THE LEARNING OUTCOME FRAME OF UG COURSE IN BIOCHEMISTRY

PO, PSO AND CO OF UG BIOCHEMISTRY

At the completion of B. Sc. in Biochemistry.This programme is designed with an objective to cover all important topics so that students will be able to use this knowledge in advancement of their career. Students will employ critical thinking and the scientific method to design, carry out, record and analyse the results of biochemical experiments and get an awareness of the impact of biochemistry on the environment, society, and other cultures outside the scientific community.

- Demonstrate, solve and an understanding of major concepts in all disciplines of biochemistry.
- Solve the problem and also think methodically, independently and draw a logical conclusion.
- Employ critical thinking and the scientific knowledge to design, carry out, record and analyse the results of biochemical reactions.
- To inculcate the scientific temperament in the students and outside the scientific community.
- Learn the laboratory skills and safely to transfer and interpret knowledge entirely in the working environment.
- Got exposures of a breadth of experimental techniques using modern instrumentation

After completion of degree, students gained the theoretical as well as practical knowledge. Also, they expand the knowledge

available opportunities related to biochemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist, pathology etc

Program Outcomes (POs) for B.Sc. Biochemistry Program

Program outcome	Pos1.Comprehending fundamental concepts in modern biology to meet the emerging trends Pos2.Handling microbial, cellular and biochemical systems Pos3.Contribution to the betterment of the society by inculcating expertise in healthcare sector pos4.Facilitate placement in various clinical laboratories and biological research institutes Pos5.Procuring hands on real time experience in industries. Pos6. Acquire necessary knowledge and skills to undertake post graduation and than a career in research, either in industry or in an academic set up. Pos7. Apply the knowledge of experimental approaches to solve problems of a chemical nature and will have an ability to extend that knowledge to the solution to new program. Pos8. Integrate and apply the techniques in biophysics, analytical biochemistry, clinical biochemistry, microbiology, molecular biology and basics in bioinformatics.

Course Outcomes (CO) for B.Sc. Biochemistry Program

B. Sc. First Year

Course outcome *On completion of this course, successfully students will be able to:*

Title of the paper

FIRST PAPER -BIOMOLECULES	
CO1:	• Understand the significance of Biochemistry, Recognize the structures and functions of biomolecules that form the basis of what we understand to be living organisms. Learn basic principles of structural and functional relationships of biological molecules. • chemistry of water • Understand in detail the structure, physico chemical properties and function of carbohydrates from monosaccharide to polysaccharides • Learn the significance of structural and storage polysaccharides in nature
CO2:	• Understand in detail the classification, nomenclature, structure, physico chemical properties and function of lipid from simple to derived lipid • Describe characterization of fat Describe properties and functions of phospholipids, isoprenoids and sterols
CO3:	• Understand in detail about amino acid structures, types of amino acids, classifications, structure of proteins and types of proteins. • Learn the molecular structures of 20 amino acids, differentiating essential and non-essential amino acids, biologically important modified amino acids and their functions. • Recognize the structural levels of organization of proteins, 3D structure of proteins, its functions, denaturation (hemoglobin, myoglobin etc.).
CO4:	• Understand the classification, nomenclature, structure, and biological significance of nucleotides • Understand the detailed structure and type of DNA and RNA along with their significance • Describe denaturation and annealing of DNA and factors involved in denaturation.

	• Understand different steps in the central dogma of molecular biology
CO5:	• Understand the classification of porphyrine and describe its structure and function. • Describe chemical nature of bile pigment with their physiological importance. • Describe structure, biological functions and cellular signaling of hormones
SECOND PAPER – BIOPHYSICAL & BIOCHEMICAL TECHNIQUES	
CO1:	• Develop a competent knowledge of classical thermodynamic principles, and redox reactions • Relating entropy to law of thermodynamics and Free energy and its relation to chemical equilibria. • Understanding the utilization of proton gradient to drive the formation of high energy bonds and high energy compounds. • Understand the fundamental energetics of biochemical processes, chemical logic of metabolic pathways. Knowing in detail about concepts to illustrate how enzymes and redox carriers and the oxidative phosphorylation machinery occur
CO2:	• Understanding the principle and applications of centrifugation and pH meter • Determine molecular weight by hydrodynamic methods • Understand Complications in pH measurement due to dependence of pH on ionic strength, electrode contamination and sodium error
CO3:	• Differentiate between paper, ion exchange and affinity chromatography, calculate Rf value from a chromatogram • Exhibit a knowledge base in handling different chromatographic techniques and knowing the sequences of different proteins • Learn fundamental principles behind centrifugation and electrophoresis and apply them practically • Capable to choose and apply suitable separation techniques to identify different biomolecules.
CO4:	• Describe the principles and applications of visible and UV spectroscopic technique • Determine the extinction coefficient and describe its use in various

	application • Exhibit Knowledge about principle and applications of various immuno techniques ranging from precipitation and agglutination reactions to ELISA, Radio immunoassay, Immunodiffusion, Immunoelectrophoresis, Immunofluorescence.
CO5:	• Understand the basic concept of radioisotopic techniques and handling of radioisotopes. • Describe gas ionization and liquid scintillation counting to measure radioactivity • Explain the dangers and safety precautions associated with xrays and identify the various isotopes used in radiography

