

**DEPARTMENT OF BIOCHEMISTRY**

**Course outcomes (COs):**

<b>Paper</b>	<b>Paper Name</b>	<b>Outcomes</b> <b>After completion of the course the student should be able to</b>
<b>Semester I</b>		
<b>1</b>	<b>Biomolecules</b>	<b>CO 1 :</b> Gives brief knowledge about the significance of water, buffer and analytical techniques used to detect the quality of water and soil. <b>CO 2 :</b> Introduces carbohydrates, its classification, properties and biological functions. <b>CO 3 :</b> Provides detailed information about the different types of lipids, their properties and biological significance in living organisms. <b>CO 4 :</b> Teaches in depth knowledge about proteins, different levels of their structural organization and functions. <b>CO 5 :</b> Establishes the fundamentals of Nucleic acids and porphyrins.
	<b>Practical – Qualitative analysis</b>	<ul style="list-style-type: none"><li>● Gives the expertise to the student in the preparation of buffers and steps involved in determining the pH of a given solution.</li><li>● Develop skills in students to analyse and identify different biomolecules qualitatively.</li><li>● Introduces what is absorption maxima and how to determine absorption maxima of p-Nitrophenol and methyl orange.</li><li>● Teaches the basics of absorption spectrum and how to record absorption spectra of BSA and DNA.</li></ul>
<b>Semester II</b>		

<b>II</b>	<b>Analytical Techniques</b>	<p><b>CO 1 :</b> Introduces various analytical techniques involved in tissues homogenisation and fractionation.</p> <p><b>CO 2 :</b> Provides fundamental knowledge about chromatographic technique, its types, principle involved in it and its applications in the separation of biomolecules.</p> <p><b>CO 3 :</b> Teaches the basic principles of various spectroscopic and tracer techniques and their applications in elucidating the structure of biomolecules, and biochemical pathways.</p> <p><b>CO 4 :</b> Gains knowledge about the fundamentals of electrophoresis and its applications in separation of biomolecules like proteins, lipoproteins and nucleic acids.</p> <p><b>CO 5 :</b> Get knowledge about basic microbial techniques involved in isolation, purification and biochemical characterization of microbes and their preservation.</p>
<b>II</b>	<b>Practical – Biochemical techniques</b>	<ul style="list-style-type: none"> <li>● Generates the expertise to the student for isolation of nucleic acids and their identification.</li> <li>● Develops the skill to isolate egg albumin, cholesterol and polysaccharides from their respective sources.</li> <li>● Creates the ability to separate different amino acids using paper chromatography</li> <li>● Gains proficiency to separate plasma proteins using electrophoretic technique.</li> </ul>
<b>Semester III</b>		
<b>III</b>	<b>Enzymology, Bioenergetics and Intermediary metabolism</b>	<p><b>CO 1 :</b> Introduces enzymes, its classification and nomenclature, mechanism of enzyme action and its applications in diagnostic labs and various industries.</p> <p><b>CO 2 :</b> Teaches the basic principles of thermodynamics, its relevance in the formation and maintenance of ATP and mechanism of oxidative phosphorylation.</p> <p><b>CO 3 :</b> Gains knowledge about how the carbohydrates get metabolized for the purpose of energy and other physiological functions in the body.</p> <p><b>CO 4 :</b> Enable the student to understand the metabolic fate of lipids and inborn errors associated with it.</p> <p><b>CO 5 :</b> Gives knowledge about the metabolism of amino acids, significance of urea cycle and various metabolic disorders like phenylketonuria, alkaptonuria etc.,</p>

	<b>Practical - Quantitative Analysis</b>	<ul style="list-style-type: none"> <li>● Provide the expertise for quantification of various enzymes.</li> <li>● Develops skill to estimate glucose, proteins and lipid levels in blood quantitatively.</li> <li>● Cultivate ability to find out optimum parameter for a particular enzyme.</li> </ul>
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#### **Semester IV**

<b>IV</b>	<b>Physiology, Nutritional and Clinical Biochemistry</b>	<ul style="list-style-type: none"> <li>● Get knowledge about digestion and absorption of carbohydrates, Proteins and lipids, composition of blood, its biological relevance and clinical significance.</li> <li>● Introduces the anatomy, structure and function of nervous and excretory systems.</li> <li>● Teaches the basics of endocrinology, secretion of different hormones, mechanism of their action and their role in maintaining the homeostasis of cells.</li> <li>● Understand what is balanced diet, its importance in keeping healthy body, biological role of vitamins and diseases. associated with its deficiency.</li> <li>● Gains knowledge about the clinical significance of isozymes, plasma proteins and other enzyme markers in organ functioning.</li> </ul>
<b>IV</b>	<b>Practical – Nutritional and clinical biochemistry</b>	<ul style="list-style-type: none"> <li>● Creates ability to quantify minerals like calcium, iron and vitamin C.</li> <li>● Train the student to quantify haemoglobin, total WBC and RBC in blood and interpret the results.</li> <li>● Clinical chemistry unit along with practical will enable the student to do diagnostic tests for liver diseases, Gastro intestinal diseases, renal diseases and nutritional deficiencies.</li> </ul>

