



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 18.01.2021

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 : **PANKAJ KUMAR SHARMA**
Instructor(s) : **P R Deepa**
Practical Instructors : **P R Deepa, Pankaj K Sharma, Monika Paul, Tripti Joshi, Sumit K Mandal, Garima Singh, Anirudha K Sahu, Subhashree Chatterjee**

1. Course Description: The advent of dedicated bio-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 with a high precision with the help of modern sophisticated instruments having high sensitivity, selectivity, and extremely low detection limit.

2. Scope and Objective of the Course: 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.

3. Text Books: “Instrumental Methods of Analysis”, B. Sivasankar, Oxford Higher education 2012; appropriate reading material will also be provided

4. Reference Books: R1. “Principles and Techniques of Biochemistry and Molecular Biology”, Wilson and Walker, 7th Ed.

Suggested Reading: 1. “Instrumental Methods of Analysis”, Williard *et. al.*, CBS Publication, New Delhi, 7th ed., 1998. **2.** “Handbook of Analytical instruments”, R.S. Khandpur, Tata Mc Graw-Hill, 2nd edition, 2006.

5. Course Plan:

Module No.	Lecture Session	Reference *	Learning outcomes
1. Introduction to the course	L1: Introduction to Instrumental Methods	T-1	Students will get the big picture of studying this course
2. Spectrophotometric analytical techniques	L2-L4: Characteristics of atomic and molecular spectroscopy; Visible and Ultraviolet Spectroscopy; Fluorescence Spectroscopy; Infrared Spectroscopy	T-1, R-1	Students will learn how to analyze biomolecules based on their optical properties
3. Chromatographic purification techniques	L5-L7: Basic principles, Thin Layer Chromatography; Gas chromatography; High Performance Liquid Chromatography	T1, R1	Students will learn different methods to separate biomolecules based on their affinity to certain matrix or medium
4. Molecular separation and analysis	L8-L10: Centrifugation; Introduction to Electrophoresis; Separation and	R-1	Students will get acquainted to a few molecular methods used in



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	detection of DNA and proteins by agarose gel electrophoresis and SDS-PAGE; Separation of cells by Flow Cytometry		biological science research
5. Microscopic Analysis	L11: Various types of microscopy e.g., phase contrast microscopy, fluorescence microscopy, FE-SEM, TEM, AFM, Laser scanning Confocal Microscopy	R-1	Students will learn how to use various microscopes to observe cell and cellular structures.
6. Conclusion	L12: Concluding/summarizing the course	-	Students will understand the relevance and combined usage of these techniques in research/industry

* Relevant research/review articles will be discussed to understand the applications of the techniques.

Lab Experiments:

The experiments will be classified in the following headings - spectrophotometry, chromatography, molecular detection and/or microscopy. The specific experiments would be as follows (the order of performance may be subject to change):

- 1: Purification and analysis of molecules by TLC
- 2: Purification and analysis of molecules by HPTLC
- 3: Purification and analysis of molecules by Gas chromatography
- 4: Purification and analysis of molecules by HPLC
- 5: Purification of molecules by Gel-filtration chromatography
- 6: Qualitative and quantitative analysis of given sample using UV-Vis spectrophotometry
- 7: Spectrofluorimetric estimation of quinine sulphate and fluorescence quenching of the same by potassium iodide
- 8: Separation and characterization of proteins by SDS-PAGE
- 9: Analysis of the chemical structure of molecules using FTIR spectroscopy
- 10: Detection and characterization of cancer cells by flow cytometry

Note: *Minor changes are possible subject to availability of chemicals/instruments.*



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6. Evaluation Scheme:

Component	Duration	Weightage (%)	Marks (200M)	Date & Time (As per AUGSD notice)	Nature of component (Closed Book/ Open Book)
Mid-Semester Test	60 min	25%	50M	<TEST_1>	CB/OB
Comprehensive Examination (<i>for testing of concepts learnt in both theory and practical classes</i>)	120 min	40%	80M	<TEST_C>	CB/OB
Lab Records	-	12.5%	25 M	Continuous	-
Lab Quizzes	-	12.5%	25M	Continuous	-
Assignment(s)	-	10%	20M	-	Take home type

Guidelines to Writing Lab Records: The experiments should be written on hardbound, covered practical files. It should include the following: Objective, Principle, Materials required, Procedure, Results, Inference, Precautions & Applications. The record book should be written during lab hour.

7. Chamber Consultation Hour: -

8. Notices: To be provided in classes or by email

9. Make-up Policy: Make-up will be granted only in any emergency situations, with prior permission wherever possible.

10. Note (if any): -

Instructor-in-charge
BIO F244