

DEPARTMENT OF BIOCHEMISTRY

Programme Specific Outcomes (PSO)

- **To impart advanced knowledge on various concepts of biochemistry.**
- **Enable students to achieve capacity for inquisitive enquire in the field of biochemistry.**
 - **To integrate and apply the techniques of Analytical biochemistry, Clinical Biochemistry, Microbiology and Molecular biology.**
- **To develop skills in students necessary for careers into advanced research.**
- **To learn the technical aspects of existing technologies that help in addressing the biological and medical challenges faced by humankind.**
- **Enrich the skills and applied knowledge of students towards current industry expectations from biochemists.**

DEPARTMENT OF BIOCHEMISTRY

SEMESTER 1

COURSE CODE	COURSE NAME	COURSE OUTCOME	
BC 511	ADVANCED TECHNIQUES IN BIOCHEMISTRY		Obtain knowledge about the principle, applications and basic operational procedures of essential laboratory equipment like bright field and fluorescence microscopy, centrifugation and electrophoresis.
			Get an understanding of various chromatographic techniques and its application in the isolation of nucleic acids, proteins, sugars and other bio molecules
			Develop an understanding about the principle and application of immunological techniques
			Understand the different processes employed in tissue histopathologic analysis.
			Attain insights about how genetic material can be amplified by techniques like PCR and analysed to understand the source of biological samples.
			Gain confidence to handle advanced laboratory equipment like atomic force microscopy and advanced spectroscopy.
		BC 512	PHYSIOLOGY
			Memorize blood components and how gaseous exchange occur in lungs, respiratory adaptation and the role of hemoglobin.
			Critically analyze and discuss the structure, muscle proteins and molecular events of muscle contraction.
			Comprehend how neuron and synapse transmit nerve impulses and path to brain.
			Appreciate the role of kidney in urine formation and detoxification mechanism occurring in the liver.

BC 513	PLANT AND MICROBIAL BIOCHEMISTRY		Discuss the importance and processes of photosynthesis, photorespiration and electron transport chain in plants.
			Explain the value of secondary metabolites produced in plants.
			Understand the mechanism of plant resistance.
			Discuss the role of plant hormones and how these regulate plant functions.
			Distinguish different groups of microbes, their nutritional requirement and genetic aspects.
			Apply the theoretical knowledge on various microbial techniques to practical purpose.
			Apply the knowledge in microbial nutrition for the culturing of microbes in laboratory.
BC 514	PRACTICAL I: BIOCHEMICAL AND MICROBIAL TECHNIQUES		Separate molecules using chromatographic and electrophoretic techniques
			Conduct sterilization techniques and prepare microbial culture media
			Differentiate bacteria using different staining techniques
			Isolate pure culture and identify the organism using biochemical techniques
			Determine the quality of milk and water

SEMESTER 2

COURSE CODE	COURSE NAME	COURSE OUTCOME
BC521	ENZYMES	Describe nomenclature and classification of enzymes and coenzymes.
		Predict possible catalytic mechanism of a given reaction type.
		Apply knowledge on enzyme kinetics for laboratory and research purpose.
		Predict the type of enzyme inhibition from kinetic data.
		Apply the knowledge on isolation and purification of enzymes for practical purpose
		Describe the major applications of enzymes in industry and medicine.
BC522	METABOLISM	Explain the metabolism of carbohydrates
		Compare and contrast aspects of lipid metabolism
		Discuss the important biochemical steps in the metabolism of amino acids
		Discuss the important biochemical steps in the metabolism of nucleic acids
		Illustrate the structure of mitochondria and how energy production occur in the organelle
		Comprehend the role of oxidative phosphorylation in bioenergetics and ATP generation
BC523	CLINICAL BIOCHEMISTRY	Gain detailed knowledge on the biological sample collection and its interpretation.
		Explain the automation in the clinical laboratory.
		Understand the importance of enzymes in diagnosis of diseases
		Understand the etiology of diseases that occur due to improper digestion and absorption of foods
		Acquire clinical knowledge on physiological organs and its related disorders.
		Obtain in depth idea on oncologic aspects and anti-oxidants

BC524	CELL BIOLOGY AND GENETICS		Characterize structure, function and models of plasma membrane
			Define processes occurring in cells like membrane transport and the mechanisms involved
			Describe major stages of important cellular processes like cell cycle and apoptosis
			Illustrate cell-cell interactions and molecular players involved
			Discuss receptor mechanisms and role played by receptors
			Elucidate protein sorting and roles played by vesicles, lysosomes, Golgi apparatus and endoplasmic reticulum
			Explain the nature of inheritance and how it results in phenotype
			Understand genetic testing and genetic counseling, linkage and genetic mapping, population genetics
BC525	PRACTICAL II: ENZYMOLOGY AND CLINICAL BIOCHEMISTRY		Trained on handling and isolation of enzymes from biological sample.
			Assay enzymes and express the activity in different units
			To determine the kinetic parameters of any enzyme
			To determine the optimum pH, temperature, effect of activator/inhibitors on enzyme activity.
			Perform liver function test.
			Estimate cardiac markers.
			Analyze biochemical markers of diabetes

