BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

HYDERABAD CAMPUS

FIRST SEMESTER 2022-2023

COURSE HANDOUT (Part-II)

Date: 29/08/2022

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No.	**:**	**PHA F244**
Course Title	**:**	**Physical Pharmacy**
Instructor-in-charge	**:**	**Venkata Vamsi Krishna Venuganti**
Instructors	**:**	**Bollareddy Srivarsha Reddy, Rupal Kothari, Parameshwar Patra**

1. Course description:

Preformulation characterization including solid state pharmaceutics, crystallinity, solubility, micromeritics, drug stability and compatibility, reaction kinetics, rheology, interfacial phenomenon, principles of diffusion and dissolution. Different types of colloidal systems and their properties and complexation.

2. **Scope and objective of the course:**

This course deals with the applications of physico-chemical principles to the study of drug stability, behavior of drug powders and their pharmaceutical systems. It also includes the discussions on surface properties, kinetics and rheology.

3. Learning outcomes:

- The student should be able to understand the importance of physical and chemical properties of compounds and their role in formulation development
- The student should be able to differentiate different solid compounds into crystalline and amorphous substance
- The student should be able to understand and apply the concept of solubility and perform solubility determination study
- The students should be able to determine average particle size of powders and dispersions and relate to their performance
- The student should be able to understand different stability problems of pharmaceuticals and perform simple stability tests
- The student should be able to understand stabilizing multi-phase systems by altering surface tension using amphipathic substances
- The student should be able to measure the viscosity and understand its relation to different pharmaceutical product performance
- The students should know the concept of diffusion and dissolution

4. **Textbook:**

a) Sinko, Patrick J Martin's Physical Pharmacy & Pharm, SC B.I./Lippincott, 5th ed, 2006.

Reference Books:

(i) Gennaro, A.R., Remington Pharmaceutical Sciences, Hack Pubs. Pennsylvania, 17th Ed. (1995)
(ii) Liberman, H and Lachmnan, L, Theory and Pratice of Industrial Pharmacy. Verghese Publs., Bombay., 1994, 3rd Edn.
(iii) Liberman, H and Lachman, L, Pharmaceutical dosage forms: Tablets Vol.2, Marcel Dekker, New York, 1980.
(iv) Liberman, H and Lachman, L, Pharmaceutical dosage forms: Disperse systems Vol.1, Marcel Dekker, New York, 1987.

5. **Course Plan:**

L. No.	**Learning objectives**	**Topics to be covered**	**Chapter in the Text Book**
1, 2	Application of Physical Pharmacy	Introduction to Physical Pharmacy, states of matter, phase distribution	3(a) ch 2
3, 4	Crystallinity, amorphous compounds and polymorphism, characterization of polymorphs	Solid state pharmaceutics	3(a) ch 4 and class notes
5, 6	Solubility terminology, factors influencing aqueous solubility, determination of solubility, solubility enhancement	Solubility	3(a) ch 10
7-10	Kinetics and order of reactions & its determination, rate expressions, determination of shelf life of pharmaceuticals	Stability of drugs	3(a) ch 15
11, 12	Knowledge of various methods for determining surface tension	Determination of surface tension	3(a) ch 16
13-15	Applications of adsorption at solid/liquid interfaces	Adsorption at interfaces	3(a) ch 16
16-19	Applications of colloids	Colloids	3(a) ch 17
20, 21	Factors influencing properties of suspensions	Suspensions	3(a) ch 18
22	Factors influencing properties of emulsions	Emulsions	3(a) ch 18
23-25	Concept of viscosity, viscosity measurement & pharmaceutical applications	Rheology	3(a) ch 20
26, 27	Particle size characterization, measurement & analysis	Micrometrics	3(a) ch 19
28-30	Principles of diffusion & dissolution, mathematical models & applications	Diffusion & Dissolution	3(a) ch 13

List of experiments

S No	**Experiment Name**
1	Demonstration of PXRD for crystalline and amorphous samples.
2	Determination of the upper critical solution temperature for phenol - water system.
3	Determination of the lower critical solution temperature for tween 80 - water system.

4	Determination of homogenous phase in ternary system of methanol-chloroform-water system
5	Determination of equilibrium solubility of paracetamol by shake-flask method.
6	Determination of partition coefficient of diclofenac sodium in hexane – water system.
7	Determination of pK_a of a weak acid (oxalic acid) by titration method.
8	Determination of degradation rate constant of ethyl acetate.
9	Determination of surface tension of sodium lauryl sulfate and tween-80 using drop-count method.
10	Adsorption of acetic acid on charcoal as adsorbent using Freundlich and Langmuir adsorption isotherms.
11	Determination of viscosity of glycerin relative to water using Ostwald viscometer.
12	Demonstration of dissolution study of immediate release and sustained release tablets.
13	Demonstration of drug release study of diclofenac gel through pre-wetted cellulose membrane by using Franz diffusion cell.
14	Determination of the particle size and zeta potential of nanoparticle suspension using zetasizer.
15	Determination of mechanical properties of polymeric film using texture analyzer.

6. Evaluation Schedule:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Midsemester test	90 minutes	25	04/11 11.00 - 12.30PM	Closed book
Quizzes/ Assignments		10	Continuous	Closed book
Laboratory component	Weekly	25	Continuous	
Comprehensive exam	180 minutes	40	27/12 AN	Closed book (20) Open book (20)

Mid-semester evaluation: Will be announced after midsemester test.

7. (i) Make-up's for tests will be granted only on genuine grounds.

8. **Chamber consultation hour:** Wednesday 5-6 PM at A005

9. **Notices:** All notices regarding this Course will be displayed on CMS.

10. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
PHA F244