MECHANICAL OPERATIONS

Course Code :15CH1105

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Course Outcomes:

On successful completion of the course, the student should be able to

CO 1 Classify and identify the storage, mixing and transportation equipment.

CO 2 Calculate the average size of solid particles of a given solid sample. Describe size reduction equipment and distinguish between different size reduction equipment.

CO 3 Choose the type of filtration process for a solid liquid separation.

CO 4 Explain the flow patterns in an agitator.

CO 5 Describe the stages involved for converting saturated solution to crystals and explain crystallization equipment.

UNIT-I **(10 Lectures)**

Properties, handling and mixing of particulate solids: Characterization of solid particles, properties of particulate masses, storage of solids, mixing of solids, types of mixers, mixers for cohesive solids, mixers for free-flowing solids, conveyors.

UNIT-II **(10 Lectures)**

Size Reduction: Principles of comminution, size reduction equipment— crushers, grinders, ultrafine grinders, cutting machines, equipment operation.

UNIT-III **(10 Lectures)**

Mechanical Separations: Screening, screening equipment, filtration, cake filters, centrifugal filters, principles of cake filtration, clarifying

filters, liquid clarification, gas cleaning, principles of clarification, cross flow filtration, types of membranes, permeate flux for ultra filtration, concentration polarization, partial rejection of solutes, microfiltration, separation based on the motion of particles through fluids, gravity settling processes and centrifugal settling processes.

UNIT-IV (10 Lectures)

Agitation and mixing of liquids: agitation of liquids, circulation velocities, power consumption in agitated vessels, blending and mixing of liquids, suspension of solid particles, dispersion operations.

UNIT-V (10 Lectures)

CRYSTALLIZATION:

Crystal geometry, principles of crystallization, equilibria and yields, nucleation, crystal growth, application of principles to design, MSMPR crystallizer, crystallization from melts.

TEXT BOOK:

1. McCabe W.L., Smith J.C. and Harriott P, *"Unit Operations in Chemical Engineering"*, 7th Edition, McGraw Hill, 2005.

REFERENCE:

1. Alan S. Foust, Leonard A. Wenzel, Curtis W. Clump, Louis Maus, L.Bryce Anderson, *"Principles of Unit Operations"*, 2nd Edition, John Wiley & Sons, 2010.