS

1. McCabe, W.L., Smith and Peter Hariott, "Unit Operations of Chemical Engineering", 7th Edition, McGrawHill, New Delhi, (2012).

2. Chhabra, R.P. and Basavarai G., “Coulson and Richardson’s Chemical Engineering: Volume 2A, Particulate systems and Particulate Technology”, 6th Edition. Pergamon Press, (2019).
3. Brown, G.G. “Unit Operations”, 3rd Edition, John Wiley & Sons, Inc., New York, (1968).
4. Kulkarni, A.P., Hiremath, R.S., “Mechanical Operations”, 21st Edition. Everest Publishing House, (2020).

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hr.**
Part A: 10 Questions each carrying 5 marks	50 Marks
Part B: 5 Questions each carrying 10 marks	50 Marks