

**SECOND SEMESTER: 2020-2021**

**Course Handout (Part‑II)**

16-01-2021

In addition to Part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course).

***Course No.* :** **BIO F244**

***Course Title* :** **Instrumental Methods of Analysis**

***Instructor‑in‑charge* :** Debashree bandyopadhyay

***Team of Instructors* :** Ramakrishna Vadrevu, Sridev Mohapatra, Aishwarya Natarajan, Ali Akbar Safdari, Devarakonda Himaja, Raja Gopalan NS, Raunak Sharma

**1.** **Scope & Objective of the Course:**

The advent of dedicated instruments and computers has facilitated an explosive progress in the instrumental methods of analysis in biology. Large number of data points, whether they are physicochemical or biological, can be collected, stored, manipulated and analyzed at a high precision with the help of modern sophisticated instruments having high sensitivity, selectivity, and extremely low detection limit. This course aims at providing a sufficient background of these instruments, their handling and application, in the field of molecular biology, structural biology and biotechnology.

**2. Text Book:**

**T1.** “Instrumental Methods of Analysis”, Sivasankar *et. al*., Oxford University Press, New Delhi, 1st ed., 2012 (available online for purchase).

**T2.** Lab Manual for PHA C391 IMA. Mahesh *et. al,.* 2008

**Reference Book**

**R1**. “Principles of Instrumental Analysis”, Skoog *et. al*., Harcourt Asia, 5th ed., 2001.

**R2 “**Instrument Methods of Analysis. Williard *et al*., CBS Publication, New Delhi, 7th edition, 1998.

**R3 “**Handbook of Analytical instruments”, R.S. Khandpur, Tata Mc Graw-Hill, 2nd edition, 2006.

**3.a) Course Plan :**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Learning Objectives** | **Topic to be covered** | **Chapter in the Text Book** |
| 1 | Spectroscopy | Characteristic of atomic and molecular spectroscopy | T-1 (Ch. 6)  R-1 |
| 2 | Atomic Spectroscopy | Atomic Absorption Spectroscopy, Flame Emission Spectroscopy | T-1 (Ch. 7)  R-1, R-3 |
| 3 | Molecular Spectroscopy | Visible and Ultraviolet Spectroscopy, Fluorescence Spectroscopy, Infrared Spectroscopy | T-1 (Ch. 8)  R-1, R-3 |
| 4 | Optical Spectroscopy | Polarimetry and Circular Dichroism | T-1 (Ch. 4) |
| 5 | Electrophoresis | SDS-PAGE | T-1 (Ch. 14)  R-1 |
| 6 | Chromatography | High-Performance liquid Chromatography | T-1 (Ch. 13)  R-1, R-3 |
| 7 | Molecular Biology Techniques | ELISA, PCR | Class notes |
| 8 | Mass Spectrometry | Basic principles and applications | T-1 (Ch. 10) |

**3. b)** **Lab Components:**

**Experiments**

Exp 1: Preparation of buffer solutions and measurement of pH using a pH meter

Exp 2: Qualitative and quantitative analysis of biomolecules using UV spectroscopy

Exp 3: Fluorescent spectroscopy; total intensity and quenching measurements

Exp 4: Infrared spectroscopy; identification of functional groups in bio molecules

Exp 5: Separation of proteins using SDS-polyacrylamide gel electrophoresis

Exp 6: Polarimetric/ Circular Dichroic analysis of samples possessing optical activity

Exp 7: Identification of amino acids using TLC

Exp 8: Separation of molecules using HPLC

Exp 9: Measurement of molecular weight by mass spectrometry

Exp 10: Amplification of DNA using PCR

Exp 11: Atomic absorption spectrophotometric analysis of elements

Exp 12: Detection of antigen using an ELISA reader

**Note:**

* Text book 2 will be used for experimental details
* Extra reading material will be provided to the students, if required.
* Minor changes are possible subject to availability of chemicals/ Instructors/Instruments

**4**. **Evaluation Scheme:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No** | **Evaluation Component** | **Duration** | **Weightage** | **Date & Time** | **Nature of Component** |  |
| 1. | Laboratory Evaluation-1:  Evaluation will be based on Ist cycle experiments, punctuality, records, participation and viva-voce | - | 15% |  | OB |  |
| 2. | Lab Quiz-1 | - | 15% |  | OB |  |
| 3. | Midsem | 1.5 hr | 20% | 06/03 1.30 - 3.00PM | OB |  |
| 4. | Laboratory Evaluation-2:  Evaluation will be based on 2nd cycle experiments, attendance, records, participation and viva-voce | - | 15% |  | OB |  |
| 5. | Lab Quiz-2 | - | 15% |  | OB |  |
| 6. | Comprehensive Exam | 2 hr | 20% | 07/05 FN | OB |  |

5. **Chamber Consultation Hours:** To be announced in the Class.

**6.** **Make-up Policy:** Make-up will be granted only in the case of hospitalization and after submission of medical certificate through the proper process. *No makeup for Laboratory evaluation*.

**7. 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**

**BIO-F244**