

Course No.	Course Name	L-T-P-Credits
<b>CY 544</b>	<b>Bioanalytical Techniques</b>	<b>3-0-0: 03</b>
Prerequisite: NIL		
<p><b>Course Objectives:</b> This course is commenced to link the gap between academic research and industry. This course is intended to discuss about the methodologies about the protein purification and DNA technologies. This course is related to different theory and applications of bioanalytical techniques, and it is highly essential for multiple domains of scientific research. Students will also get exposure of electrophoresis techniques, electron microscopy and spectroscopy in biology.</p> <p><b>Course Outcomes:</b></p> <ul style="list-style-type: none"> <li>• Students will acquire the knowledge of various advanced instrumental techniques in the domain of biological sciences.</li> <li>• Students will learn about the importance of protein analysis and recombinant DNA Technologies along with their real-life applications.</li> <li>• Students will understand about the basic concepts of electrophoresis techniques and their applications in separation of proteins, nucleic acids and their functional aspects.</li> <li>• Students will acquire knowledge of electron microscopy and spectroscopy in chemistry-biology interface for various applications in the domains of biomedical chemistry, life sciences, biotechnology.</li> </ul>		
<b>SYLLABUS</b>		
<b>Module</b>	<b>Contents</b>	<b>Hours</b>
I	<b>Protein analysis:</b> Protein purification methods (ion-exchange, gel filtration and affinity chromatography), MS-based protein estimation/quantification methods, western blot technique, x-ray crystallography, nuclear magnetic resonance studies, automated peptide sequencing and synthesis.	10
II	<b>Recombinant DNA Techniques:</b> automated DNA sequencing and synthesis, Techniques for the preparation of mRNA and cDNA, probes, Genome mapping, DNA fingerprinting, Gene cloning and expression, production of recombinant proteins, construction of DNA libraries, PCR methodology and applications, micro arrays.	10
III	<b>Electrophoresis techniques:</b> Separation of proteins, DNA, RNA (Agarose, PAGE, SDS-PAGE), 2D electrophoresis techniques.	04
IV	<b>Electron microscopy in biology:</b> Scanning Electron Microscopy (SEM), Transmission electron microscopy (TEM), Scanning Transmission electron microscopy (STEM) – basic technique and application in biomaterials characterization. <b>Spectroscopy in biology:</b> Matrix assisted laser desorption and ionization (MALDI), Electrospray ionization (ESI), Circular Dichroism (CD), Isothermal titration calorimetry (ITC), Differential scanning calorimetry (DSC), Atomic force microscopy (AFM).	12

**Essential Readings:**

1. M. L. Srivastava, Bioanalytical Techniques, Narosa Publishers, 1<sup>st</sup> Edition, 2008.
2. Fundamentals of Bioanalytical techniques and Instrumentation, Sabari Ghosal and A. K. Srivastava, PHI Learning, 2<sup>nd</sup> Edition, 2018.

**Supplementary Readings:**

1. A. Shourie, S. S. Chapadgaonkar, Bioanalytical Techniques, TERI, 1<sup>st</sup> Edition, 2015.
2. D. Sheehan, Physical Biochemistry: Principles and Applications, 2<sup>nd</sup> Edition, 2009.
3. A. Manz, N. Pamme and D. Iossifidis, Bioanalytical Chemistry, World Scientific Publishing Company, 2004.