

# Instrumentation in Biotechnology

## Details of course: -

Course Title	Course Structure			Pre-Requisite
	L	T	P	
<b>Instrumentation in Biotechnology (BT309)</b>	3	1	0	NIL

## Course Objective:

To impart broad knowledge of commonly used instruments and their working principles

## Course Outcomes:

1. To define the global significance of biotechnology and examine the potential applications of Biotechnology in all sectors of life.
2. To compare prokaryotic and eukaryotic cellular architecture.
3. To comprehend the functioning of various biomolecules and enzymes and to compare various microorganisms.
4. To explain the underlying mechanism of gene expression, explain and appraise the genetic engineering of organisms for human welfare, and formulate new ideas.
5. To explain and translate separation, purification and identification techniques for biomolecules in research.

S. No.	Contents	Contact Hours
1.	<b>Hydrodynamic Techniques: Centrifugation:</b> Viscosity and diffusion, sedimentation equilibrium and sedimentation velocity methods, analytical and Preliminary centrifuges, application of density gradient and differential centrifugation; cell disruption techniques.	8
2.	<b>Electrophoretic Techniques:</b> Paper and gel electrophoresis, Immunoelectrophoresis, isoelectric focusing, two - dimensional electrophoresis, capillary electrophoresis.	7
3.	<b>Chromatographic Methods, Chemo Sensors and Biosensors:</b> Paper, TLC gas chromatography, gel filtration, ion-exchange chromatography, affinity chromatography and HPLC, FPLC, adsorption and desorption.	9

	Sensors and transducers; Electrochemical sensors; Semiconductor devices as chemical sensors; Optical chemical sensors; Piezoelectric sensors; Sensor signal processing; Chemistry of biomolecules and their immobilization for biosensors; Types of biosensors and their application -Environmental monitoring, process control, and clinical/biochemical analysis; Amperometric biosensors; Immunosensors.	
4.	<b>Spectroscopic and Diffraction Techniques:</b> UV and visible, Spectrofluorimetry, atomic absorption spectrophotometry, Mass Spectrometry, Infrared and Raman Spectroscopy, Mossbauer, MALDI-TOF, ORD and Circular Dichroism, Nuclear Magnetic Resonance and Electron Spin Resonance spectroscopy, X-Ray diffraction, Electron diffraction, Neutron Diffraction	9
5.	<b>Optical Techniques, Radioisotope Techniques, Microscopy:</b> Optical and Electron Microscopy, Transmission and Scanning Electron Microscopy, Tunneling Electron Microscopy, Atomic Force Microscopy, Polarization and Fluorescence microscopy. Radio tracers, GM Counter, Proportional and Scintillation Counters, autoradiography, radioimmunoassay (RIA).	9
	<b>Total</b>	42

#### Books: -

S. No.	Name of Authors /Books / Publishers
1.	Principles and Techniques of Practical Biochemistry by Keith Wilson and John Walker, Fifth edition, Cambridge University Press
2.	Biophysical Chemistry: The conformation of Biological Macromolecules by C.R.Cantor and P.R. Schimmel. Publisher: W.H. Freeman
3.	Essentials of Biophysics by P. Narayanan. Publishers: New Age International Publishers
4.	Introduction to Spectroscopy by D.L. Pavia, G.M. Lampman and G. S. Kriz and Vyvyan Publisher: Brooks Cole
5.	Principles of Physical Biochemistry by Kensal E. Van Holde, Curtis Johnson, K.E. Van Holde., W.Curtis Johnson and Pui Shing Ho. Publisher: Prentice Hall.
6.	Process Biotechnology Fundamentals by S N Mukhopadhyay. Publisher: Viva Books Pvt. Ltd., New Delhi.
7.	Microbiology by Bernard D. Davis, Renato Dulbecco, Herman N. Eisen and Harold S. Ginsberg. Publisher: Lippincott Williams & Wilkins

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