

St.James College of Pharmaceutical Sciences St.James medical Academy River Bank, Chalakudy			
Programme:	B. PHARM	Sem.:	III
Name of Course: (Subject)	PHARMACEUTICAL ENGINEERING	Course Code:	BP304T
Teaching faculty of the course	Mrs. AKHILA JOPHY		

Summary of the Lecture Plan

Topic	Lectures	Hours
Flow of fluids	manometers, Reynolds number and its significance, Bernoulli's theorem and its applications	1
	Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.	1
Size Reduction	Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction. Hammer mill.	1
	Ball mill, fluid energy mill, Edge runner mill & end runner mill.	1
Size Separation	Objectives, applications & mechanism of size separation, official standards of powders, sieves.	1
	Size separation Principles. Sieve shaker, cyclone separator,	1
	Air separator, Bag filter & elutriation tank.	1
Mixing	Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing.	1
	Double cone blender, twin shell blender, ribbon blender.	1
	Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier.	1
Evaporation	Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process.	2
	Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator.	1
	Forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporators.	2

Heat Transfer	Objectives, applications & Heat transfer mechanisms. Fourier's law.	1
	Heat transfer by conduction, convection	2
	Heat transfer by radiation. Heat interchangers & heat exchangers.	2
Drying	Objectives, applications & mechanism of drying process.	1
	Measurements & applications of Equilibrium Moisture content, rate of drying curve. Tray dryer, drum dryer	2
	Spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.	2
Distillation	Objectives, applications & types of distillation, molecular distillation	1
	Simple distillation & steam distillation	1
	Preparation of purified water and water for injection BP by distillation, flash distillation.	1
	Fractional distillation, distillation under reduced pressure.	2
Filtration	Objectives, applications, Theories.	1
	Factors influencing filtration, filter aids, filter medias.	2
	plate & frame filter, filter leaf, rotary drum filter	1
	Meta filter & Cartridge filter, membrane filters and Seidtz filter	1
Centrifugation	Objectives, principle & applications of Centrifugation.	1
	Perforated basket centrifuge, Nonperforated basket centrifuge, semi continuous centrifuge & super centrifuge	2
Materials of pharmaceutical plant construction, Corrosion and its prevention	Factors affecting during materials selected for Pharmaceutical plant construction. Ferrous and nonferrous metals.	2
	Inorganic and organic non metals.	1
	Corrosion and its prevention, Theories of corrosion, types of corrosion.	2
Material handling systems	Objectives & applications of Material handling systems.	1
	Belt, screw and pneumatic conveyors	1

Major issues or Core aspects to be addressed/ covered:

Flow of fluids
Types of manometers.
Principles, construction, working, uses, merits and demerits of instruments.
Size Reduction
Objectives, applications & mechanism of size reduction.
Principles, construction, working, uses, merits and demerits of instruments.
Size Separation
Objectives, applications & theory of size separation.
Types and official standards of sieves.
Principles, construction, working, uses, advantages and disadvantages of instruments.
Mixing
Types and differences between mixing.
Principles, construction, working, uses, merits and demerits of equipments.
Evaporation
Objectives, applications, factors affecting Evaporation.
Principles, construction, working, uses, advantages and disadvantages of instruments.
Heat Transfer
Heat Transfer methods and mechanism.
Instruments descriptions.
Drying
Application and significances of drying.
EMC, FMC.
Detailed study of instruments.
Distillation
Types and applications.
Lab scale and industrial scale of Simple distillation & steam distillation.
Filtration
Applications, Theories.
Different filter aids and filter medias.
Principles, construction, working, uses, merits and demerits of equipments.
Centrifugation
Applications and types.

Materials of pharmaceutical plant construction, Corrosion and its prevention
Factors and classifications of Materials of pharmaceutical plant construction.
Detailed study of corrosion.
Material handling systems
Applications and types.

Sample Questions

Flow of fluids
Explain Bernoulli's theorem
What is Reynolds number
Principle of Orifice meter
Venturimeter
Size Reduction
Advantages and disadvantages of fluid energy mill.
Laws governing energy and power requirements of a mill.
Mechanisms of size reduction.
Factors affecting size reduction
Principle and uses of Edge runner mill
Size Separation:
Official standards of powders
Sieve shaker
Neat labelled diagram of Bag filter
Application of elutriation tank.
Size separation Principles
Mixing
Define mixing. Principle, construction and working of sigma blade mixing
Mechanisms of liquid mixing.
Applications of mixing.
Propellers for liquid mixing devices.
Difference between solid and liquid mixing
Silverson Emulsifier.

Evaporation:
Classification of evaporators
Principle and construction of Steam jacketed kettle
Define evaporation. Discuss about the factors affecting evaporation in detail.
Climbing film evaporator
Applications of evaporation.
Economy of multiple effect evaporators.
Heat Transfer
Overall heat transfer coefficient.
Define conduction. Discuss about the Fourier's law of heat conduction in detail
Application of heat exchangers.
Steam as heating medium
Any one Heat interchangers
Raoult's law
Drying
Advantages and disadvantages of spray drying
Principles of freeze drying.
Measurements of Equilibrium Moisture content.
Neat labelled diagram of vacuum dryer.
Explain drying curve.
Principle of Tray dryer and fluidized bed dryer
Distillation
Simple distillation
Flash distillation with neat diagram
Water for injection BP by distillation
Principle of Fractional distillation
Filtration
Define filtration. Principle, construction and working of filter leaf.
Mechanisms of filtration.
Kozeny carman equation
filter aids.
Principle of plate & frame filter
Membrane filters
Centrifugation
Theory of centrifugation

Objectives of centrifugation
Difference between perforated basket centrifuge and Nonperforated basket centrifuge.
Principle and construction of super centrifuge
Materials of pharmaceutical plant construction, Corrosion and its prevention
Materials of construction – glass.
Ferrous and nonferrous metals.
Inorganic and organic nonmetals.
Corrosion and its prevention.
Theories of corrosion.
Material handling systems
Conveyers for handling of solids
Types of Conveyers
Belt conveyers