



VIDHYADEEP UNIVERSITY
VIDHYADEEP INSTITUTE OF PHARMACY, ANITA, SURAT



B. PHARMACY SEMESTER: II

Subject Name: PHARMACEUTICAL ENGINEERING

Subject Code: BP203TP

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

Course Outcomes: Upon completion of this course the student should be able to

| CO | STATEMENTS |
|--------|--|
| C110.1 | To illustrate fundamental and facts of flow of fluids and materials used for pharmaceutical plant construction, corrosion and its prevention |
| C110.2 | To describe objectives, mechanisms, factors of size reduction and size separation with their equipment |
| C110.3 | To summarize heat transfer and evaporation with their types, mechanism, instrumentation & applications |
| C110.4 | To define drying and mixing, classify different types of dryers and mixers |
| C110.5 | To underscore principles, theories, mechanism and equipment of filtration and centrifugation |
| C110.6 | To explain types of distillation and their mechanism with appropriate diagrams |

Teaching Scheme and Examination Scheme:

| Teaching Scheme (hr/ Week) | | | | Evaluation Scheme | | | |
|----------------------------|----------|-----------|-------|-------------------|----------|----------------|----------|
| Theory | Tutorial | Practical | Total | Internal | External | Internal | External |
| | | | | Theory Exam | | Practical Exam | |
| 3 | 1 | 4 | 8 | 25 | 75 | 25 | 75 |

| Sr No | Course content | (hr) |
|-------|---|------|
| 1 | <p>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.</p> <p>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.</p> <p>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.</p> | 10 |
| 2 | <p>Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.</p> <p>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.</p> | 10 |

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| | Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation. | |
| 3 | 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. | 10 |
| 4 | Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. 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. | 8 |
| 5 | 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 nonmetals, basic of material handling systems. | 7 |

Subject Name: PHARMACEUTICAL ENGINEERING

Subject Code: BP203TP (PRACTICAL)

LIST OF PRACTICAL:

1. Determination of radiation constant of brass, iron, unpainted and painted glass
2. Steam distillation – To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.
6. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier
8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots
9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/viscosity
12. To study the effect of time on the Rate of Crystallization.
13. To calculate the uniformity Index for given sample by using Double Cone Blender

Recommended Books (Latest Editions):

1. Introduction to chemical engineering – Walter L Badger & Julius Banchemo, 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.