Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER : 2023-2024
Course Handout (PartII)

09-01-2024

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 (IMA)**
Instructorincharge **:** DEBASHREE BANDYOPADHYAY
Lecture Instructor: *Prof. Debashree*
Team of Lab Instructors **:** Prof. Sridev Mohapatra, Prof. Trinath Jamma, Prof. Pragya Komal, Ms. Puja Das, Ms. Satarupa Das, Mr. Kunja Chaitanya, Ms. Manali Chindarkar, Ms. Omalur Eswari, Ms. Devika P, Mr. Nikhil P.T., Mr. Vaibhav Jain, Mr. Ali Safdari

Lecture Hour: Fridays-3.00-3.50pm in G-104
Lab Hours: Monday & Wednesday 1.00pm-3.50pm in B-108

1. Scope & Objective of the Course:

The advent of dedicated bio-instruments and computers has facilitated 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 to provide 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.

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 :

Lecture No	Learning Objectives	Topic to be covered	Ref. to the Book
1	Spectroscopy	Characteristic of atomic and molecular spectroscopy	T-1 (Ch. 6) R-1
2	Atomic Spectroscopy	Infrared Spectroscopy	
3	Atomic Spectroscopy	Atomic Absorption Spectroscopy	T-1 (Ch. 7) R-1, R-3
4	Molecular Spectroscopy	Visible and Ultraviolet Spectroscopy	T-1 (Ch. 8) R-1, R-3
5	Molecular Spectroscopy	Fluorescence Spectroscopy	
6	Optical Spectroscopy	Polarimetry	T-1 (Ch. 4)
7	Optical Spectroscopy	Circular Dichroism	
8	Electrophoresis	SDS-PAGE	T-1 (Ch. 14)

			R-1
9	Chromatography	High-Performance liquid Chromatography	T-1 (Ch. 13) R-1, R-3
10	Molecular Biology Techniques	ELISA	Class notes
11	Molecular Biology Techniques	PCR	
12	Mass Spectrometry	Basic principles and applications	T-1 (Ch. 10)

3. b) <u>Lab Components:</u>

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: Atomic absorption spectrophotometric analysis of elements
Exp 4: Fluorescent spectroscopy; total intensity and quenching measurements
Expt 5: Separation of molecules using HPLC
Exp 6: Polarimeteric/ Circular Dichroic analysis of samples possessing optical activity
Exp 7: Measurement of molecular weight by mass spectrometry
Exp 8: Identification of amino acids using TLC
Expt 9: Detection of antigen using an ELISA reader
Exp 10: Amplification of DNA using PCR
Exp 11: Separation of proteins using SDS-polyacrylamide gel electrophoresis
Exp 12: Quantification of gene expression by real-time PCR

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	Venue
1.	<u>Continuous Laboratory Evaluation (3 components)</u>: Evaluation will be based on the completion of each set of four experiments. Evaluation components – punctuality, records, and participation, **viva, and lab exam**	-	20M+20M+ 20M (30%)	During Lab hours	OB	Lab
2	Midsem	1 hr	30M (15%)	16/03 - 2.00 - 3.30PM	CB	To be announced
3	Comprehensive exam	2 hrs	40M (25%)	18/05 FN	CB	
4.	Lab Quiz-1	60 min	30M+30M (30%)	During Lab hours	CB	- During Lab hours
5.	Lab Quiz-2	60min				

5. Guide to Writing Lab Reports:

The report must have to be written on hardbound, practical files. It should include the following:
a. Objective of the experiments,
b. Theory on which the experiment is based,
c. Steps in the experimental procedure,
d. Results including all observations, e. Discussion and Conclusion. f. Precautions

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

7. Make-up Policy: Make-up will be granted only in the case of hospitalization and after the submission of a medical certificate from the campus doctor. *No makeup for Laboratory evaluation*.

8. 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.

IMPORTANT NOTE:

- Lab Coat is mandatory for performing experiments.
- You will not be allowed to do the experiments without your lab record.
- You must enter into lab on time; in case of delay, you may lose your evaluation and marks.

Instructorincharge
BIO-F244