Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER : 2022-2023
Course Handout (Part-II)

16-01-2023

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)**
Instructor-in-charge **:** TRINATH JAMMA
Lecture Instructor: *Prof. Debashree*
Team of Lab Instructors **:** Dr. Trinath Jamma, Prof. Sridev Mohapatra, Dr. Gireesha, Mr. Murali K Ramgopal, Ms, Ashna Fathima, Ms. Aishwarya Natarajan, Mr. Lakesh
Lecture Hour: Fridays-3.00-3.50pm in G-103
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 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.
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	Ref. to the Book
1	Spectroscopy	Characteristic of atomic and molecular spectroscopy	T-1 (Ch. 6) R-1
2	Atomic Spectroscopy	Infrared Spectroscopy Atomic Absorption Spectroscopy, Flame Emission Spectroscopy	T-1 (Ch. 7) R-1, R-3
3	Molecular Spectroscopy	Visible and Ultraviolet Spectroscopy, Fluorescence 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: Detection of antigen using an ELISA reader
Exp 3: Atomic absorption spectrophotometric analysis of elements
Exp 4: Fluorescent spectroscopy; total intensity and quenching measurements
Expt 5: Identification of amino acids using TLC
Exp 6: Amplification of DNA using PCR
Exp 7: Separation of proteins using SDS-polyacrylamide gel electrophoresis
Exp 8: Quantification of gene expression by real-time PCR
Expt 9: Separation of molecules using HPLC
Exp 10: Qualitative and quantitative analysis of biomolecules using UV spectroscopy
Exp 11: Measurement of molecular weight by mass spectrometry
Exp 12: Polarimeteric/ Circular Dichroic analysis of samples possessing optical activity
Exp 13: Flame photometric analysis of alkaline earth metals in biological samples

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.	Laboratory Evaluation-1: Evaluation will be based on Ist cycle experiments, punctuality, records, and participation. (6 Experiments)	-	30M (15%)	During Lab hours	OB	Lab
2	Mid Sem	1 hr	30M (15%)	To be announced	CB	15/03/2023; 9.30am-11.00am
3.	Laboratory Evaluation-2: Evaluation will be based on 2nd cycle experiments, attendance, records, participation and viva.	-	30M (15%)	During Lab hours, to be announced	OB	Lab
4.	Lab Quiz-1	60 min	30M+30M (30%)	During Lab hours	CB	- During Lab hours
5.	Lab Quiz-2	60min				
6.	End Sem Examination	2hrs	50M (25%)		CB	12/05/2023 FN

5. Guide to Writing Lab Reports:

The report must have to be written on hardbound, practical files. It should include the followings:
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 submission of medical certificate through the proper process. *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.

Instructor-in-charge
BIO-F244