

Program Name: **M. Sc. Biotechnology**

### **Program specific Outcomes**

A student completing this program will be able to

**PSO1:** Understanding and proposing experimental designs, develop problem solving abilities of the protocols developed for commercially viable biotech products

**PSO2:** Learning bioprocessing techniques used in large-scale production units

**PSO3:** Developing skill sets for research, employability and entrepreneurship

**PSO4:** Finding sustainable solutions to issues pertaining to environment, health, agriculture etc.

**PSO5:** Understanding the computational biology, omics interventions in development of novel molecules/ drugs/ products etc

### **Course outcomes for all courses offered by the department:**

<b>Semester</b>	<b>Course code</b>	<b>Course name</b>	<b>Course Outcomes Student completing this course is able to</b>
<b>1</b>	PBT-1801	Proteins: Concepts and Applications	1: To describe the structure of protein and correlate with its functions such as like molecular motors, interaction, carriers, signalling, repair and structure 2: To describe the synthesis of protein, its sorting and degradation 3: To understand and interpret the original experiments carried out to propose structure and functioning of various proteins 4: Ability to interpret Ramachandran plot and explaining proteins structure using bioinformatics tool 5: To explain techniques used in understanding the working of the proteins 6: To appreciate the importance of proper folding of proteins and relate to health, agriculture, and environmental issues arising from its expression.
<b>1</b>	PBT-1802	Nucleic Acids: Structure and Working	1: To explain the synthesis, breakdown of nucleic acids and role of inhibitors which has applications in medical field. 2: To demonstrate the existence of various forms of nucleic acids and its relevance and to comprehend that the modern concepts of DNA structure beyond what Watson – Crick proposed. 3: To analyze how topological changes and condensation of DNA influences gene expressions 3: To explain the concept of RNA interference and its applications in various fields 4: To describe and interpret experimental result arising from various DNA based studies

			<p>5: To apply the concepts of regulation of gene expression as a tool in research and industry</p> <p>6: To assess how genetic complexity is associated with repetitive sequences and gene duplications.</p>
<b>1</b>	PBT-1803	Carbohydrates and Lipids	<p>1: To identify biological importance of carbohydrates and lipids</p> <p>2: To distinguish between anabolic and catabolic processes of carbohydrates and lipids</p> <p>3: Compare and contrast metabolic pathway of complex carbohydrates in different living system</p> <p>4: To elucidate the role of lipids in maintaining homeostasis at cellular and systemic level</p> <p>5: Recognize and explain the contribution of lipid biochemistry in understanding the development of certain human diseases such as Niemen-peck disease, Tay-Sachs syndrome, hypercholesterolemia etc.</p> <p>6: Appreciating biotechnological intervention in microorganism to use them as cell factories for production of biomolecules of commercial importance.</p>
<b>1</b>	PBT-1804	Biophysical Concepts in Biotechnology	<p>1: To describe the various centrifugal techniques used for fractionation of cells, cell organelles and bio-molecules.</p> <p>2: Apply the techniques of chromatography and electrophoresis to separate bio-molecules.</p> <p>3: Explain individual components of different instrument.</p> <p>4: Devise a suitable and workable experimental strategies for separation, purification, identification and characterization of a specific bio-molecules from a biological sample</p> <p>5: Define the principles of various spectroscopic techniques used for characterization of bio-molecules</p> <p>6: Acquire adequate skills to use the instruments and analyze the experimental data.</p> <p>7: Implement the theoretical knowledge gained experimentally all the analytical techniques for characterization of bio-molecules.</p>
<b>1</b>	PBT-1805L	Practical Biochemistry	<p>1: To learn good lab practices</p> <p>2: To explain use of various instruments required in bioscience lab</p> <p>3: Ability to isolate and estimate various biomolecules</p>
<b>1</b>	PBT-1806L	Bioanalytical Techniques	<p>1: To explain techniques used in understanding the nature of proteins</p> <p>2: Ability to isolate and estimate chloroplast</p> <p>3: To learn use instruments to interpret the results</p>

			4: Apply the techniques of chromatography and electrophoresis to separate bio-molecules.
2	PBT-2801	Cell Biology	<p>1: Reviewing conserved structures and molecules of biological systems through evolution and model organisms</p> <p>2: Review the applications of advanced techniques to support the structure and functions of cell membrane</p> <p>3: Illustrate the specific receptors for various signaling molecules and their signaling pathways.</p> <p>4: Identify and distinguish mechanism of development across species</p> <p>5: Appreciating the use of various model organisms to relate the development of vertebrates</p>
2	PBT-2802	Enzymes: Structure to Function	<p>1: To describe the different models of enzyme catalysis and the mechanisms for its assessment</p> <p>2: To explain various methods for identifying active site residues</p> <p>3: To illustrate the several methods for the enzyme regulation</p> <p>4: To appreciate the applicability of enzymology in various industries for growth and sustainability</p> <p>5: To develop skill for analyzing kinetic data of enzyme substrate reaction</p>
2	PBT-2803	Immunology	<p>1: Discuss the history of important landmarks in the mammalian immune system</p> <p>2: Differentiate the interplay of molecules and organs of immune systems</p> <p>3: Critique immunological methods for diagnosis and therapeutics</p> <p>4: Analyzing the negative connotations of immune system</p> <p>5: Compare and contrast the response of the host immune system to different pathogens</p>
2	PBT-2804	Genetics and Bioinformatics	<p>1: To assess the variation of genes and their alleles that exist at a population level</p> <p>2: To evaluate, understand and become aware of the risk factors and ethical issues associated with inbreeding in humans and pre-natal diagnosis of genetic diseases.</p> <p>3: To analyse the impact of human migration on genetic material and utilizing this epigenetic data to map migration</p> <p>4: To expose students to use computational power to evaluate biological information</p> <p>5: Acquire skills to retrieve information from biological data-bases, analyze it and further remodel protein and genes to create their phylogeny</p>

