

DEPARTMENT OF BIOCHEMISTRY

PROGRAMME- M.Sc. BIOCHEMISTRY

Program Outcome

To understand the molecular machinery of living cells and understand the functions of biomolecules in relation to their molecular structure and to understand the issues of environment and to analyze the impact of scientific and technological advances on the environment and society and the need for sustainable development.

Programme specifications

Programme Title	M.Sc. BIOCHEMISTRY
Pattern of Delivery	Full Time
Programme Length	2 Years

Aims of the programme:

- To assume ,enquire and analyze, apply logical principles, validate assumptions, solve problems integrate knowledge and widen perspective
- To apply contemporary research methods, skills and techniques for conduction independent inquiry in a chosen scientific disciple.
- To acquire deep scientifi knowledge in subjects like cell biology, enzymology, biotechnology, Metabolism, endocrinology,immunology,genetics, genetic engineering and clinical biochemistry
- To describe the biochemical basis of diseases, regulation of metabolic pathways and gene expression regulation
- To build on their knowledge and understanding in tackling more advanced and specialized courses, and more widely to pursue independent, self-directed and critical learning
- To acquire the ability to engage in independent and life-long learning process

Course Outcome

Delivery Pattern	Paper	Paper Code	Objectives
First Semester	Analytical Biochemistry & Bioanalytical Techniques	BCH1C01	<ul style="list-style-type: none"> To understand the difference between UV visible and fluorescence spectroscopy and colorimeter To identify different organic compounds using ESR ,NMR ,ORD and CD the various principles and instrumentation behind them To differentiate between paper, ion exchange and affinity chromatography, calculate Rf value from a chromatogram To exhibit a knowledge base in handling different chromatographic techniques and knowing the sequences of different proteins To explain the dangers and safety precautions associated with xrays and identify the various isotopes used in radiography To learn fundamental principles behind centrifugation and electrophoresis and apply them practically. To choose and apply suitable separation techniques to identify different biomolecules To understand the southern and northern blots and applying them at genome level
	Structural Biology, Bioinformatics And Biostatistics	BCH1C02	<ul style="list-style-type: none"> To develop knowledge about how proteins work at a molecular level To understand structural molecular biology To apply knowledge of basic principles and concepts of biology , computer science and mathematics to solve complex biological problems To understand existing softwares to extract information from large databases and to use this in computer modeling To imparts the knowledge of basic statistical methods to solve problems To apply the importance of various statistical tools in research (ANOVA,SPSS,T-test,Chi-square testetc...)

First semester	Microbiology And Immunology	BCH1C03	<ul style="list-style-type: none"> • To understand diverse microbiological and immunological process such as medical, environmental and immunology • To acquire knowledge of the diverse places where microbiology and immunology are involved • Ability to present and articulate their knowledge of microbiology and immunology field • To design knowledge of recent developments in the area of Microbiology
	Practical I	BCH1L01	<ul style="list-style-type: none"> • To analyse different sugars from a mixture • To understand about the preparation of different solutions • To acquire knowledge about the standardization and optimization of pH meter • To develop competence in sampling and laboratory management • To develop good laboratory practices and minimize hazards in laboratory • To apply the knowledge in the working principle of UV-VIS spectrophotometer to quantify different biomolecules present in test samples • To apply the knowledge in clinical biochemistry to diagnose the samples and interpretate the results by comparing with normal values • To learn about computer basics like OS, programming in Visual Basic, Data Access, Internet and Nucleic acid sequence and Protein Data Banks • To perform the Data Base Similarity Searches like BLAST, FASTA • To understand Multiple sequence alignments, Primer Designing, Homology Modelling, Phylogenetic Analysis and protein structure determination • To operate various Molecular Visualizing Tools like Rasmol • To apply suitable separation techniques to identify different biomolecules

