



**Gyanmanjari**  
Innovative University

**Course Syllabus**  
**Gyanmanjari Pharmacy College**  
**Semester-2(B.Pharm.)**

**Subject:** Pharmaceutical Engineering (BPHBP12307)

**Type of course:** Major

**Prerequisite:** NA

**Rationale:** Pharmaceutical engineering is a branch of engineering focused on discovering, formulating, and manufacturing medication, analytical and quality control processes, and on designing, building, and improving manufacturing sites that produce drugs.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks
CI	T	P		Theory Marks		Practical Marks	CA	
				ESE	MSE	VP	ALA	
3	1	4	6	75	25	35	15	150

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*

**Continuous Assessment:**

(For each activity maximum-minimum range is 5 to 10 marks)

Sr. No	Active Learning Activities	Marks
1.	<b>Identification:</b> Faculty will provide name or image of equipment. Students have to identify and write basic working principles and applications of it and upload on portal.	5
2.	<b>Think – Pair – Share ( Structural configuration of compounds )</b> Faculty will provide name of different pair of name of unit process, operation or equipments students have to discuss and think about it and share their ideas related to differences in principle, working, equipments etc and upload on portal.	5
3.	<b>Assignments:</b> Faculty will provide questions and students answer them and upload on portal.	5
Total		15



**Course Content:**

Sr. No	Course content	Hrs	% Weightage
1.	<b>Mixing:</b> 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.	8	18
2.	<b>Size Reduction:</b> 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 <b>Size Separation:</b> 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	8	18
3.	<b>Heat Transfer:</b> Objectives, pharmaceutical applications, & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. <b>Drying:</b> 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.	8	18
4.	<b>Evaporation:</b> 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 <b>Distillation:</b> Basic Principles and methodology of simple distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation	8	18
5.	<b>Filtration:</b> 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. <b>Centrifugation:</b> 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.	8	18

6.	<p><b>Flow of fluids:</b> Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter</p> <p><b>Materials of pharmaceutical plant construction, Corrosion and its prevention:</b> Factors affecting during materials selected for Pharmaceutical plant construction, types of corrosion and there prevention. basic of material handling systems.</p>	5	10
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### Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	25%	45 %	20%	05%	05%	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Course Outcome:

After learning the course the students should be able to:	
CO1	Know various unit operations used in Pharmaceutical industries.
CO2	Perform various processes involved in pharmaceutical manufacturing process.
CO3	Handle and work with different equipments used in Pharmaceutical industry.
CO4	Know and appreciate the various preventive methods used for corrosion control in Pharmaceutical industries
CO5	Uunderstand the material handling techniques.



**List of Practical**

Sr. No	Descriptions	Unit No	Hrs
1.	To determine mixing index for given powders using laboratory mixer.	1	4
2.	To perform size reduction by using ball mill.	2	4
3.	Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.	2	4
4.	Determination of moisture content and loss on drying.	3	4
5.	To determine the overall heat transfer coefficient of given condenser.	3	4
6.	To study the effect of viscosity on rate of evaporation.	4	4
7.	To study effect of solute concentration on boiling point elevation.	4	4
8.	Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.	4	4
9.	To demonstrate steam distillation.	4	4
10.	Factors affecting Rate of Filtration (Surface area, Concentration and Thickness/ viscosity.	5	4
11.	To study the working of laboratory centrifuge and to study the effect of centrifugal force on separation of solid from liquid.	5	4
12.	To calibrate the given orificemeter and to calculate coefficient of discharge at orifice.	6	4
13.	To measure pressure in gas line using U tube manometer & inclined Manometer	6	4
14.	To study corrosion susceptibility of a metal.	6	4
15.	Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.	3	4
		Total	60



**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**Reference Books:**

- [1] Introduction to chemical engineering – Walter L Badger & Julius Banchero, 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