SEMESTER 3

BC531	MOLECULAR BIOLOGY		Describe cellular processes like DNA synthesis, RNA synthesis and protein synthesis and how they relate to each other.
			Discuss the Central dogma of molecular biology and its importance
			Define gene expression and how a stimulus can affect the expression of a gene.
			Describe different regulatory mechanisms of gene expression
			Describe how RNA functions as genetic material in some organisms
			Explain how misfolded proteins cause diseases in the body
			Discuss the applications of molecular biology in the modern world like PCR, RNA interference, CRISPR-Cas9
BC532	IMMUNOLOGY		Understand the basics of immune system and the various cells and organs involved.
			Understand the concept of antigen-antibody interaction and their molecular aspects.
			Distinguish the various components of innate immunity and their mechanism of action.
			Evaluation of the role of B-lymphocytes in humoral immune response at the molecular level.
			Evaluation of the role of T-lymphocytes and Antigen-presenting cells in cell mediated immune response.
			Correlate serological reactions used in the diagnostic laboratory to detect interactions between antigens and antibodies.

			Justify reasons for vaccination, immunization and immunotherapy.
			Discuss the different immunodeficiency disorders that affect humans.
			Explain monoclonal antibody production.
BC533	PHARMACOLOGY AND TOXICOLOGY		Define a drug and to know its nature, classification, dose-response and how to design/develop drugs.
			Express various drug targets like receptors, enzymes, hormones etc and drug-receptor interaction with theories
			Critically evaluate what drug does to the body by drug-protein interactions.
			Analyse and come to know what the body does to a drug through absorption, distribution, metabolism and excretion of drugs by the body.
			Comprehend the concept of pharmacogenomics and its applications
			Illustrate the diverse modes of drug action of common diseases
BC534	METHODS IN RESEARCH		Define the purpose and scope of research methodology.
			Develop an understanding on various kinds of research, objectives of doing research, research process, research designs, sampling and to explore research methodology seen in literature.
			Propose a research design and identify different methods to conduct a research project.
			Nurture analytical skills and awareness on various aspects of research in biochemistry.
			Gain knowledge in statistical techniques used in data analysis.
			Understand the ethics in research involving human samples, embryo and stem cell research and to identify plagiarism and data fabrication.
BC535	PRACTICAL III: IMMUNOTECHNIQUES AND PHYTOCHEMICAL ANALYSIS		Perform various immunological techniques like immunodiffusion, immunoelectrophoresis and ELISA.
			• Develop an analytical thinking on how to test a

			biological sample and derive data.
			• Comprehend classical and modern techniques to isolate phytochemicals from plants
			• Would have acquired practical laboratory experience to expand understanding of biological processes and build a career.

SEMESTER 4

BC541	MOLECULAR ENDOCRINOLOGY		Get an idea on the endocrine system and its mode of operation
			Develop an understanding about the roles of the endocrine system in homeostasis, growth, development and reproduction
			Obtain knowledge on the response of endocrine organs to environmental changes
			Develop an understanding about the role of hormone receptors in hormone action
			Get an idea on the mechanism of action of hypothalamus, pituitary, thyroid, pancreatic, adrenal, gastrointestinal hormones
			Understand the pathophysiological processes associated with hormone imbalance
BC542	BIOTECHNOLOGY AND GENETIC ENGINEERING		Get basic idea about recombinant DNA (rDNA) technology, tools and the steps involved in the process.
			Gain knowledge on the requirements, steps and applications of gene cloning

			Know the basis of gene mapping and its usage.
			To judge the importance of genetically modified organisms
			Get an awareness on the various applications of biotechnology and genetic engineering.
BC543	PRACTICAL IV: TECHNIQUES IN MOLECULAR BIOLOGY		Gain insight of molecular biology techniques that are instrumental in analysis of genes at DNA level.
			Acquire practical experience in DNA and RNA extraction and their qualitative and quantitative analysis
			Learn to isolate DNA and to perform Agarose gel electrophoresis of DNA
			Understand theoretical and practical introduction to important methods like PCR and plasmid isolation
			Decide and apply appropriate tools and techniques in molecular biology
BC544	DISSERTATION		Identify research methods
			Ask the right scientific questions
			Identify review of literature
			Critically think and evaluate on the topic that is chosen for research
			Combine theory and practice
			Apply the knowledge obtained on the topic to the research being conducted
			Develop a response on the results obtained and analysis done and thereby draw conclusions
			Apply appropriate methods to represent the results
			Communicate the scientific data effectively
			Demonstrate the research skills in career advancement or future work-related studies
BC545	COMPREHENSIVE VIVA VOCE		

