Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER: 2021-2022
Course Handout (Part-II)

15-1-2022

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 **:** KUMAR PRANAV NARAYAN
Team of Instructors **:** Vdya Rajesh, Ramakrishna Vadrevu, Ashwariya Natarajan, Ali Akbar Safdari, Devarakonda Himaja, Raunak Sharma, Monica, Sharayu Umakant Ghodesw.

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	Topics 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	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	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: Identification of amino acids using TLC
Exp 6: Separation of proteins using SDS-polyacrylamide gel electrophoresis
Exp 7: Detection of antigen using an ELISA reader
Exp 8: Separation of molecules using HPLC
Exp 9: Polarimeteric analysis of samples possessing optical activity (CD)
Exp 10: Amplification of DNA using PCR
Exp 11: Demonstration of Confocal Microscopy/SEM, FACS
Exp 12: Measurement of molecular weight by mass spectrometry

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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

4. Evaluation Scheme:

No	Evaluation Component	Duration	Weightage	Date & Time	Nature of Component	Venue
1.	Laboratory Evaluation-1: Evaluation will be based on Ist and 2 nd cycle experiments, punctuality, records, and participation.	-	15%		OB	Lab
2.	Lab Quiz-1	-	10%		OB	-
3.	Mid Sem test	1.5 hr	15%	10/03 3.30pm to5.00pm	CB	
4.	Laboratory Evaluation-2: Evaluation will be based on 3rd and 4th cycle experiments, attendance, records, participation.	-	15%		OB	Lab
5.	Lab Quiz-2	-	10%		OB	-
6.	Lab comprehensive examination	-	20%		OB	
7.	Comprehensive Exam	2 hr	15%	07/05 AN	CB	

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