

LJ UNIVERSITY

LJ INSTITUTE OF PHARMACY

SEMESTER: I

Subject Name: PHARMACEUTICAL ENGINEERING

Subject Code: BP101TP

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry

Objectives: Upon completion of the course the student shall be able to

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries

Teaching scheme and examination scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	4	8	75	25	35	15

Sr. No.	Course Contents	Hours
1	Mixing: Objectives (Explain importance of unit operation in designing of final dosage form), pharmaceutical applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier	08
2	Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill Size Separation: Objectives, pharmaceutical applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank	08
3	Drying: Objectives, applications & mechanism of drying process, measurements & pharmaceutical applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer	06
4	Evaporation: Objectives, pharmaceutical applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator Distillation: Basic Principles and methodology of simple distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation	08
5	Filtration: Objectives, pharmaceutical applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, rotary drum filter, & Cartridge filter, membrane filters and Seitz filter	08

	Centrifugation: Objectives, principle & pharmaceutical applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge	
6	Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter Heat Transfer: Objectives, pharmaceutical applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, types of corrosion and there prevention. basic of material handling systems	07
Total Hours		45

Practical

1. To determine mixing index for given powders using laboratory mixer.
2. To perform size reduction by using ball mill.
3. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
4. Determination of moisture content and loss on drying.
5. To study the effect of viscosity on rate of evaporation.
6. To study effect of solute concentration on boiling point elevation.
7. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
8. To demonstrate steam distillation.
9. Factors affecting Rate of Filtration (Surface area, Concentration and Thickness/ viscosity.
10. To study the working of laboratory centrifuge and to study the effect of centrifugal force on separation of solid from liquid.
11. To calibrate the given orificemeter and to calculate coefficient of discharge at orifice.
12. To measure pressure in gas line using U tube manometer & inclined Manometer
13. To determine the overall heat transfer coefficient of given condenser.
14. To study corrosion susceptibility of a metal.
15. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
16. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.

Recommended Books:

1. Introduction to chemical engineering – Walter L Badger & Julius Bancharo, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson-Latest edition.
3. Unit operation of chemical engineering – McCabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition