

Learning Outcomes:

After successful completion of the course, student will be able to understand:

- Chemical/chemistry aspects of biomedical engineering
- Though understanding of electromagnetic radiation and its use for analysis
- Basic statistics required for the analysis
- Operation of the basic laboratory instruments
- Principle, theory and working of the advanced analytical techniques

SYLLABUS

Unit No.	Topics	Lectures (Hours)
1	INTRODUCTION: Introduction to Chemical instrumental analysis, Advantages over classical methods, Beer Lambert's law. Classification: Spectral, electro analytical and separative methods, Basic Components of analytical instruments. General Laboratory Instruments: Centrifuge, Autoclave, Balances, Hot Air Oven.	7
2	MICROSCOPY: Bright field microscopy, Dark field microscopy, Phase contrast microscopy, electron microscopy & their importance in clinical diagnosis.	4
3	COLORIMETERS AND SPECTROPHOTOMETERS Colorimeters: Principle, Constructional details, Single and double beam instruments, Sources and detectors, Application. Spectrophotometers: UV-Visible spectrophotometer, IR spectrophotometers. Flame Photometry: Principle, Constructional details, Application. Mass Spectrometer (MS): Principle, Constructional details, Ionization methods, X-ray spectrometry: Instrumentation for X-ray spectrometry, X-ray diffractometer.	8
4	BLOOD GAS ANALYZERS: Blood pH Measurement, Measurement of blood pCO ₂ , calculated bicarbonate, Total CO ₂ and Base excess, Blood pO ₂ measurement, Complete blood gas analyzer.	6
5	CHROMATOGRAPHY: Classification, Gas chromatography: Principle, Constructional details, GC detectors, Liquid Chromatography, High Performance Liquid Chromatography (HPLC): Principle, constructional details.	6
6	BLOOD CELL COUNTERS : Types of blood cells, Methods of cell counting, Automatic recognition and differential counting of cells.	6
7	ELECTROPHORESIS: Overview of electrophoresis, Types of Electrophoresis, Basis for electrophoretic separations, various types of detection in capillary electrophoresis, Applications to biomolecules.	6

Term Work and Practical shall be based on the above syllabus.

Text Books:

1. Handbook of Analytical Instruments
By R. S. Khandpur, Tata McGraw–Hill Publications, 3rd edition
2. Introduction to Instrumental Analysis
By Robert D. Braun, McGraw-Hill Book Company

Reference Books:

1. Instrumental Methods of Analysis By Willard, Merritt, Dean, Settle
CBS Publishers & Distributors, New Delhi, Seventh edition
2. Principles of Instrumental Analysis By Skoog, Holler, Nieman
Thomson books-cole publications, 5th edition
3. Instrumental Methods of Chemical Analysis By Galen W. Ewing
McGraw-Hill Book Company, Fifth edition.