CH215	MECHANICAL OPERATIONS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

1. To make the students exposed to different geometrical sizes of raw materials used in the industries, area of calculation of the particles w.r.t their sizes.
2. To get familiarity with the different laws of grinding
3. To do the power consumption calculations
4. To learn different separation process on their physical properties

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Identify the role of mechanical unit operations in chemical industries
2. Select suitable size reduction equipment based on performance and power requirement
3. Evaluate solid-fluid separation equipment
4. Determine the power required for agitation, blending and mixing

UNIT I [CO:1] **(12)**

Properties and Handling of Particulate Solids:

Characterization of solid particles: shape and size, mixed particle size analysis, specific surface of mixtures, average particle size, number of particles in mixture, screen analysis and standard screen series, size measurements with fine particles. Properties of masses of particulate, storage and conveying of solids.

Size Reduction:

Characteristics of comminuted products, energy and power requirements in comminution, crushing laws and work index. Equipment for size reduction; crushers, grinders, ultra-fine grinders. Equipment operation: Open circuit and closed circuit operation.

UNIT II [CO:2] **(12)**

Mechanical Separations:

Screening, screening equipment; stationary, grizzlying, gyratory, vibrating, revolving screens. Comparison of ideal and actual screens, material balances over screen, Capacity and effectiveness of screens.

Materials Separation:

Magnetic separators, Electro- static separators and froth flotation.

UNIT III [CO:3] **(12)**

Filtration:

General consideration, cake filters, centrifugal filters, filter media, filter aids.Principles of Cake filtration: Pressure drop calculations, constant rate filtration, constant pressure filtration.

Clarifying filters; liquid clarification, gas cleaning, principle of clarification.

UNIT IV [CO:4] **(12)**

Gravity Sedimentation Processes:

Gravity classifiers, sorting classifier; sink and float methods, differential settling methods, clarifiers and

thickeners. Centrifugal sedimentation processes; cyclones, hydro-cyclones, centrifugal decanters.Agitation and Mixing of Liquids:

Purpose of agitation, agitation vessels, power consumption in agitated vessels. Blending and mixing. Mixing of Solids: Measures of mixer performance, mixers for non-cohesive solids, and mixers of cohesive solids.

LEARNING RESOURCES:

TEXT BOOK:

Unit operations of Chemical Engineering, Warren,L., McCabe, Julian C.Smith, Peter Harriot, 7th Edition, McGraw Hill(2008).

REFERENCE BOOK(s):

1. Unit Operations-I, K.A.Gavhane, 25th Edition, Nirali Prakashan (2015)
2. Mechanical Operations for Chemical Engineers, C. M. Narayana and B.C.Bhattacharyya, Khanna Publishers (1992)
3. Chemical Engineering, vol.-II, J.H.Coulson and Richardson, 5th edition,Elsevier India (2006)