

<b>Biochemistry</b>	
<b>Name of Course</b>	<b>Course Outcomes</b>
CC1: Molecules of Life	<p>CO1: Students will be able to understand unique properties of water and aqueous environment.</p> <p>CO2: Students will develop a thorough knowledge of different biomolecules e.g. carbohydrates, lipids, proteins and nucleic acids.</p> <p>CO3: Students will achieve in-depth knowledge on structure and functions of proteins e.g. hemoglobin etc. and related disorders in theory classes.</p> <p>CO4: In practical classes, students will learn to a) separate amino acids by TLC b) identify biomolecules c) estimate protein by Lowry method d) analyze proteins by SDS-PAGE.</p>
CC2: General Organic Chemistry	<p>CO1: Students will be able to demonstrate a thorough knowledge on atomic structure.</p> <p>CO2: Students will be able to describe different intermolecular forces e.g. ionic bonding, covalent bonding, weak chemical forces and coordination compounds.</p> <p>CO3: Students will be able to identify different aspects of stereochemistry of carbon compounds and their biochemical relevance.</p> <p>CO4: Students will be able to conceptualize reaction mechanisms e.g. nucleophilic substitution reaction, elimination reaction, electrophilic reactions.</p> <p>CO5: Students will be able to identify the structural aspects of heterocycles.</p> <p>CO6: Students will learn to evaluate the property of radioactivity along with atomic nucleus and application of radioactive isotopes in biochemistry.</p> <p>CO7: Students will detect special elements by Lassaigne's tests and functional groups by systematic</p>

	chemical tests.
CC3: General Physical Chemistry	<p>CO1: Students will be able to demonstrate different biophysical properties of chemical compounds e.g. surface tension, chemical equilibrium, ionic equilibrium.</p> <p>CO2: Students will discuss the basic concepts of electrochemistry along with electrochemical cells and cell reactions.</p> <p>CO3: Students will study the principles of thermodynamic, specially first and second laws of thermodynamics, concepts of Gibbs free energy and their applications in living systems.</p> <p>CO4: Students will analyze and discuss about homogenous and heterogenous equilibriums and colloidal states and micelle formation.</p> <p>CO5: Students will differentiate between ideal and non-ideal solutions by Raoult's Law, Delye- Huckel limiting law and study thermodynamic derivation of EMF of cells.</p> <p>CO6: Students will learn a) safety measures in laboratories b) prepare normal, molar and percent solutions c) prepare buffers with conception of pH d) Determine specific rotation of optically active biomolecule and % composition using polarimeter e) Titrate amino acid Glycine by formol titration.</p>
CC4: Enzymes	<p>CO1: Students will discuss the preliminary idea about enzymes, features of enzyme catalysis.</p> <p>CO2: Students will demonstrate enzyme kinetics along with chemical kinetics.</p> <p>CO3: Students will differentiate between different types of enzyme inhibitions.</p> <p>CO4: Students will demonstrate a thorough understanding of mechanism of action of different enzymes.</p>

	<p>CO5: Students will understand the detailed idea on regulation of enzyme activity as well as role of coenzymes.</p> <p>CO6: Students will evaluate the extraction, separation and characterization of techniques for proteins/ enzymes.</p> <p>CO7: Students will describe describe different biochemical methods e.g. ammonium sulphate fractionation, solvent fractionation, dialysis and lyophilization, SDS-PAGE and 2D-electrophoresis.</p> <p>CO8: In practicals students will a) estimate enzyme activity and specific activity of alkaline phosphatases b) identify the effect of pH on the enzyme activity c) determine <math>K_M</math> and <math>V_{max}</math> using Lineweaver- Burk plot c) determine <math>K_I</math> for competitive inhibition d) separate serum proteins by ammonium sulphate fractionation method (demonstration)</p>
CC5. Biophysical Chemistry	<p>CO1: Students will learn Spectroscopy</p> <p>CO2: Students will also learn hydrodynamics and bio-calorimetry</p>
CC6. Metabolism of carbohydrates and lipids	<p>CO1: Students will learn the anabolic and catabolic pathways of carbohydrate</p> <p>CO2: They will also understand the catabolism and anabolism of lipid.</p>
CC7: Cell Biology	<p>CO1: Students will be able to understand structures and functions of different cell constituents and tools and techniques to study them.</p> <p>CO2: They will also learn the process of transport of proteins across the cell</p> <p>CO3: They will be able to perceive the events associated with cell cycle</p>

