



Source : <https://mpl.loesungsfabrik.de/en/english-blog/method-validation/analytical-vs-bioanalytical-method-validation>

22BT204 BIOANALYTICAL TECHNIQUES

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Biochemistry and Organic Chemistry.

COURSE DESCRIPTION & OBJECTIVES:

The course provides an in-depth understanding of various scientific instruments used for analysis. The objective of this course is to understand the scope of application, advantages and limitations of the various modern analytical and separation techniques.

MODULE-1

UNIT-1

9L+0T+6P=15 Hours

TRADITIONAL AND MODERN ANALYTICAL METHODS

Microscopy – types of bright field, types of dark field and electron microscopy, Electromagnetic radiation– Breaking of bonds, Vibration and rotation in chemical bonds, Absorption spectroscopy, Beer-Lambert's law and apparent deviations, Mass determination.

UNIT-2

15L+0T+10P=25 Hours

MICROSCOPY AND SPECTROSCOPY

Fluorescent microscopy, Confocal microscopy, Phase contrast microscopy, Scanning electron microscopy and Transmission electron microscope, Flow cytometry, UV-Visible spectrophotometer, Infra-Red spectroscopy, Proton and 2D-NMR, X-ray spectroscopy, Mass spectroscopy.

PRACTICES:

- Application of array of fluorochromes to identify cells and sub-microscopic cellular components.
- Determination of lambda max using UV visible spectrophotometer.
- Estimation of Molar Extinction Co-efficient using Beer Lamberts law.
- Characterization of proteins using Fourier Transform Infrared Spectroscopy.
- Fortitude crystalline nature of biological materials using X-ray diffraction analysis (XRD).
- Measuring of materials under Scanning electron microscopy.

MODULE-2

UNIT-1

9L+0T+6P=15 Hours

BASICS IN SEPARATIONS

Centrifugation–basic & principles, RPM-RCF, Electrophoresis - principles and types, Chromatography-general principles and its applications, Liquid and gas chromatography.

UNIT-2

15L+0T+10P=25 Hours

ADVANCED TECHNIQUES IN SEPARATION

Ultra centrifugation and density gradient centrifugation, Disc electrophoresis, slab iso - electric focusing and iso tachophoresis, Ion - exchange chromatography, gel -filtration chromatography, affinity chromatography and HPLC.

PRACTICES:

- Separation of biomolecules using a density gradient centrifuge.
- Agarose gel electrophoresis for separation of DNA fragments.
- SDS-PAGE electrophoresis for determination of molecular weight of proteins.
- Purification of biological macromolecules using Ion Exchange chromatography.
- Fractionation of bioactive compounds using gel filtration chromatography.
- Characterization of bioactive compounds through HPLC.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the morphology of cells using Microscopy.	Analyze	1	1,2,4,5,9,10
2	Apply the analytical techniques for characterization of proteins.	Apply	1	1,2,3,5,9,10
3	Apply the electrophoresis techniques for separation of proteins.	Apply	2	1,2,3,5,9,10
4	Analyze the purity level of molecules using chromatographic techniques.	Analyze	2	2,3,4,5,9,10

TEXT BOOKS:

1. Keith Wilson and John Walker, "Principles and Techniques of Biochemistry and Molecular Biology", 7th edition, Cambridge University Press, 2013.
2. J. Jayaraman, "Laboratory Manual in Biochemistry", 2nd edition, New Age International, 2011.

REFERENCE BOOKS:

1. K. Wilson, K.H. Goulding, "A Biologist Guide to Principles and Techniques of Practical Biochemistry", 7th edition, Cambridge University Press, 2006.
2. Douglas A. Skoog, Donald M. West, F. James Holler and Stanley R. Crouch "Fundamentals of Analytical Chemistry", 9th edition, Cengage learning, 2013.
3. Frank A. Settle, "Hand Book of Instrumental Techniques for Analytical Chemistry", Prentice Hall, 1997.

SKILLS:

- ✓ Handling of microscope and UV Visible spectrophotometer.
- ✓ Skilled handling of chromatography techniques.
- ✓ Experience in analyze the results of XRD and FTIR.