	Practical II	BCH1L02	<ul style="list-style-type: none"> • To develop a deep knowledge in working with microbiological tools and techniques • To develop moderately advanced skills in working with microbes such as culturing, staining, preserving, biochemical identification and immunological tests • To develop skills in the preparation of microbiological culture medias used for the cultivation of microbes • To explain the dangers and safety precautions associated with the handling of various pathogenic microorganisms • To understand the working principles of various sterilizing equipments and chemical sterilizing agents used in microbiology lab • To develop a skill to set a basic microbiology lab • To analyze water quality parameter for the detection of coliforms using MPN test • To develop a deep knowledge in various immunological tests commonly performing in clinical laboratories
Second Semester	Enzymology	BCH2C01	<ul style="list-style-type: none"> • To explain relationship between the structure and function of enzymes • To explain how enzymes are able to increase speed of an biochemical reaction in sense of thermodynamics, kinetics and molecular interactions • To interpret and explain significant mechanisms of regulation of enzymatic action and specifies importance of enzymes in regulation of metabolism • To apply appropriate methods for determination of catalytic parameters and activity of enzymes and resolve problems considering kinetics and thermodynamics of enzymatic reactions • To analyze options for applying enzymes and their inhibitors in medicine and various industries. • To illustrate the enzyme catalysis, kinetics and regulatory aspects. • To design step wise protocols for the extraction purification and characterization of enzymes from different sources. • To apply the knowledge of immobilization techniques in medical and industrial sectors

Second semester	Plant Biochemistry	BCH2C02	<ul style="list-style-type: none"> ▪ To develop a basic understanding of structural arrangement of plant cell and organization. ▪ To explain and understand the biochemistry of photoreceptor complexes, like phtochrome, cryptochromes and phototropins. ▪ To understand the basics of photosystems and photosynthesis. ▪ To differentiate between light and dark reactions of photosynthesis and photorespiration. ▪ To explain photosynthetic pathways like C3, C4, C2 and CAMP. ▪ To know the significance of plant growth regulators in the development of plants. ▪ To understands the stages of plant development- ripening, germination, dormancy and senescence, ▪ To understands the mechanism of water and mineral balance in plants. ▪ To understand the mechanism of Nitrogen metabolism, mechanism of nitrate and nitrite reduction, and nitrogen fixation and its importance. ▪ To acquire knowledge about the importance of secondary metabolites and its applications. ▪ To explain various bio-geochemical cycles like, carbon, nitrogen, sulphur and phosphorus cycles.
	Cell And Molecular Biology	BCH2C03	<ul style="list-style-type: none"> ▪ To understand the various stages of cell cycle ,and their regulation ▪ To explain the different stages of development and their regulation. ▪ To differentiate between apoptosis and necrosis ▪ To understand the structure and functions of the plasma membrane and transport mechanisms across the membrane ▪ To analyse the mechanisms underlying cell adhesion, cell-cell communication, and cell matrix communication ▪ To understand basics of cell signalling mechanism and their receptors. ▪ To learn and understand the basics of replication, transcription, and translation. ▪ To analyse the various enzymes involved in central dogma of life.

			<ul style="list-style-type: none"> ▪ To understand the concept of operon, gene regulations and various factors involved in gene expression.
Second semester	Practical III	BCH 2L01	<ul style="list-style-type: none"> ▪ To understand a basic knowledge about enzymes total activity and specific activity ▪ To have a deep knowledge about various factors affecting enzyme activity ▪ To acquire knowledge about calculating Km by MM-Plpt and LB-Plot ▪ To interpretate LB plots
	Practical IV	BCH 2L02	<ul style="list-style-type: none"> ▪ To acquire knowledge about preparation of medias and sterilization techniques in plant tissue culture ▪ To understand about isolation of DNA & AGE techniques ▪ To interpretate DO of water samples
Third semester	Metabolic Regulation and Boenergetics	BCH3C01	<ul style="list-style-type: none"> ▪ To learn deeply about biochemical and genetic regulation of various metabolic pathways of carbohydrates, proteins, fatty acids, and nucleic acids. ▪ To 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. ▪ To understand the utilization of proton gradient to drive the formation of high energy bonds and high energy compounds. ▪ To understand how biosynthetic processes are controlled and integrated with metabolism of the cell as well as gene regulation and biochemical aspects of