<b>IV</b>	<b>Microbiology, Immunology and Molecular Biology</b>	<p><b>CO 1 :</b> Enable the student to know numerous microorganisms, including bacteria, fungus, and viruses, as well as their structures, other characteristics, and the diseases they cause..</p> <p><b>CO 2 :</b> Introduces nitrogen cycle, different ways of nitrogen fixation, its importance in the synthesis of glutamine and its regulation.</p> <p><b>CO 3 :</b> Teaches the basics of fermentation technology, its types and its commercial applications in the production of alcohol, acids, solvents and antibiotics.</p> <p><b>CO 4 :</b> Develops understanding of the immune system, vaccines, and the aetiology of immune deficiency disorders and auto immune diseases.</p> <p><b>CO 5 :</b> Teaches basics of the central dogma of the cell, outlines cloning technologies and its applications in agriculture, medicine and other industries.</p>
<b>IV</b>	<b>Practical – Microbiology and Immunology</b>	<ul style="list-style-type: none"> <li>● Inculcate the knowledge about safer handling of bio-samples and GLPs.</li> <li>● Gives training to the students to prepare microbiological media and sterilize it.</li> <li>● Enable the student to become expert in growing the respective culture for the production of appropriate metabolites.</li> <li>● The practical will provide the expertise to the student to work in microbiology laboratory, food and pharma industries, and biotech companies for production of vaccines and other life saving drugs</li> </ul>
<b>Semester V</b>		

V	<b>SEC-Clinical Biochemistry</b>	<p><b>CO 1 :</b> Understand the organisation of clinical laboratory, various instruments used in it, significance of automation, types of specimens, safety regulations and quality control.</p> <p><b>CO 2 :</b> Know the various enzymes involved in normal functioning of liver as well as kidney and their clinical relevance.</p> <p><b>CO 3 :</b> Creates knowledge about the digestion, absorption, assimilation of glucose, Hormonal regulation of glucose and the metabolic disorders associated with it.</p> <p><b>CO 4 :</b> Introduces the different types of lipids, lipoproteins, their metabolic fate, physiological role and clinical significance.</p> <p><b>CO 5 :</b> Provides basics of cardiovascular physiology, biochemical symptoms associated with various heart diseases and various isozymes and their levels in the disease diagnosis.</p>
V	<b>Practical – Clinical Biochemistry</b>	<p>Provides expertise</p> <ul style="list-style-type: none"> <li>● in collection of blood</li> <li>● Principle involved in the Separation of plasma and serum</li> <li>● Quantitative estimation of clinically relevant biomolecules like glucose triglycerides, cholesterol, troponin and lipoproteins</li> <li>● Quantification of enzymes like ALT, AST, CK, LDH</li> <li>● Understand the clinical significance of the levels of various biomolecules and enzyme markers.</li> </ul>
V	<b>SEC-Haematological and Immunological techniques</b>	<p><b>CO 1 :</b> Understand the organisation of immunological laboratory and its maintenance, significance of normal range, reference values, internal and external standards, WHO standards and quality control.</p> <p><b>CO 2 :</b> Learn different components of blood and their functions</p> <p><b>CO 3 :</b> Get knowledge on advance molecular diagnostic tools like ELISA, RT-PCR microtome sections and histopathology</p> <p><b>CO 4 :</b> Fundamentals of Auto-immunity and its classification with examples</p> <p><b>CO 5 :</b> Basics of immunoglobulin, types, structure, its function and production of antibodies.</p>

<b>V</b>	<b>Practical – Haematological and Immunological techniques</b>	Creates expertise in <ul style="list-style-type: none"><li>● Determining blood group based on Haemagglutination test</li><li>● Estimating total RBC and WBC count and its significance in diagnosing the clinical manifestations</li><li>● Determining ESR, PCV, Mean cell RBC volume and Haemoglobin content</li><li>● Performing immunochemical techniques to diagnose various auto-immune disorders and microbial infections.</li></ul>
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