BTT-104: Techniques in Biology **Marks 50** **Hours 45**

UNIT I : Microscopy:

Light microscope, Fluorescence microscope, Phase contrast microscope, Electron microscope. Centrifugation: Principles, RCF and Types of centrifuges, types of rotors, preparative and analytical ultra centrifuge.
Electrochemical techniques: Principles of electrochemical techniques, redox reactions, the pH electrode, ion-sensitive and gas-sensitive electrodes, The Clark oxygen electrode.

UNIT II: Chromatographic techniques:
Principles of chromatography, lon-exchange and affinity chromatography. High performance liquid chromatography (HPLC), Gas liquid chromatography (GLC), Thin layer chromatography (TLC), Paper chromatography, GC-MS, LC-MS, Maldi Tof.
Electrophoresis: General principles, SDS-PAGE , Native gels, Gradient gel, Iso electric focusing, 2-D gel electrophoresis (2-D PAGE), Detection, estimation and recovery of proteins, Western blotting. Electrophoresis of nucleic acids: agarose gel electrophoresis of DNA, DNA sequencing gels, Pulse field gel electrophoresis, Capillary electrophoresis.

UNIT III: Spectroscopic techniques:
Properties of electromagnetic radiation, interaction with matter. Gamma ray spectroscopy, X-ray spectroscopy, UV and Visible spectroscopy, Infrared and Raman spectroscopy, Electron spin resonance spectroscopy, Nuclear magnetic resonance spectroscopy, Circular dichorism spectroscopy, Atomic spectroscopy, x-ray diffraction, x-ray crystallography. Spectrofluorimetry, turbidometry and nephelometry.

UNIT IV : Radio isotope techniques:
The nature of radioactivity, detection and measurement of radioactivity: detection based on gas ionization- Geiger Muller counter- principles and applications. Detection based on excitation- Liquid Scintillation counter-principle and applications. Supply, storage and purity of radiolabelled compounds, specific activity, inherent advantages and restrictions of radiotracer experiments, safety aspects, applications- of radio isotopes in biological sciences. Flowcytometry, ELISA, immunoblotting.

UNIT V: Biosensor
Principle, construction, mechanism and applications of biosensor with one example. (Enzyme and cell based)

Text and Reference:
1. Physical Biochemistry by D. Freifelder W. H. Freeman
2. Practical Biochemistry- Principles and techniques-Wilson & Walker.; Cambridge Press
3. Practial Biochemistry -David T Plummer, Tata McGraw- Hill
4. Instrumental methods of chemical analysis - P.K. Sharma
5. Biophysical chemistry - Upadhyay. Upadhyay and Nath-Himalaya
6. Handbook of Biomedical Instrumentation - R.S. Khandpur, Tata McGraw Hill
7. Principles Of Physical Biochemistry-K Holde, W Johnson-Pearson/Prentice Hall
8. Biosensors-Cooper and Cas- Oxford

Practicals :
1. Study of standard operating protocols, validation and calibrations of instruments
2. Electrophoresis of proteins under native and denaturing conditions (PAGE)
3. Separation of proteins / pigments using column chromatography
4. Demonstration of techniques : GC,HPLC and atomic absorption spectroscopy AAS
5. Theory & Principal, operation of microscopes centrifuges, spectrophotometers, chromatographic techniques, electrophoresis, radio isotopic techniques
6. Methods based on centrifugation, electrochemical techniques, spectrophotometer
7. Methods on TLC , Paper Chromatography
8. SDS PAGE , 2D Gel electrophoresis capillary , electrophoresis western blotting,
9. ELISA, Immunoblotting
10. Demonstration of flowcytometry liquid scintillation counter , Geiger Muller counter