

(B. Pharm.)
(Semester - III)

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Course Code	BP304T
Course Title	Pharmaceutical Engineering - Theory

Scope:

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

Objectives:

After completion of course student is able to know,

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.

Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. Understand theoretical principles of various unit operations.
2. Describe factors influencing various unit operations.
3. Discuss properties of materials used for pharmaceutical plant construction.
4. Explain pharmaceutical equipment of various unit operations.
5. Correlate various unit operations and its applications in formulation development.
6. Solve calculations involved in various pharmaceutical unit operations.

Syllabus:

Teaching hours: 45 Hours

UNIT I

10 Hours

Flow of fluids:

Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

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, Edge runner mill & end runner mill.

Size Separation:

Objectives, 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.

UNIT II

12 Hours

Heat Transfer:

Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation:

Objectives, 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, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.

Distillation:

Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation.

UNIT III

08 Hours

Drying:

Objectives, applications & mechanism of drying process, measurements & 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.

Mixing:

Objectives, 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, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier.

UNIT IV

08 Hours

Filtration:

Objectives, applications, Theories & Factors influencing filtration, filter aids, filter media. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.

Centrifugation:

Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT V

07 Hours

Materials of pharmaceutical plant construction, Corrosion and its prevention:

Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

TUTORIALS

Teaching hours: 15 Hours

Tutorials will be based on above syllabus

Suggested Readings[^]: (Latest edition)

1. Walter L. B., Julius B. T. *Introduction to chemical engineering*. Tata McGraw-Hill Publishing Company Ltd. New Delhi.
2. Nigel J. K. S., *Solid phase extraction, Principles, techniques and applications*. Marcel Dekker Inc., USA.
3. Warren L. M., Julian C. S., Peter H. *Unit operation of chemical engineering*. McGraw-Hill Companies, Inc. USA.
4. Subrahmanyam C.V.S. Setty J. T., Suresh S., Devi V. K. *Pharmaceutical engineering principles and practices*. Vallabh Prakashan, New Delhi.
5. Gennaro A. R. *Remington the science and practice of pharmacy*. Lippincott Williams & Wilkins
6. Lachman I., Lieberman H. A., Kanig L. *Theory and practice of industrial pharmacy*. Varghese Publishing House, Mumbai.
7. Subrahmanyam C. V. S. *Essentials of Physical pharmaceuticals*. Vallabh Prakashan, New Delhi.
8. Carter S. J. *Cooper and Gunn's Tutorial pharmacy*. C. B. S. Publishers & Distributors, Delhi.

L= Lecture, T= Tutorial, P= Practical, C= Credit

[^] this is not an exhaustive list
