

## CH 252: Mechanical Operations

**CREDITS = 6 (L = 4, T=0, P = 2)**

1. **Size Separation:** Particle size analysis: Differential and cumulative methods. Screening; industrial screening; equipment. Elutriation. Settling. Classification. Flotation. Electrostatic and magnetic separation; centrifugal separation. 6 Hours
2. **Solids:** Size reduction, Types of crushers, grinders and disintegrators for coarse, intermediate and fine grinding. Power requirements, close and open circuit grinding. Laws of crushing. Introduction to size enlargement and agglomeration. 4 Hours
3. **Mixing and agitation;** Fundamentals of mixing; characteristics of mixing equipment; power consumption and equipment. Different types of impellers for agitation, Power requirement for agitation 6 Hours
4. **Settling, sedimentation and Froth Flotation:** free and hindered settling. Types of thickeners; batch and continuous; settling chambers. Cyclones and their design; dusts and fumes, fogs etc. Separation of immiscible liquids, liquid-solid suspensions, gas-solid, liquid-solid suspension 8 Hours
5. **Fluidization:** Aggregate and particulate fluidization; incipient fluidization velocity; expansion of fluidized beds, flow through packed bed. 6 Hours
6. **Filtration:** Batch and continuous filtration equipment; theories of filtration and washing; filter aids, industrial practice; centrifuges. Micro filtration and ultra filtration. Membrane separations. 5 Hours
7. **Conveying and Elevators for handling solids:** Storage of solids. Pneumatic conveying and hydraulic transportations. 5 Hours

### REFERENCE BOOKS:

Title: Unit operations of chemical engineering  
Author: W C McCabe & J C Smith  
Publisher: McGraw Hill

Title: Chemical Engineering, vol. II  
Author: J M Coulson and J F Richardson  
Publisher: Pergamon press

Title: Perry's Handbook for Chemical Engineers  
Author: J H Perry & Chilton  
Publisher: McGraw Hill

## LIST OF EXPERIMENTS:

- (1) **Sieve Analysis:** To analyze the given powder for its particle size distribution. / Cumulative and Differential methods of particle size distributions.
- (2) **Jaw Crusher:** To verify the laws of crushing.
- (3) **Roll Crusher:** To determine i) Angle of nip ii) Reduction ratio iii) Actual capacity iv) Theoretical capacity v) Ribbon factor vi) Efficiency
- (4) **Ball Mill:** To determine the optimum speed for maximum new surface area created for the given feed size and also determine the critical speed of the ball mill.
- (5) **Settling and sedimentation:** To determine the settling and sedimentation characteristics of given slurry and to calculate the area of the continuous thickener.
- (6) **Froth Flotation:** To study the effect of different frothing agent in the recovery of given sample during flotation.
- (7) **Cyclone separator:** To determine the efficiency of the cyclone separator and to determine cut diameter.
- (8) **Filtration:** To determine the specific cake resistance and filter medium resistance in the given plate and frame filtration.
- (9) **Pulverizer:** To determine the power consumption in the pulverizer.
- (10) **Fluidized Bed:** To obtain the relation between pressure drop across the fluidized bed and superficial velocity of the fluid.
- (11) **Power Consumption:** To determine the power number and power consumption for a given liquid.
- (12) To determine the pressure drop through the Packed bed column.