2	PBT-2805L	Cell Biology and Enzymology Lab	<ol style="list-style-type: none"> <li>1: To describe the different models of enzyme catalysis and the mechanisms for its assessment</li> <li>2: To develop skill for analyzing kinetic data of enzyme substrate reaction</li> <li>3: To master immobilization techniques</li> <li>4: To cultivate and analyse yeast growth</li> </ol>
2	PBT-2806L	Immunology, Genetics and Bioinformatics Lab	<ol style="list-style-type: none"> <li>1: To study the techniques used in understanding the characteristics of immune system</li> <li>2: To understand the bio-analytical tools used to study proteins and nucleic acids</li> <li>3: To familiarise with softwares used in bioinformatics</li> </ol>
3	PBT-3801	Molecular Biology	<ol style="list-style-type: none"> <li>1: To compare the replication and repair mechanism in eukaryotic system with the prokaryotic system</li> <li>2: To explain the process of transcription in eukaryotes and its multi-level regulation</li> <li>3: To correlate the external signalling with the changes in gene expression</li> <li>4: To describe gene regulation and its significance in biological sciences</li> <li>5: To learn to apply various molecular biology techniques in research</li> <li>6: To explain methodologies that have been used to understand the concepts of molecular Biology</li> <li>7: To design simple experiments based on the concepts of gene expression in eukaryotes.</li> </ol>
3	PBT-3802	Genetic Engineering	<ol style="list-style-type: none"> <li>1: To explain the basic tools required in recombinant DNA technology</li> <li>2: To explore the methods used to study gene location and structure</li> <li>3: To know the various techniques used to study the gene expression and regulation</li> <li>4: To assess the techniques used in analyzing transcripts and proteins</li> <li>5: To be discuss problems associated with production of recombinant molecules</li> <li>6: To explore the use of recombinant DNA technology in betterment of the society</li> <li>7: To comprehend the use of Omics and develop skills</li> </ol>
3	PBT-3803	Microbial Biotechnology	<ol style="list-style-type: none"> <li>1: To analyse the role of microbiology in the field of Biotechnology</li> <li>2: To learn how to work with microbes</li> <li>3: To explain bioprocessing using microbes to get different products</li> <li>4: To evaluate the way the microbes can be improved to enhance quality and yield of products</li> <li>5: To appraise the techniques that have been developed in Microbial Biotechnology</li> </ol>

3	PBT-3804	Applied Biotechnology	<p>1: To explore how different techniques in plant biotechnology has contributed to the society</p> <p>2: Comprehend how biotechnology has helped in Drug Discovery and Development</p> <p>3: To explain the culturing of animal cells <i>in vitro</i> and its applications</p> <p>4: To describe the role that biotechnology concepts have helped in environment management</p> <p>5: To describe the innovations and development of tools in Biotechnology</p>
3	PBT-3805L	Molecular Biology and rDNA Techniques	<p>1: To explain the basic tools required in recombinant DNA technology</p> <p>2: To be discuss problems associated with production of recombinant molecules</p> <p>3: To explore the use of recombinant DNA technology in betterment of the society</p>
3	PBT-3806L	Microbial and Environmental Biotech Lab	<p>1: To isolate various microorganisms.</p> <p>2: To produce biofertilizer and explain the role that biotechnology concepts have helped in environment management</p> <p>3: Assessing and analyzing the effect of environmental, chemical factors on plant growth development</p> <p>4: To demonstrate the culturing of animal cells <i>in vitro</i></p>
4	PBT-4801	Research Methodology	<p>1: Promulgate the understanding of formulating, pursuing and analyzing research benefitting human development</p> <p>2: Sensitize students regarding the ethics of conducting research by enabling in-depth understanding of plagiarism</p> <p>3: Imparting necessary traits to analyze, compare, logically criticize and evaluate biological data Developing competitive acumen to use modern-age computer programs to analyze and represent research data</p> <p>4: Elevate skills of scientific writing to present research interpretations in a form of research paper, presentation, book chapters and short communication</p>
4	PBT-4802	Research Project	<p>1: Apply critical thinking skills</p> <p>2: Apply foundational research skills to address a research question</p> <p>3: Demonstrate planning, time and change management skills.</p>