	CO4: They will come to know about apoptosis and cell renewal.
CC8. Membrane Biology and Bioenergetics	CO1: Students will have a knowledge in membrane structure and dynamics.  CO2: They will learn the process of transport across the membrane.  CO3: They will also learn Bioenergetics.
CC9. Metabolism of amino acids and nucleotides	CO1: Students will learn the catabolism and anabolism of amino acids.  CO2: They will also learn the catabolic and anabolic pathways of purine and pyrimidine nucleotides.
CC10. Basic Microbiology and Microbial Genetics	CO1: Students will gain knowledge of different staining techniques to visualise bacterial morphology and subcellular structures.  CO2: They will also learn about bacterial nutrition.  CO3: They will be able to understand bacterial growth and its regulations.
CC11. Gene, Gene Expression and Regulations	CO1: Students will learn DNA structure  CO2: Students will be able to understand Gene and gene organization.  CO3: They will learn DNA replication  CO4: They will come to know the process of transposition of DNA  CO5: Students will perceive the molecular basis of mutation.  CO6: They will learn different DNA repair mechanisms.  CO7: Students will further learn RNA synthesis in

	<p>prokaryotes</p> <p>CO8: They will develop a knowledge of genetic code.</p>
CC12. Physiology and Hormones	<p>CO1: Students will learn about homeostasis and components of body fluid</p> <p>CO2: They will come to know about the cardiovascular physiology</p> <p>CO3: They will also learn respiratory endocrinology</p>
CC13. Recombinant DNA Technology and Genetic Engineering	<p>CO1: Students will learn different cloning strategies</p> <p>CO2: Moreover, they will understand the application of PCR</p> <p>CO3: They will learn DNA sequencing methods</p> <p>CO4: They will perceive the importance of genetic engineering in Biotechnology</p>
CC14. Immunology	<p>CO1: They will know about innate immunity</p> <p>CO2: They will come to know about B and T lymphocytes</p> <p>CO3: Students will learn about the immunogens and antigens</p> <p>CO4: They will learn about the antibody diversity</p> <p>CO5: They will develop a knowledge in MHC molecules and antigen presentation</p> <p>CO6: They will understand immuno tolerance</p> <p>CO7: They will learn about autoimmunity</p> <p>CO8: Students will be able to perceive hypersensitivity</p>
DSE-A2. Molecular basis of infectious diseases	<p>CO1: They will understand the mechanism behind manifestation of different diseases</p> <p>CO2: They will also learn the treatment thereof</p>

DSE-B1. Advanced Biochemistry	<p>CO1: They will learn the mechanism of photosynthesis</p> <p>CO2: Carbohydrate biosynthesis in animals and biomolecular interactions</p>
SEC-B1. Clinical Biochemistry	<p>CO1: Students will be able to evaluate biochemical changes during a disease</p> <p>CO2: Estimation of glucose metabolism in blood</p> <p>CO3: They will be able to check lipid profile</p> <p>CO4: They will learn liver function tests</p> <p>CO5: They will understand renal function test</p> <p>CO6: They will be able to analyse urine samples</p> <p>CO7: They will also learn different tests for cardiovascular diseases</p>
SEC-A2. Protein Purification Techniques	<p>CO1: Purification and characterization of a protein from a mixture of proteins</p> <p>CO2: They will also get the demonstration of HPLC</p>