**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**

**HYDERABAD CAMPUS**

## FIRST SEMESTER 2021-2022

**COURSE HANDOUT (Part-II)**

Date: 20/08/2021

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 : B. Sony Priyanka, Parameshwar Patra**

1. **Course description:**

This course is designed to make the students conversant with the applications of physico-chemical principles to the study of the drug stability, behaviour of drug powders and of other pharmaceutical systems; it includes the discussion of drug degradation, micromeritics, rheology and interactions of drugs.

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.

1. **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 & molecular weight determination | 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 X-ray diffractometer |
| 2 | Preparation of a ternary phase diagram |
| 3 | Determination of equilibrium solubility of paracetamol by shake flask method |
| 4 | Determination of pKa of a compound |
| 5 | Determination of log P of a compound |
| 6 | Determination of rate constant of acid hydrolysis of ethyl acetate |
| 7 | Determination of surface tension of liquid mixtures |
| 8 | Determination of adsorption isotherm of glacial acetic acid |
| 9 | Determination of total surface area of stearic acid adsorbed on to kaolin |
| 10 | Determination of cloud point temperature of a surfactant |
| 11 | Determination of rate of sedimentation (Stability of a suspension) |
| 12 | Determination of viscosity using Ostwald viscometer |
| 13 | Micromeritics of lactose and CaCO3 |
| 14 | Dissolution profile of marketed paracetamol tablets |

1. **Evaluation Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| Midsemester test | 90 minutes | 30 | 18/10/2021 3.30 - 5.00PM | Open book |
| Quizzes, Assignments |  | 15 | Continuous | Open book |
| Laboratory component | Weekly | 15 | Continuous |  |
| Comprehensive exam | 120 minutes | 40 | 13/12 FN | Open book |

**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:** Will be announced in the class

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

**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