LABORATORY COURSE: BIOCHEMISTRY PRACTICAL

CO1:	✓ Determination of saponification and iodine number
CO2:	✓ Determination of pK, pH value
CO3:	✓ Qualitative and quantitative analysis
CO4:	✓ Extraction and separation techniques

B. Sc. Second Year

Course outcome *On completion of this course, successfully students will be able to:*

Title of the paper

FIRST PAPER –ENZYMOLOGY CLASSIFICATION OF ENZYMES

CO1:	• Understand the basics of enzymes their nomenclature and IUB enzyme classification
CO2:	• Describe the basic principle of enzymatic catalysis. Determine enzyme activity, urn over number and specific activity. • Understand the difference between the water soluble and fat soluble vitamins and their key role in the metabolism as coenzymes.
CO3:	• Identify the enzyme kinetics and describe the factors affecting its activity. • Derive Michaelis-Menten equation for uni-substrate reactions

	• Understand Km and its significance
CO4:	Have a complete understanding of rate of reactions and order of reactions, and inhibitions and their kinetics. To gain knowledge on enzyme catalysis and isoenzymes.
CO5:	• Identify the commercial applications of enzymes including clinical application. • Understand the importance of enzymes such as SGOT, SGPT, ALP act as marker enzymes and are used in assessing the functioning of liver • Perform immobilization of enzymes and understand the wide applications of enzymes and future potential.
SECOND PAPER -INTERMEDIARY METABOLISM	
CO1:	• Understand the concepts of metabolism • Illustrate the metabolism of carbohydrates through various anabolic and catabolic pathways like glycolysis, Kreb's cycle, Glycogen metabolism, glucuronic acid cycle etc. • Describe the regulation of glycolysis and TCA cycle.
CO2:	• Understand the fundamental energetics of biochemical processes, chemical logic of metabolic pathways. Knowing in detail about concepts to illustrate how enzymes and redox carriers and the oxidative phosphorylation machinery occur. • Describe coupled reactions and their role in metabolism and Chemiosmotic hypothesis of ATP synthesis. • Understand transportation of reducing potentials into mitochondria. • Describe Inhibitors of ETC and inhibitors and uncouplers of oxidative phosphorylation.
CO3:	• Illustrate the metabolism of lipid through various anabolic and catabolic pathways like ß-oxidation, Biosynthesis of saturated and unsaturated fatty acids, Metabolism of ketone bodies • Describe what happens: - when lipids are metabolized, cholesterol, prostaglandins etc. are synthesized, emphasizing the defects of lipid metabolism. • Describe regulation of cholesterol metabolism • Describe synthesis & Utilization of ketone bodies

CO4:	• Describe general reactions of amino acids metabolism (transamination, oxidative deamination and decarboxylation) • Illustrate urea cycle • Describe how amino acids and proteins are metabolized, emphasizing the role of few intermediates of their metabolism, monitoring the deficiency and abundance disorders of amino acid metabolisms (phenyl ketonuria, alkaptonuria and albinism) and the role of enzymes in the regulation of the pathways
CO5:	• Understand the Sources of the atoms in the purine and pyrimidine molecules • Describe Biosynthesis, degradation and Regulation of purine and pyrimidine bases • Describe biosynthesis and degradation of porphyrins

LABORATORY COURSE: BIOCHEMISTRY PRACTICAL	
CO1:	✓ Determination of albumin and A/G ratio
CO2:	✓ Estimation of protein, lipids, blood urea, lipoprotein, bilirubin etc.
CO3:	✓ Qualitative and quantitative analysis
CO4:	✓ Separation techniques

B. Sc. Third Year

Course outcome *On completion of this course, successfully students will be able to learn:*

Title of the paper

FIRST PAPER -MOLECULAR BIOLOGY	
CO1:	Genetic information, structure levels of DNA
CO2:	DNA replication, mechanism of transcription,
CO3:	Transcription in Prokaryotes,Eukaryotes,
CO4:	Genetic code, mechanism of translation and gene expression in prokaryotes
CO5:	Mutation, mutagenicity testing, Recombinant DNA technology and its applications
SECOND PAPER -NUTRITION, CLINICAL & ENVIRONMENTAL BIOCHEMISTRY	

CO1:	Nutritional aspects of carbohydrates, fats, proteins, vitamins and minerals.
CO2:	Nutritive and calorific vale of foods, BMR, SDA
CO3:	Clinical biochemistry, quality control and importance of biochemical analysis
CO4:	Clinical enzymology, Diagnostic enzymes,SGOT,SGPT,LDH,Acid and Alkaline Phosphatase enzymes
CO5:	Air, water and soil pollution

LABORATORY COURSE: BIOCHEMISTRY PRACTICAL

CO1:	✓ Determination of albumin and A/G ratio
CO2:	✓ Estimation of hemoglobin, calcium, phosphorous, creatinine, immunoglobins, SGOT and SGPT.
CO3:	✓ Qualitative and quantitative analysis
CO4:	✓ Separation techniques, Enumeration of bacteria