			<p>evolution</p> <ul style="list-style-type: none"> ▪ To apply the knowledge of biochemical and genetic regulation of metabolism in research and diagnostic sectors
Third semester	Physiology and Endocrinology	BCH3C02	<ul style="list-style-type: none"> • To identify and explain the structure and functions of each body system. • To discuss diseases, disorders, and conditions commonly found in healthcare occupations. • To explain the role of each body system in maintaining homeostasis. • To describe the physiological effects of aging on the human body. • To understand the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems. • To understand how these separate systems interact to yield integrated physiological responses to challenges such as exercise, fasting and ascent to high altitude, and how they can sometimes fail. • To perform, analyse and report on experiments and observations in physiology. • To recognize and identify principal tissue structures
	Genetics ,rDNA technology and IPR	BCH3C03	<ul style="list-style-type: none"> • To learn and understand the Principles of Mendelian inheritance, Linkage and genetic mapping; Extrachromosomal inheritance, Sexlinked inheritance and genetic disorders, Somatic cell genetics, Population genetics. • To learn about Genetic engineering and prospects of improving crop productivity, resistance, resistance to disease and environmental stresses, methods for production of transgenic animals • To understand Recombinant DNA methods, Features of commonly used vectors, strategies for cloning in various vectors and restriction enzymes. • Understand theoretically about Intellectual Property Rights and Patenting procedures

Third semester	Neuro Biochemistry	BCH3E01	<ul style="list-style-type: none"> • To understand the physiology and anatomy of human nervous system • To describe how the nervous system is established and how neurons are connected in neuronal circuits that control bodily functions and behavioral output' • To develop a knowledge in neuroscience to study how neurochemicals influence the operation of neurons, synapses, and neural network. • To analyse the biochemistry and molecular biology of organic compounds in the nervous system. • To acquire a deep knowledge in various neurodegenerative diseases.
	Protein Chemistry	BCH3E02	<ul style="list-style-type: none"> • To develop knowledge in protein engineering, structure and function relationships, physicochemical properties of proteins and methodologies for characterization of proteins. • To understand the recent results in systems biology and are able To work on related research projects. • To acquire a thorough understanding of protein structure and function from both molecular and chemical vantage point
	Practical V	BCH3L01	<ul style="list-style-type: none"> • To perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol. • To distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases • To recognize safety equipment and laboratory safety measures and utilize adequate personal protective equipments. • To diagnosis prediction of red and white blood cell disorders from the correlation of hematology results

Fourth semester	Biochemical Toxicology	BCH4E01	<ul style="list-style-type: none"> • To utilize a variety of advanced quantitative and qualitative analysis methods, methodology in the field and the application of these to independently analyze and solve (modelling) toxicological and/or chemical problems. • To demonstrate the basic principles of toxicology and illustrate toxicity risk assessment and fate of toxicants in humans • To demonstrate the experimental approach for analyzing drug action • To evaluate acute and chronic toxicity of environmental chemicals • To develop competence in handling drugs and toxic materials • To integrate theoretical and practical knowledge acquired in pharmacology and toxicology for advanced studies
	Cancer Biology	BCH4E03	<ul style="list-style-type: none"> • To understand chromatin as it relates to gene expression. Understand epigenetics and somatic genetic changes in tumors. • To understand modern aspects of RNA and protein biology. • To understand the cell cycle, angiogenesis and apoptosis. • To familiarize with basic facets of carcinogenesis and methods to study the process • To understand how immunotherapy is, and can be, used to treat human illness: strategies, advantages, and hurdles to overcome to realize its potential. • To examine different cancer cell lines. – To characterize some examples of cytological features of cancer cells. – To examine pattern of factors inducing cancer.

Fourth semester	Project	BCH4P01	<ul style="list-style-type: none">• To analyze primary literature• To evaluate experimental techniques• To develop skill in experimental design, hypothesis formulation, statistical analysis of results• To analyze and prepare final reports and publications
------------------------	---------	---------	--